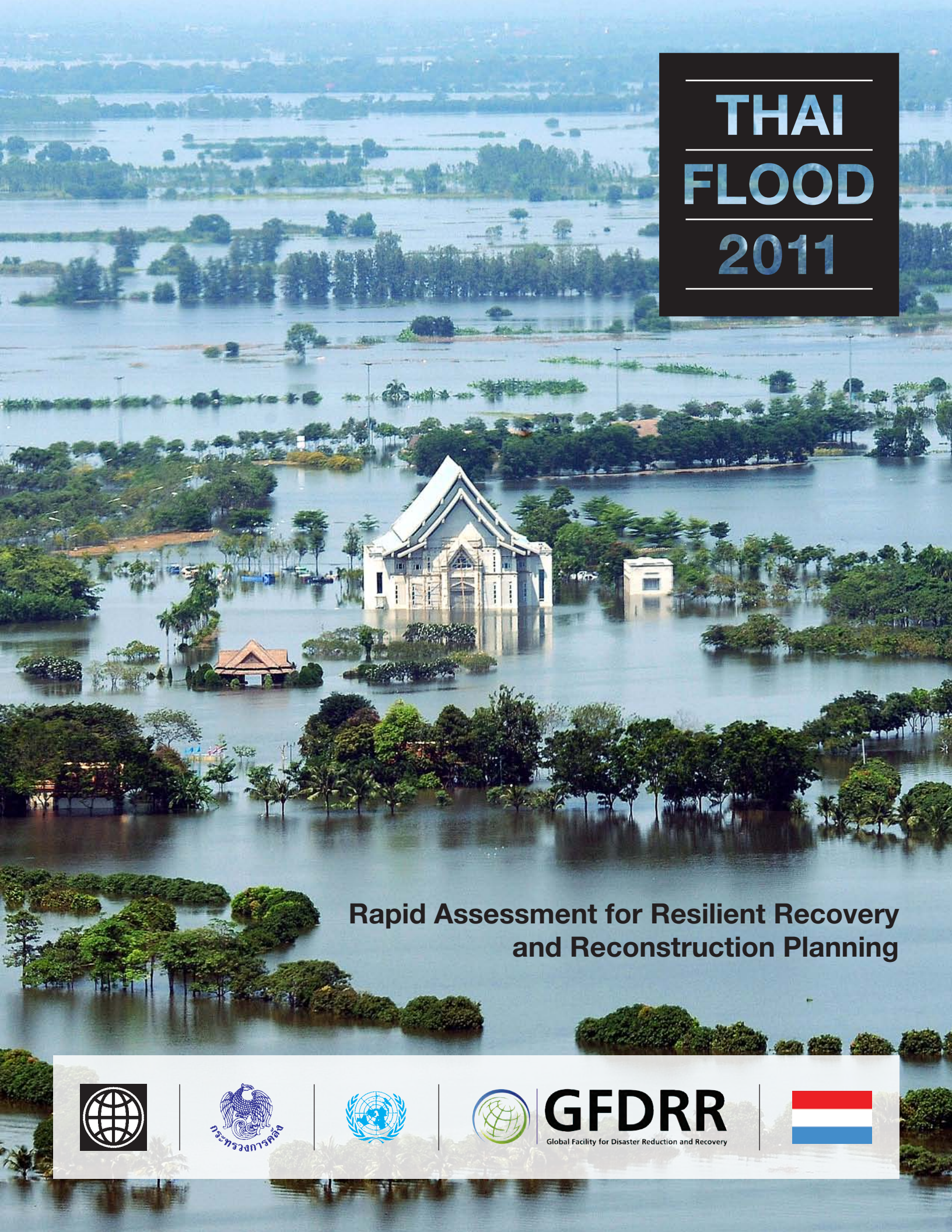

THAI FLOOD 2011

Rapid Assessment for Resilient Recovery and Reconstruction Planning

กระทรวงการคลัง

GFDRR
Global Facility for Disaster Reduction and Recovery

THAI FLOOD 2011

Rapid Assessment for Resilient Recovery and Reconstruction Planning



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FOREWORD

In 2011, Thailand suffered its worst floods in more than half a century. Caused by excessive and continuous rainfall from successive, powerful monsoons and subsequent, numerous dam breaches, the floods inundated more than six million hectares of land in 66 of the country's 77 provinces, and affected more than 13 million people from July through December 2011.

In response to the disaster, the Royal Thai Government established centralized flood monitoring and relief operations in mid-August, allocated extra flood-relief financial support to the affected provinces, and pledged investment in resilient recovery and reconstruction for all impacted sectors.

In October, the Royal Thai Government, led by the Ministry of Finance, initiated an exercise to assess the economic and social impact of the floods and prepare recovery and reconstruction plans. This exercise was done in collaboration with the World Bank and various development partners. This Rapid Assessment for Resilient Recovery and Reconstruction Planning report is the result of the exercise which took place from November 4–25, 2011. Twenty-six of the country's 66 affected provinces were included in the assessment, which examines 18 main sectors and used a comprehensive and internationally established methodology looking at damage and losses caused by the disaster. The report determines the country's needs for post-disaster recovery and reconstruction and proposes short-, medium-, and long-term measures in each of the 18 sectors for a sustainable post-disaster reconstruction program. Drawing on global good practices for disaster risk management and building-back-better strategies, the report also gives suggestions on how to improve the resilience of the country's infrastructure and its communities to the impacts of disasters.

This report was made possible through the concerted efforts of government agencies, private sector partners, civil society organizations, and development partners. The speed with which such a comprehensive report was prepared is testimony to the remarkable dedication of a broad range of agencies and individuals, who came together as a team with one serious task at hand; to help the government of Thailand and its people form a full picture of the situation and the challenges ahead. There are many agencies and individuals whose great contributions deserve acknowledgement. This report, and the experience of producing it, will provide a strong foundation for the continued efforts of the government to develop a framework for strategic and rapid responses to future disasters and the integration of disaster prevention and mitigation efforts into a range of development activities for the benefit of the people of Thailand and the country's future economic growth and prosperity.

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Permanent Secretary
Ministry of Finance

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The World Bank
On behalf of the International Development Partners

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An additional list of partners and colleagues met during the rapid assessment can be found in Annex 1.

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ACRONYMS

ACHR	Asian Coalition for Housing Rights
ADPC	Asian Disaster Preparedness Center
AIS	Advanced Info Service Public Company Limited
AIT	Asian Institute of Technology
AM	Amplitude modulation (radio)
AOT	Airports of Thailand
ASA	The Association of Siamese Architects under the Royal Patronage of His Majesty the King
ASEAN	Association of Southeast Asian Nations
ATM	Automatic Teller Machine
ATTA	Association of Thai Travel Agents
avg	average
BAAC	Bank for Agriculture and Agricultural Cooperatives
BBB	Build-Back-Better
BCP	Business Continuity Plan
BMA	Bangkok Metropolitan Administration
BOP	Balance of Payments
BOT	Bank of Thailand
CAR	Capital Adequacy Ratio
CAT	CAT Telecom Public Company Limited (formerly Communications Authority of Thailand)
CCB	[Lijiang] Country Construction Bureau
CFA	Child and Family Assistance Fund
CBDRM	Community Based Disaster Risk Management
CBDRR	Community Based Disaster Risk Reduction
CODI	Community Organizations Development Institute
Co-Ops	Co Operatives
CSMBS	Civil Servant Medical Benefit Scheme
DAE	Department of Agriculture Extension
DALA	Damage and Loss Assessment
DDPM	Department of Disaster Prevention and Mitigation, Ministry of Interior
DDRM	Department of Disaster Risk Management, Ministry of Interior
DGR	Department of Groundwater Resources
DHL	DHL Express
DIW	Department of Industrial Works
DLD	Department of Livestock Development
DMCR	Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment
DNP	Department of National Parks, Wildlife and Plant Conservation, Ministry of Natural Resources and Environment
DOH	Department of Highways
DOF	Department of Fisheries

DOT	Department of Tourism
DOTS	Directly Observed Treatment Short-Course
DPMA	Disaster Prevention and Mitigation Act
DPM	Disaster Prevention and Mitigation
DPT	Department of Public Works and Town Planning, Ministry of Interior
DRM	Disaster Risk Management
DRG	Diagnosis Related Group
DRR	Department of Rural Roads, Ministry of Transport
DSLAM	Digital Subscriber Line Access Multiplexer
DSNG	Digital Satellite News Gathering
DTAC	Total Access Communication Public Company Limited
DWR	Department of Water Resources
EGAT	Electricity Generating Authority of Thailand
EOC	Emergency Operation Center
EPPO	Energy Policy and Planning Office
ERT	Emergency Rescue Team
EU	European Union
EWS	Early warning system
EXAT	Expressway Authority of Thailand
EXIM Bank	Export and Import Bank of Thailand
FAD	Fine Art Department
FAO	Food and Agriculture Organization of the United Nations
FedEx	Federal Express Corporation
FETTA	Federation of Thai Tourism Associations
FDG	Focus Group Discussions
FM	Frequency modulation (radio)
FPO	Fiscal Policy Office
FROC	Flood Relief Operations Center
FSAP	Financial Sector Assessment Program
FTI	Federation of Thai Industry
GDP	Gross Domestic Product
GER	Gross Enrollment Rate
GFDRR	Global Facility for Disaster Reduction and Recovery
GHB	Government Housing Bank
GIS	Geographic Information System
GPP	Gross Provincial Product
GISTDA	Geo-Informatics and Space Technology Development Agency
GSB	Government Saving Bank
GW	giga-Watt
GWh	giga-Watt hour
ha	hectare
HAII	Hydro and Agro Informatics Institute
HEI	Higher Education Institute
HFA	Hyogo Framework for Action
HISRO	Health Insurance System Research Office
ICOM	International Council of Museums
ICOMOS	International Council on Monuments and Sites
IDP	Internally Displaced Person

IFC	International Finance Corporation
ILO	International Labor Organization
IOM	International Organization for Migration
IP	in-patient
IPP	Independent Power Producer
ITU	International Telecommunication Union
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
KII	Key Informant Interviews
km	kilometer
KMUTT	King Mongkut's University of Technology Thonburi
kV	kilo-volt
kWh	kilo-Watt hour
l/s	liter per second
m	meter
m^2	square meter(s)
m^3	cubic meter(s)
MEA	Metropolitan Electricity Authority
MFs	Military Funds
MICE	Meetings, Incentive, Conference and Exhibitions
mm	millimeter
MOAC	Ministry of Agriculture and Cooperatives
MOC	Ministry of Commerce
MOE	Ministry of Education
MOF	Ministry of Finance
M-Industry	Ministry of Industry
MOI	Ministry of Interior
MOPH	Ministry of Public Health
MOST	Ministry of Science and Technology
MNRE	Ministry of Natural Resources and Environment
MSAN	Multi-Service Access Node
MSDHS	Ministry of Social Development and Human Security
MSMEs	Micro, Small and Medium Enterprises
MSW	Municipal Solid Waste
MTS	Ministry of Tourism and Sports
MVA	megavolt-ampere
MW	mega-Watt
MWA	Metropolitan Waterworks Authority
NBTC	National Broadcast and Telecommunications Commission
NCD	Non-Communicable Disease
NDPMC	National Disaster Prevention and Mitigation Committee
NDPMP	National Disaster Prevention and Mitigation Plan
NEB	National Environment Board
NESDB	National Economic and Social Development Board
NIDA	National Institute of Development Administration
NGO	Non-Government Organization
NHA	National Housing Authority
NHSO	National Health Security Office
NPL	Non-Performing Loan

NRCT	National Research Council of Thailand
NSO	National Statistical Office
NWRA	National Water Resources Authority
NWRC	National Water Resources Committee
O&M	Operation and Maintenance
OAE	Office of Agricultural Economics
OECD	Organization for Economic Co-operation and Development
OIC	Office of Insurance Commission
ONAB	Office of National Buddhism
ONEP	Office of Natural Resources and Environment Policy and Planning, Ministry of Natural Resources and Environment
ONWRC	Office of the National Water Resources Committee
OP	outpatient
OTOS	One Tambon One Search & Rescue
OTP	Office of Transport and Traffic Policy and Planning, Ministry of Transport
PCD	Pollution Control Department, Ministry of Natural Resources and Environment
PDMO	Public Debt Management Office
PEA	Provincial Electricity Authority
PHO	Provincial Health Office
PMT	Proxy Means Test
PPP	Private Power Producer
PRD	Public Relations Department
PWA	Provincial Waterworks Authority
PWD	Public Works Department
RBC	River Basin Committee
RBO	River Basin Organization
RID	Royal Irrigation Department
RTG	Royal Thai Government
SARS	Severe Acute Respiratory Syndrome
SBCG	Small Business Credit Guarantee Corporation
SEAMEO	Southeast Asian Ministers of Education Organization
SEC	Securities and Exchange Commission
SET	Stock Exchange of Thailand
SFI	Specialized Financial Institution
SNAP	Strategic National Action Plan on Disaster Risk Reduction
SMC	Secondary Mortgage Corporation
SME	Small- and Medium Size Enterprises
SME Bank	Small and Medium Enterprises Development Bank of Thailand
SOP	Standard Operating Procedures
SPP	Small Power Producer
SRT	State Railway of Thailand
SSF	Social Security Fund
SSO	Social Security Office
SSS	Social Security Scheme
SWOT	Strength, Weakness, Opportunity and Threat
TA	Technical Assistance
TAO	Tambon Administrative Office
TAT	Tourism Authority of Thailand

TATA	Thailand Association of Travel Agencies
TB	tuberculosis
TBA	Thai Boats Association
TCG	Thai Credit Guarantee Corporation
TCT	Tourism Council of Thailand
TDRI	Thailand Development Research Institute
THA	Thailand Hotel Association of Thailand
THB	Thai baht
TICON	TICON Industrial Connection Public Company Limited
TMD	Thai Meteorological Department
TNT	Thomas Nationwide Transport, Ltd
TOT	Telecom of Thailand Public Company Limited
TOU	Time of Use
TRC	Thai Red Cross
TRF	Thai Research Funds
TRUE	True Corporation Public Company Limited
TTAA	Thai Travel Agents Association
UC	Universal Health Coverage
UF	Urban Funds
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Program
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UPS	United Parcel Service, Inc.
USD	US dollar
VFs	Village Funds
VSPP	Very Small Power Producer
WFP	World Food Programme
WHO	World Health Organization
WMA	Wastewater Management Authority
WSS	Water Supply and Sanitation
WTTC	World Travel and Tourism Council
WUA	Water User Association


ทัฟ-โคท
ไดนอส

EXECUTIVE SUMMARY

In response to the prolonged and widespread flooding throughout Thailand in 2011, the Royal Thai Government, in conjunction with the World Bank and other development partners, undertook this rapid assessment of the impact of the floods in 26 of the 66 affected provinces. This report outlines these findings, including damage and loss estimates and social and economic impacts, and proposes strategies for resilient recovery and reconstruction planning.

The Disaster

Heavy rain combined with multiple tropical storms throughout the extended rainy season played a large part in the extensive flooding. Flash floods were reported in several areas in the north in May, and tropical depression Haima arrived in June followed by Nock-Ten in July, the combination of which caused widespread flooding. The southwest monsoon in August-September and the northeast monsoon in October added to the flooding, which was making its way into the central plains, filling many major dams to capacity and causing breaches in 10 major flood control structures. Some 66 provinces were affected by severe, record-high flooding, including the Bangkok metropolitan area and its surrounding areas[1]. By November more than 5.5 percent of total landmass in the country had been inundated, and at the time of writing, approximately 11.2 million rai (18,000 km2) of farmland remained under water[2]. Overall, the floods affected more than 13 million people and resulted in more than 680 deaths.

Economic and Social Impacts

The total damage and losses from the 2011 floods in Thailand amounted to THB 1.43 trillion (USD 46.5 billion), with losses accounting for 56 percent of the total. The manufacturing sector bore roughly 70 percent of the total damage and losses due to the flooding of six industrial estates in Ayuthaya and Pathum Thani from mid-October to November 2011. Overall, approximately 90 percent of the damage and losses from the 2011 floods were borne by the private sector.

Rehabilitation and reconstruction needs[3] over the next two years and beyond are estimated at THB 1.5 trillion (USD 50 billion). Approximately three-quarters of the needs will be borne by the private sector. The manufacturing sector's needs account for 80 percent of the private sector needs. As for the government, the majority of needs are estimated to be for water resources management and for the rehabilitation of transportation facilities such as roads and bridges. Both commercial financial institutions and the government's specialized financial institutions require approximately THB 411 billion (USD 14 billion) as loans for rehabilitation and reconstruction.

Based on the DALA methodology, it is estimated that the floods will reduce real GDP growth in 2011 by 1.1 percent from pre-flood projections. But the reconstruction that has started in 2012 and will largely be completed by year-end is expected to increase real GDP growth in 2012 by 1.7 percent. That is, real GDP growth in 2011 would fall from the NESDB's pre-flood projection of 4.0 percent to 2.9 percent. However, if reconstruction did not take place, projected real GDP would fall by THB 50 billion (USD 1.7 billion) in 2012.

1 From Thailand's Meteorological Department (http://www.tmd.go.th/en/event/flood_in_2011.pdf)
2 UN Situation Report 14, dated December 8, 2011.
3 Needs include not only building back a part or all of the damage in each sector, but reconstructing to a higher quality that is more weather resilient and/or has better technology.

The floods will negatively affect the current account in 2011 and 2012. In 2011, exports fell by an estimated USD 7.9 billion due to the floods hampering manufacturing firms' production in the last quarter of 2011. The reduction in manufacturing, coupled with a significant fall in tourism revenues, meant the current account in 2011 was USD 11.9 billion, compared to a projected USD 20.6 billion had the floods not occurred. In 2012, the current account balance is estimated to be USD 12.4 billion, down from an earlier projection of USD 22.2 billion, mainly due to the increase in imports for reconstruction, estimated at USD 7.5 billion, and a shrinking of exports by roughly USD 1.9 billion.

Government revenue will be negatively affected most in 2011 due to interruptions in manufacturing and reduced consumption in the last quarter of the year. The estimated tax revenue loss is around THB 66.5 billion, or 3.7 percent of the estimated pre-flood revenues. In 2012, the projected revenue losses of THB 52.6 billion – or 2.6 percent of pre-flood projected revenues – are mainly due to the continued low levels of manufacturing plus import tariff exemptions on capital goods for the replacement of manufacturing production machinery damaged by the floods.

The government's fiscal stance will allow it to meet rehabilitation and reconstruction needs. The government's flood rehabilitation and reconstruction expenditure could amount to THB 389 billion (USD 13 billion). The bulk of the needs will be in the period of 6–24 months after the floods have receded, when most of the reconstruction is expected to take place. In FY 2013, government expenditure could amount to almost 11 percent of its revenue. To be able to finance such expenditure, the government will need to both prioritize spending and borrow additional resources to fund required reconstruction needs. It should be noted that, under the current public debt law, the government still has enough headroom to fund these additional expenditures.

Poor and marginalized households were heavily affected and livelihoods severely disrupted. At least THB 110 billion in wages have been lost due to the floods and a large proportion of these losses occurred within vulnerable populations with limited social protection. Total income loss from the beginning of the flood to 2014 is estimated to be around THB 129 billion. The worse affected households in terms of wage-losses were those employed in labor-intensive sectors such as wholesales and retails trade and repairs, hotels and restaurant and financial intermediaries. These sectors accounted for a total of THB 25 billion in losses.

Livelihoods have been severely disrupted in both rural and urban areas. Urban poor groups and tree crop farmers in rural areas emerged as some of the most affected groups. Agricultural laborers and daily wage earners in urban poor areas have been severely affected with their income generation activities temporarily suspended. In addition, alternative, short-term, informal work opportunities are difficult to find. Resorting to borrowing both for basic expenditures seems, therefore, to have been a widespread coping strategy in both rural and urban areas. The majority of rural farming households have loans with the Bank for Agriculture and Agricultural Cooperatives. With harvests lost and significant additional investments required to re-establish their livelihoods, farmers are concerned that they will default on their loans and thus will not be able to borrow further. For the urban poor, loss of earning opportunities has been compounded by limited access to formal sources of credit due to collateral requirements and a lack of steady income. The only sources of funds available to these groups are informal lenders, who charge extremely high interest rates (as much as 20 percent daily).

Damage, Losses and Needs Assessment

The rapid assessment estimated damage, losses and needs for reconstruction and recovery. Damage refers to direct impacts on physical assets, products, raw materials, machinery, and properties. Losses refer to reduced or lost production opportunities, i.e. loss of income, reduced production efficiency, and increasing expenditures over a period of time. Reconstruction and recovery needs are projected from the damage estimates, and are counted as additional economic activities in the macroeconomic assessment. The estimated damage and losses total approximately THB 1.43 trillion (USD 46.5 billion – Table 1). The damage to physical assets amount to THB 630.3 billion (USD 21 billion), where associated losses in economic activities add up to about THB 795 billion (USD 26.5 billion). It should be noted that these estimates assume losses will occur over the three-year period of 2011–2013.

The floods impacted heavily on the private sector, particularly manufacturing. Manufacturing makes up about 38.5 percent of Thailand's GDP and is one of the main drivers of Thailand's exports. The majority (around 70 percent in GPP values) of manufacturers are located in five flood-affected provinces, namely Bangkok, Ayuthaya, Nakhon Sawan, Pathum Thani, and Samut Sakhon. Tourism, housing and the financial sector were also heavily affected. Though there was some damage to tourism infrastructure, the greatest impact came from losses in revenue from accommodation, transportation, shopping, food & beverages, entertainment and sightseeing. In housing, some 1.9 million houses were affected with about 19,000 homes destroyed. But the greatest damage was to household goods. Damage in the housing sector were the second largest – after manufacturing – with comparable losses as a proportion of damage. The financial sector incurred very little damage, but will be heavily impacted by losses during the reconstruction period in which there will be substantial need for the extension of credit repayment plans, and new credit line extensions.

Table 1:
Summary of damage and losses by sector in Thai baht, millions

Sub Secrtor	Disaster Effects			Ownership	
	Damage	Losses	Total	Public	Private
Infrastructure					
Water Resources Management	8,715	-	**8,715**	8,715	-
Transport	23,538	6,938	**30,476**	30,326	150
Telecommunication	1,290	2,558	**3,848**	1,597	2,251
Electricity	3,186	5,716	**8,901**	5,385	3,517
Water Supply and Sanitation	3,497	1,984	**5,481**	5,481	-
Productive					
Agriculture, Livestock and Fishery	5,666	34,715	**40,381**	-	40,381
Manufacturing	513,881	493,258	**1,007,139**	-	1,007,139
Tourism	5,134	89,673	**94,808**	403	94,405
Finance & Banking	-	115,276	**115,276**	74,076	41,200
Social					
Health	1,684	2,133	**3,817**	1,627	2,190
Education	13,051	1,798	**14,849**	10,614	4,235
Housing	45,908	37,889	**83,797**	-	83,797
Cultural Heritage	4,429	3,076	**7,505**	3,041	4,463
Cross Cutting					
Enironment	375	176	**551**	212	339
TOTAL	**630,354**	**795,191**	**1,425,544**	**141,477**	**1,284,066**

Source: DALA estimates, NESDB, and Ministry of Industry
Note: Losses for each sector include higher expenditures due to floods

Recovery and reconstruction needs are estimated to be THB 1.5 trillion (USD 50 billion) over a five-year period. THB 413 billion (USD 13.7 billion) is needed for immediate recovery, whilst more than half of the total needs (THB 927 billion or USD 31 billion) will be spent in the medium-term. More than 70 percent of needs (THB 1.1 trillion or USD 37 billion) are in the private sector. Within the private sector, the manufacturing sector accounts for around 77 percent of the rehabilitation needs as it incurred most of the damage.

Table 2:
Total public and private needs for rehabilitation and reconstruction in Thai baht, millions

Sub Sector	Needs			Needs			
	Public	Private	Total	~6 mths	6-24 mths	> 24 mths	Total
Infrastructure							
Water Resources Management	54,075	15,000	**69,075**	3,023	15,462	50,590	**69,075**
Transport	23,538	-	**23,538**	6,866	14,376	2,296	**23,538**
Telecommunication	2,026	2,052	**4,078**	1,675	1,422	980	**4,078**
Electricity	5,625	-	**5,625**	899	3,037	1,689	**5,625**
Water Supply and Sanitation	5,633	-	**5,633**	2,997	2,635	-	**5,633**
Productive							
Agriculture, Livestock and Fishery	4,570	-	**4,570**	3,425	1,125	20	**4,570**
Manufacturing	-	854,356	**854,356**	172,640	668,045	13,671	**854,356**
Tourism	3,280	2,186	**5,466**	4,343	1,123		**5,466**
Finance & Banking	234,520	176,919	**411,439**	170,140	187,907	53,392	**411,439**
Social							
Health	2,318	-	**2,318**	1,128	870	319	**2,318**
Social	20,700	-	**20,700**	13,300	7,400	-	**20,700**
Education	13,343	-	**13,343**	8,045	5,298	-	**13,343**
Housing	5,110	46,870	**51,980**	14,990	12,510	24,480	**51,980**
Cultural Heritage	7,514	2,640	**10,153**	6,183	3,971	-	**10,153**
Cross Cutting							
Environment	6,181	2,004	**8,184**	3,724	1,619	2,841	**8,184**
TOTAL	**388,431**	**1,102,027**	**1,490,458**	**413,378**	**926,801**	**150,278**	**1,490,458**
Private needs				304,012	681,587	116,428	**1,102,027**
Public needs				109,366	245,214	33,850	**388,430**
as % post-flood revenues				5.5	10.8	1.4	

Source: DALA
Note: The needs of the manufacturing sector include loans from the finance and banking sector of around THB 160 billion. Similarly, the needs of the agricultural sector will be mostly financed through loans from the Bank for Agriculture and Agricultural Cooperatives (BAAC). The needs of these two sectors are also included in the finance and banking sector needs. Loan needs of the other sectors are not included in their respective sectors, but are only counted in the finance and banking sector's needs.

Recovery and Reconstruction Strategy

The 2011 floods were a powerful and intense force of nature that had a huge impact on the lives of many. The floods caused widespread damage and losses that have contributed to decline in productivity; but they also offer opportunities for advancement and growth. If planned effectively, the recovery and reconstruction program could offer opportunities to rebuild better, taking advantage of economically productive options. Below, recommendations from the sectoral assessment teams have been grouped into three overarching areas that broadly encompass the findings and recommendations of the rapid assessment. Detailed recommendations by sector can be found in the sectoral chapters.

I Provide support to the affected population with a particular focus on vulnerable groups

Providing support to the affected populations (and to vulnerable groups in particular) to help prevent further indebtedness and allow people to resume normal livelihood activities is the immediate priority. Key guiding principles of equity, beneficiary/community participation, transparency and accountability should inform the implementation of these recovery programs. The development of a robust monitoring and evaluation system will be essential to assess progress and take corrective action where needed. The proposed rapid response is expected to cover vulnerable and marginalized households with limited sources of income and no ability to participate in labor-based recovery and reconstruction intervention (including the elderly, sick and people with disabilities and children). It would also address the needs of those in both urban and rural areas that suffered heavy losses during the flooding. Additional social assistance should be put in place to: (i) provide one-off supplemental cash transfers to poor affected households (THB 4,000 per household); and ii) provide additional income support for the elderly and people with disabilities for approximately three months (increase from THB 500 to 1,000). In addition, labor-intensive public works programs with a strong community participation component would provide much-needed additional income for those able to work; priority would be given to vulnerable and marginalized groups including migrant workers. Finally, addressing the need for credit at specialized financial institutions (SFI) rates for the urban and rural poor will be critical in the recovery process to prevent escalating levels of debt (particularly for those borrowing from informal money lenders). This could be achieved through non-profit organizations and by expanding the membership of community-based savings groups.

Providing recovery assistance to the recovering productive sectors such as agriculture, SMEs and other businesses will facilitate the rapid restoration of business. The cash-for-work programs mentioned above can couple the compensation with employment opportunities and benefit communities and businesses with cleanup and restoration of infrastructure. In the agriculture sector, equitable compensation to affected farmers and the rapid distribution of quality inputs while closely monitoring the effectiveness of the distribution system, along with the alleviation of financial pressures through debt suspensions and extending loans, can support heavily-affected families and facilitate the resumption of profitable activities in this principal productive sector. Repairing damaged infrastructure would be a pre-condition for resuming activities in the productive sectors, for which access to financial services will be required.

Ensure a comprehensive social accountability framework is in place for the recovery effort, particularly given the emerging tensions observed in communities. Some key features of the proposed system include: (i) ensuring information on available programs,

resources and levels of assistance are made public and accessible to beneficiaries on a timely basis through appropriate channels and that a complaints mechanism is established; (ii) that stringent community validation processes are used to confirm lists of eligible beneficiaries for the measures proposed above (in particular for the targeting of cash transfers and selection of participants in public work schemes); and (iii) that partnerships with civil society organizations, research institutions and the media are established for effective third party monitoring of the recovery effort.

A strong communications strategy with clear lines of communication and timely information dissemination is a vital component in any effective recovery and reconstruction strategy. Strong communications, itself, is a form of aid in that it helps people understand who, what, how and where to access the support available to help get their lives back on track. Strategic communication also helps build consensus amongst major stakeholders including different levels of government, communities, and the private sector; this will take mere ideas related to recovery support programs, policy initiatives, financial access, and technical assistance to the next level of successful implementation with widespread coverage and support.

II Invest in a more climate resilient Thailand

Creating a more climate-resilient Thailand will require a range of measures, only some of which are highlighted here.

Strengthen flood management through integrated water resources management as a key step towards water management for consumption, productive use and disaster risk management related to droughts, floods and tropical storms. The concept of integrated water resources management (IWRM), founded on the river basin model, exists in the Thai framework, but would benefit from improvements, and strengthening and streamlining IWRM throughout sectoral planning and programming. A panel of local and international flood experts could: 1) review and analyze the 2011 flood event, and 2) provide recommendations to the Strategic Committee on Water Management to ensure that lessons learnt in 2011 are integrated into any strategic plans going forward. In addition, reviewing and passing the pending water bill and appointing a high-level 'champion' for the IWRM model would give it the political power required to effectively institutionalize IWRM throughout development planning.

Key structural recommendations for flood management prioritize the immediate rehabilitation of hydraulic assets and an increase in drainage capacity. Ensuring regular maintenance of these assets in the future will improve the efficiency and extend the life of flood management infrastructure. Undertaking a design review of critical flood embankments, and carrying out dam safety reviews immediately are integral to ensuring the safety of flood control structures going into the next rainy season. The Royal Initiative for Flood Management suggests a rethink on flood barriers that would allow more space for water and rivers to expand during peak water periods – a measure that must carefully consider social impacts and land use compensation. Investment in small- and medium-sized water reservoirs upstream and implementing community watershed management programs would also improve flood management capacity.

Understanding the nature of disaster risks through hazard mapping is of paramount importance for disaster risk management and disaster resilient development planning, and requires a detailed mapping and modeling exercise that includes climate change projections.

The key is really to understand the nature and geographical distribution of risk and expected damage and to incorporate these risks into planning, design, and specifications of infrastructure assets. Making these risk maps available to the public in conjunction with training can improve general understanding and is the first step towards planning a strong disaster risk management strategy.

Establishing an effective early warning system (EWS) is a vital tool for mitigating the impacts of disasters. An effective EWS must be based on high-quality, real-time data gathered from detailed hazard mapping that takes into account geographic and infrastructure characteristics, and historical disaster information. An EWS can be established over time, starting with the most deadly or costly disasters before integrating all other disasters. This comprehensive approach will ensure an effective, efficient system that provides clear messaging that the public can trust.

Infrastructure should be built-back-better (BBB), stronger and safer than it was before the flood in order to ensure households and businesses are more resilient to future disasters. The housing and heritage sector assessments highlighted useful lessons from traditional houses and structures that fared better in this flood than some of the more modern homes, whilst the flood control chapter highlighted the need for stronger dikes around the industrial estates that will be integral to mitigating such severe losses in this sector in the future. The BBB principle holds true for all sectors that have damaged infrastructure. Disseminating targeted, technical information to community groups, CSOs, businesses, industry, the public and individual home owners will help people understand best practice, and what can feasibly be done with the support the government is offering and with their limited means. If any hazard mapping information is made available during this reconstruction phase, these inputs should be included as an integral part of this process.

III Invest in the competitiveness of the country to support resilient recovery

Take advantage of the opportunities the reconstruction period presents. Despite its negative impacts on loss of lives and the economy, this reconstruction-planning period also represents a strategic opportunity for the country to rethink development priorities and create momentum to address some of the long-standing structural issues that may have remained unaddressed. This turns crisis into opportunity, and paves the way for a range of improvements to the legal framework and economic options for the country. Some of these opportunities include reviewing land use planning, which has the potential to improve Thailand's economic planning, development strategies and environmental management, thereby reducing vulnerability to hazards and mitigating social conflict. The tourism industry has the potential to come back stronger than before with strong promotional campaigns, refurbishment and regeneration of cultural heritage attractions, and the opportunity to reexamine priorities for strategic positioning and future growth. In the agriculture sector, investing in research and development (R&D) to improve yield and quality of floating rice – which is less vulnerable to flood risk than short-duration rice – and intensification of crop varieties could improve overall competitiveness of farmers in flood-prone areas. Climate-friendly investments through BBB strategies could improve energy-efficient equipment and technologies which could reduce energy consumption and operating costs in the long run. Finally, the insurance sector has an opportunity to profit from the current moment through expanding its insurance products including weather insurance and agricultural insurance products.

1

THE DISASTER

1

THE DISASTER

1.1 Introduction

Thailand is no stranger to natural disasters. The country has a long history of drought and flood cycles in seasonal variance. Flooding occurs every year in the Chao Phraya River Basin. Tropical storm cycles come from the east through Laos and Vietnam and touch-down in the northern parts of the country where water collects and flows downstream into the basin. With a changing climate and increasing variance and severity of weather, events similar to this flood may no longer be only 50 years in frequency.

Thailand has dealt with catastrophic floods in the past. In 1942, the flood level in Ayuthaya reached 5.51 m and inundated Bangkok for two months; 1983 brought a cyclone that inundated the country for five months, causing THB 6.6 billion in damage; and unprecedented rainfall in 1995 inundated the largest recorded area of 5,400 m3. Though the 2011 flood area was smaller than the area affected in 1995, the impact it had on life and the cost of damage – more than 100 times the 1983 damage costs – was unprecedented. These factors contributed to the 2011 floods registering on the magnitude of roughly a once in every 50 or 100 years event.

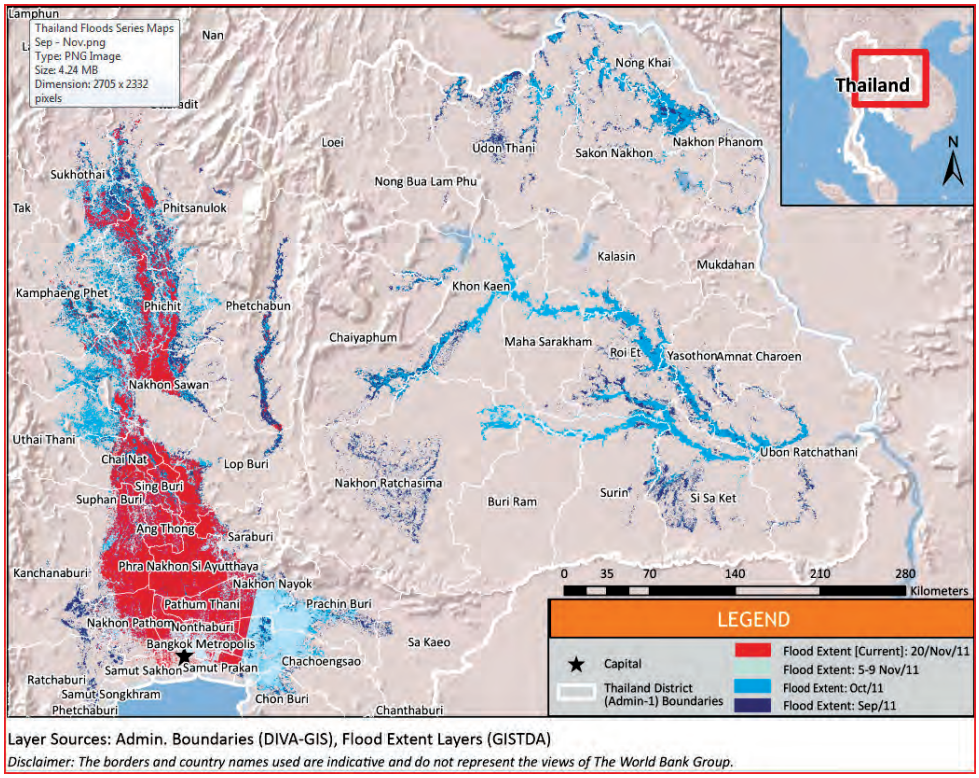
1.2 Overview of the Floods

The floods that affected 66 of the country's 77 provinces started in June in the northern regions with storm Haima, which brought 128 percent of the average rainfall for June. Haima was quickly followed by tropical storm Nock-Ten throughout parts of July and August, which resulted in rainfall of more than 150 percent of the average for both months. Though rains slowed slightly, storms continued to hit the country from the north to the east and rainfall remained above average throughout September and October (135 and 116 percent respectively). The accumulated water from months of storms and above average precipitation resulted in the flooding of the central regions.

Over time, the water drained slowly from the north downstream to the central plains in the Chao Phraya River Basin, eventually reaching Bangkok in early November. The period of September 14 to October 3 saw 10 major flood control systems overflow or breach[4]. Though the geographical peak of flooding (in terms of number of provinces affected) was in late August – after the storms, the impact was most heavily felt in terms of the number of people affected, when large parts of Bangkok were flooded in mid-November – peaking at over five million flood-affected people at one time.

[4] See flood breach maps in Annex 5.

Figure 1:
Map of the maximum extent of the floods: September – November 2011



Layer Sources: Admin. Boundaries (DIVA-GIS), Flood Extent Layers (GISTDA)

Disclaimer: The borders and country names used are indicative and do not represent the views of The World Bank Group.

1.3 The Human Toll

At the time of writing, more than 680 lives had been lost due to the floods and the accumulated affected population[5] was estimated at 13.57 million people[6] . Reports suggest the majority of deaths – particularly amongst children – were caused by drowning. A significant number were due to electrocution. Despite months of continuous flooding, assessments found that the majority of families stayed in their homes when possible. With the slow progression of the floodwaters, affected populations varied significantly over the weeks, peaking at 5.31 million people affected in the weeks that floodwaters inundated large parts of Bangkok. At the peak, more than 2,600 shelters housed more than 165,000 people[7]. The Ministry of Public Health reported mental health diagnoses amongst flood victims including high levels of stress, depression, suicide risks and people requiring special care. At the time of writing, flooding continues in more than 15 provinces[8] , and the toll on the human condition amongst those affected can be expected to rise until at least the flood waters have receded. But the road to normalcy may be long as the considerable work required to reestablish livelihoods, regain health and rebuild household community infrastructure can only begin once the waters have fully receded.

1.4 The Response

In the wake of the floods the new Flood Relief Operations Center (FROC) was established to provide rapid emergency response and coordinate responsible government bodies[9]. Immediate needs were met largely by appropriate government ministries and the Thai Red Cross. The Ministry of Social Development and Human Security has largely been

[5] Affected population totals started accumulating from July 25, 2011
[6] UN Situation Report 14, December 8, 2011
[7] Ibid.
[8] Ibid.
[9] Additional information on institutional arrangements can be found in the Disaster Risk Management chapter of this report.

responsible for the establishment of more than 2,400 shelters nationwide, with the Bangkok Metropolitan Administration establishing another 175 for residents of the capital. The Ministry of Public Health has set up emergency clinics near shelters and throughout flood affected areas. The Thai Red Cross has been very active in providing food and non-food needs throughout critically affected areas, including relief kits, bottled water, food packs, ready-to-eat meals and medical kits. In addition to formal RTG support, anecdotal reports describe significant support from private industry and business in the informal sector going directly to local communities and community-based organizations, but these are difficult to quantify and map.

The Royal Thai Army has assigned 56,000 army, naval and air force personnel to flood-related efforts, and is focusing largely on water management, care and assistance for people in needs, managing relief supplies and supporting other agencies and sectors. The military is also heavily involved in the monitoring of flood defenses, water flow acceleration and waterway evacuation missions.

For immediate recovery, the Royal Thai Government (RTG) has announced a range of measures[10] for many different target groups and needs. A cash grant of THB 5,000 has been made available for flood affected households and an additional THB 2,000 per poor household who require additional support. Household recovery allowance allocations have been announced at up to THB 200,000 for partially damaged houses, and a maximum of THB 300,000 for fully destroyed houses. In response to the need for industry and businesses and agri-business to invest in recovery operations and have access to capital to do this, the RTG has put in place a range of financial responses including debt moratorium for SFIs and agricultural cooperatives, new loans for a range of specified target groups, low interest loans, and soft loans[11].

1.5 Socio-Economic Profile of Thailand and Affected Areas

Geography and Population

Thailand has a total surface area of 513,000 square kilometers and a population of 64 million, of which about a third live in urban areas. The main land borders are with Myanmar, Laos and Cambodia, countries at a much lower level of economic and social development than Thailand.

The geographic extent of the floods was enormous, touching 66 of Thailand's 77 provinces – mainly in the northeastern and central regions. The provinces impacted in the central plains are located in the Chao Phraya River Basin, which receives rainwater from the northern, mountainous regions of the country that were the landing ground for the tropical storms in August/September. Bangkok, located at the bottom of Chao Phraya River Basin, is partially flooded as the river drains into the Gulf of Thailand. North and eastern residential areas of Bangkok have been flooded along with many industrial estates in Ayuthaya and nearby provinces.

Economic Profile

Thailand's GDP for 2010 was THB 150,118 per capita, or USD 4,875[12]. For 2010 as a whole, GDP expanded by 7.8 percent from 2009. Growth was broad-based, with significant contributions from external and domestic demands. This growth signals a recovery to levels seen before the Triple F Crisis (Food, Fuel and Finance) of 2008.

[10] This paragraph gives examples of some of the main measures the RTG has announced, but does not provide a comprehensive list.
[11] Please find a full list of financial measures in the Financial and Insurance Sector chapter.
[12] Exchange rate : USD 1 = THB 30.790

Over the last 25 years, rapid economic growth was based particularly on manufacturing and tourism. Labor moved from low productivity agriculture into manufacturing and services; the overall growth was further stimulated by rapid productivity growth in manufacturing. However, Thailand remains to a great extent an agricultural country. Nearly 40 percent of the labor force is engaged in agriculture, while 15 percent are in each of manufacturing and distribution, 10 percent in transport and tourism, and 7 percent in government service.

Although Thailand's overall economic performance has been relatively good since the 1997 Asian financial crisis, some of its neighbors (China, Malaysia, and Vietnam) have been growing relatively faster. Thailand now faces the challenge of developing its society – in addition to its economy – so as to make the further transition from a middle-income to a high-income country.

Poverty Profile

The poverty headcount average is low in Thailand, at 1.87 percent of the population[13]. Forty-eight percent of provinces have a poverty head count of 10 percent or less, and an additional 25 percent of provinces have poverty head count rates between 11 and 20 percent. The central and northern regions have proportionally higher levels of poverty that include pockets in which rates are over 40 percent of the population, reaching as high as 62 and 72 percent in some areas. Overall income inequality decreased slightly between 2007 and 2009 – registering a Gini Coefficient change from 0.376 to 0.387 – putting it on par with income equality in the United States of America[14].

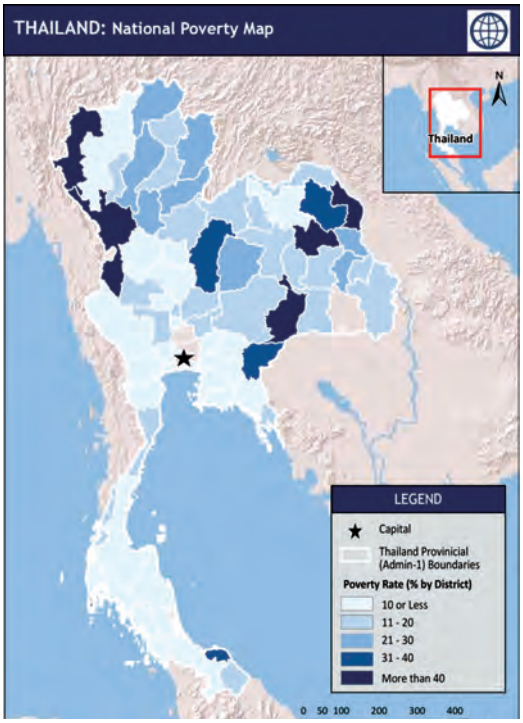


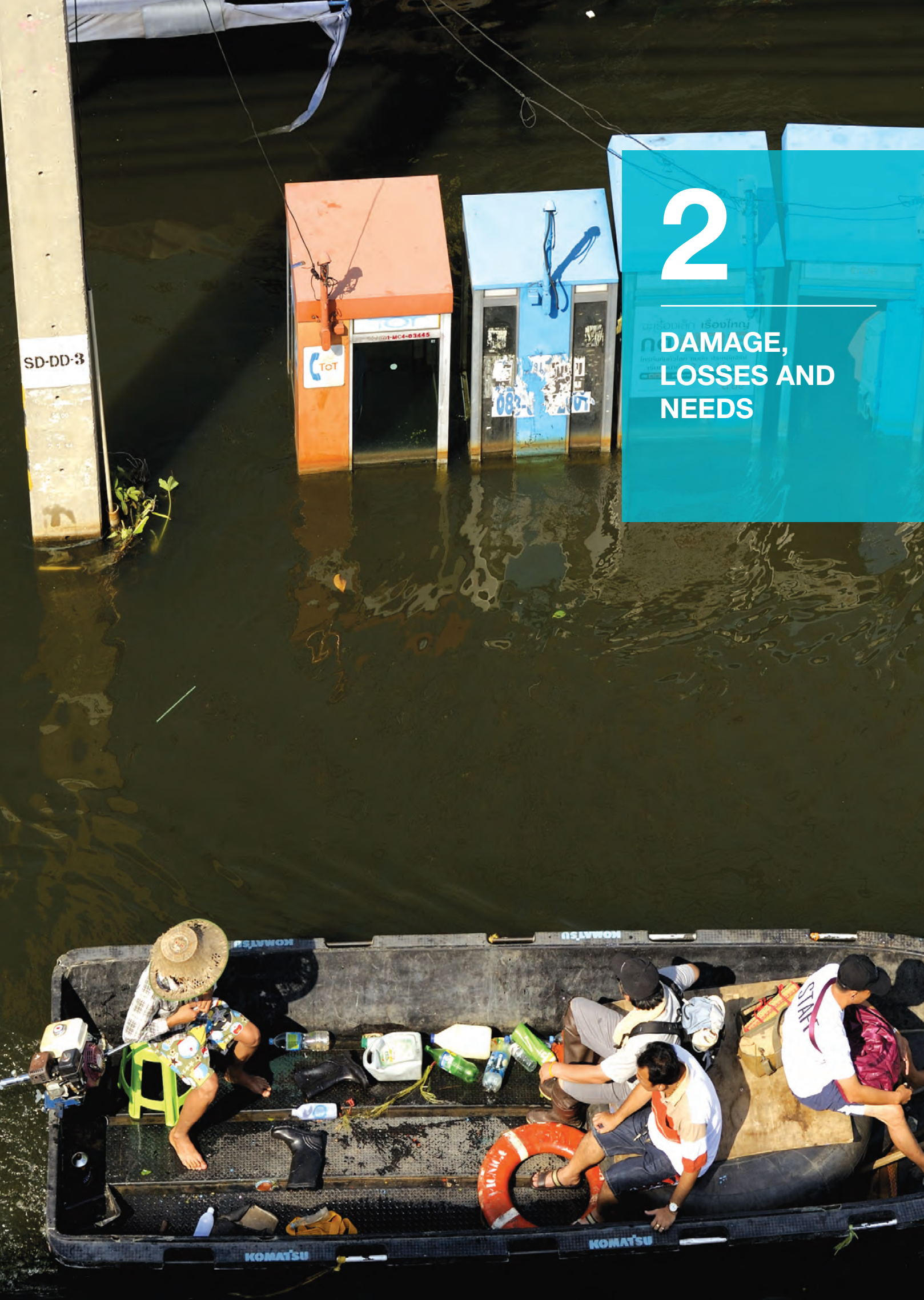
Figure 2: Poverty headcount map of Thailand

For regional comparisons, Thailand is slightly less unequal than Malaysia and the Philippines, but significantly more unequal than India, Indonesia, Singapore and the Republic of Korea.

Income is highest amongst formal sector professionals and technical employees. The lowest earning livelihoods across the country are farmers, farm workers, and general workers. The main source of income for the majority of households in the kingdom is wages and salaries, and makes up roughly half of household income in Bangkok and the central regions. Of the flood affected areas, the northern and central regions are the most dependent on farming, which makes up roughly 10 percent of household earnings – still less than earnings from wages and salaries.

Average household debt has increased since 2007 to 5.3 percent of household income, of which a large majority are in the formal sector only (76.5 percent), and only a sixth exclusively from informal lenders. Bangkok and the central region – both are flood-affected areas – were recorded as having the highest average household debt even before the flood.

[13] Based on provincial poverty lines
[14] http://www.sgi-network.org/index.php?page=scores&indicator=S11_5



2

DAMAGE, LOSSES AND NEEDS

2

DAMAGE, LOSSES AND NEEDS

2.1 Introduction

Thailand's Rapid Assessment for Resilient Recovery and Reconstruction Planning was to assess the overall impact of the flood disaster on Thailand's socio-economic development; develop immediate, medium- and long-term strategies for resilient recovery and reconstruction; and provide the Royal Thai Government with recommendations for improving its disaster risk management strategies.

The outcome of the Rapid Assessment is a comprehensive program of resilient recovery, reconstruction and disaster risk management that will help the RTG to define, quantify and prioritize the activities required to achieve full recovery from the social and economic impact of the floods, reconstruct destroyed assets, and undertake measures to reduce future risk for the entire affected area.

2.2 DALA Methodology

The Rapid Assessment used the Damage and Loss Assessment (DALA) methodology, developed originally by the United Nations Economic Commission for Latin America and the Caribbean[15] in the early 1970s, as the framework for estimating damage, loss and needs costs. This methodology has been continuously expanded and updated over the past three decades, and in recent years has been simplified and customized for application in different regions of the world. It has been applied by the World Bank and other international organizations in numerous recent disasters, and provides a solid framework for estimating the impact of damage, loss and needs costs.

DALA Conceptual Framework

The DALA methodology is based on the use of a system of national accounts for the affected country as a means of assessing the damage and losses caused by disaster. It enables one to estimate the value of property destroyed by the disaster (damage assessment), and the changes to the economic flows caused by the temporary absence of this destroyed property and impacts on economic performance (loss assessment). In addi-

[15] Handbook for Estimating the Socio-Economic and Environmental Impact of Disasters, Economic Commission for Latin America and the Caribbean, United Nations, second version, 2003.

tion, it also forms a basis for assessing the negative impact on individuals and household incomes and on overall social well-being.

Damage is defined as the monetary value of property wholly or partly destroyed. Losses are defined as the changes in the flow of goods and services that will not be supplied until the destroyed property has been rebuilt.

Macroeconomic effects arise from the damage and losses caused by the disaster. Post-disaster macroeconomic analysis includes the examination of the impact on gross investment, taking into consideration the investments to be made during the reconstruction, examining the potential inflation arising from the effects of the disaster, and the negative effects on employment and income at individual, household and family levels.

Finally, needs are defined, within the context of the DALA methodology, by estimating the financial requirements for resilient recovery and reconstruction for all impacted sectors of the economy, based on public policies as well as on preliminary strategies for recovery and reconstruction that take into consideration the possibility of "building back better" the destroyed or damaged assets, within financial constraints. Needs for resilient recovery and reconstruction are estimated for both the public and the private sectors, since disasters affect the society and economy without prejudice, and both sectors will require support for reconstruction.

Social Impact Assessment Methodology

The Thailand Rapid Assessment for Resilient Recovery and Reconstruction Planning complemented the DALA methodology with a targeted Social Impacts Analysis (SIA). Relying mostly on qualitative, field-driven research methods, the SIA aims to provide a better understanding of the full impacts of disasters on affected communities and highlights critical issues that would otherwise remain hidden: (i) cross-cutting issues, such as social accountability and negative coping strategies, that do not fit neatly within one particular sector; (ii) the perspectives of affected communities and their key priorities; and (iii) community dynamics and how these affect recovery. Understanding how affected people relate and why they employ the survival strategies they do is critical for designing better recovery programs but is difficult to gauge using primarily quantitative methodologies alone. The social impacts methodology is particularly helpful in identifying whether particular social groups or areas are (at risk of being) excluded from rehabilitation and reconstruction efforts. Incorporating such analysis into the Rapid Assessment and its recovery framework as well as into post-disaster programs enables the needs captured by the analysis to be used as the basis for resource mobilization and allocation and establishes a baseline for subsequent monitoring. Conducting such analysis as part of a Rapid Assessment can help identify such issues early, expanding the range of information available to government and other aid providers and enabling the reconstruction framework to be tailored better to community-level social realities.

The SIA was implemented in Lop Buri, Uthai Thani and Nakhon Sawan provinces in the Central Plains area of Thailand between November 7–25, 2011 by a World Bank team in close collaboration with local civil society organizations and relevant ministries. The field guide developed for the SIA focused on collecting data on three areas of inquiry using qualitative methodologies. The research tools, focus group discussions (FGD) and key informant interview (KII) guides were pre-tested in Prachinburi in the eastern region of Thailand. The three areas of inquiry included (i) livelihoods and coping strategies; (ii) social relations and cohesion; and (iii) governance, with a particular focus on the distribution of relief assistance. The team collected insights from a mix of 12 sites (one urban and three rural sites for each province) to understand how the impact of the floods may have varied across sites. The following sites were covered by the SIA. In Lop Buri: (i) Ban Pom municipality; and (ii) Phonamob village (Patarn sub-district); sub-district of Pho Kao Ton

and in Sratawaew sub-district; in Uthai Thani: (i) Pakkabadsamphan, and (ii) Hardthanong in the sub-district of Thasung; Bungtaptae in Thasung sub-district and Wang Sathit and Neuan Tontarn in Nong Paiban sub-district; in Nakhon Sawan: (i) Nakhon Sawan municipality and (ii) the following three communities: Tapkrit Pattana (Moo 8); Nuen Thong (Moo 7) and Yansawai (Moo 4). In addition, the team conducted additional informal interviews in Koksamutr in Lop Buri. These communities were selected in coordination with the Ministry of Social Development and Human Security, the Department of Disaster Prevention and Mitigation and civil society organizations. Focus group discussions (FGD) and key informant interviews (KIIs) were held with the following groups within the communities: (i) informal workers (daily laborers), small business owners and low income civil servants, in urban areas; and (ii) in rural areas the team conducted three separate focus groups – two with individuals representing a range of occupations and a third FGD was held exclusively with farmers. A total of 30 FDGs and 70 KIIs were conducted for the SIA.

Rapid Assessment Process

The DALA relies on the estimation of disaster effects on the impacted sectors of the affected economy. Once all sectors have been assessed in terms of damage and loss, the results are aggregated to obtain the total amount of disaster effects ensuring that no double accounting and/or gaps exist. This aggregation of data will enable the estimation of financial requirements or needs to achieve full recovery and reconstruction of the economy.

The Rapid Assessment covered 18 sectors and crosscutting issues with a geographic extent of 26 provinces. The sectors and sub-sectors listed below were included in the assessment. Note that the Social Impacts Assessment, the Social Protection Sector, Livelihoods and the Disaster Risk Management (DRM) Sector did not use the DALA Methodology in their Recovery and Reconstruction work.

Table 3:
Sectors teams fielded for the Rapid Assessment

Infrastructure
- Flood control, drainage and irrigation
- Transport
- Telecommunication
- Electricity
- Water supply and sanitation

Productive
- Agriculture
- Industry and commerce
- Tourism
- Financial and insurance

Economics
- Macroeconomics
- Livelihoods and Migrant workers

Social
- Health
- Education
- Housing
- Cultural heritage
- Social Protection
- Social Impacts Assessment

Cross Cutting
- Environment
- Gender
- Disaster Risk Management

The Rapid Assessment process involved many steps and activities, beginning with a two-day DALA methodology orientation for all participating team members including representatives from all line ministries, the EU, the UN Country Team, and the World Bank. This was done in conjunction with the collection of baseline information and data on damage and losses provided by the government through different line ministries, provincial authori-

ties and local governments. Immediately after, the DALA assessment sector teams carried out plausibility reviews of the data, including triangulation and independent verification of the data, through field visits and surveys in the affected flooded areas.

Baseline data across the various sectors of the economy were reviewed to provide the best possible reference for the analysis. This included desk reviews of available information, identification of information gaps, and possible sources for filling them. Sectoral teams undertook brief field surveys of selected, affected areas where extensive consultations non-governmental organizations, business owners and other stakeholders.

In addition to the above, a special sample survey of industrial and trade shops – including those in the informal sector – was undertaken in cooperation with private sector associations to obtain information on their special damage, losses and needs.

2.3 Principles for Resilient Recovery and Reconstruction

In the aftermath of the flood disaster, the focus will necessarily be on establishing a recovery and reconstruction program that responds to the immediate effects of the disaster. The challenge ahead is to ensure a medium- and long-term focus, and non-structural as well as structural elements are incorporated so that the opportunity to reduce vulnerability to future disasters is not lost in the race to reconstruct physical damage as quickly as possible. International experience in responding to disasters has ensured a number of lessons learnt for recovery and reconstruction. While the institutional arrangements for the implementation of recovery and reconstruction programs inevitably differs across countries and regions, a core set of guiding principles has emerged from these lessons and experiences which should be considered in Thailand's 2011 flood resilient recovery and reconstruction program. The following principles are the most relevant:

Include non-structural measures, in addition to structural measures, in recovery plans such as legislation and policy reviews, improved institutional arrangements, coordination mechanisms, communications strategies, and community-engagement in planning and prevention.

Ensure a holistic socio-economic focus for recovery and reconstruction that goes beyond responding to the economic impacts of the damage and focuses on promoting resilient livelihoods, establishing social support systems that function in times of crisis, and supporting the vulnerable.

Establish strong leadership and institutional frameworks that can manage disasters when they hit. This requires strong engagement at all levels of government, and with civil society.

Focus on prevention and disaster management rather than control. Particularly in the context of climate change, disasters will happen. Ensuring sectors are resilient, and the population is ready to manage disasters is more effective than trying to avoid their impacts. This can start with establishing a medium- to long-term resilience strategy now that focuses beyond the recovery period, and builds disaster risk management planning into sectoral strategies and programming.

2.4 Productive Sectors

Agriculture Sector

Summary

This chapter outlines the impact of the floods on the agriculture sector in the 26 provinces in the central, northern and northeastern regions. Crops were worst affected by the floods. The following tables summarize the total damage and losses in the 26 provinces in the crop, livestock and fisheries sub-sectors. The crops most affected were rice, sugar cane, cassava, sweet corn, maize, vegetables, and fruit trees (e.g., milk banana, guava, mango) planted in approximately 11,460,000 rai[16] of land. It was estimated that in the 26 provinces, much of the area that was planted with rice, sweet corn, vegetables and fruit trees had been under water since the first/second week of September until the time of writing, resulting in a total loss of crops. Farm machinery such as tractors, power tillers and threshers have been damaged and will need repair. The damage and losses are exceptionally high because the 2011 floods arrived earlier and lasted longer than normal. Damage to soil has not been widely reported, however, as many areas were still inundated at the time of writing, a proper assessment was not possible. Table 4 shows the estimated affected areas for crops, fisheries and heads of livestock affected.

Table 4: Overview of total damaged crops, livestock and fisheries

Region	Affected provinces	Affected crops (rai)	Affected Livestock (heads)	Affected Fishery (rai)
Central	14	1,844,327	2,148,271	142,039
North	4	3,249,466	3,202,310	16,668
Northeast	8	2,220,912	846,330	18,418
Total	26	7,314,705	6,196,911	177,124.82

Source: Ministry of Agriculture and Cooperatives, Thailand. www.moac.go.th, accessed on November 21, 2011

It was reported that 687,522 farmers – practicing cropping, livestock rearing and fisheries management – have been affected by the floods. Table 5 summarizes the total affected farming population disaggregated by region, occupation, showing average land loss per farmer for the agriculture crops[17].

Thanks to the media's broadcasts prior to the floods and slow move of water, many of the large animals, such as cattle, ducks and pigs were moved to higher grounds and roads and were saved from the flood. However, farmers still lost some cattle and pigs. Major losses were experienced in poultry; many of the small- and medium-sized poultry entrepreneurs were reported to have lost almost all of their stock, including tools and equipment, and fighting cocks. The total number of livestock lost is about 29.34 million heads[18].

[16] Source: Ministry of Agriculture and Cooperatives (DDPM Situation Report from November 22, 2011)
[17] The numbers estimated for this research are preliminary and subjected to revision.
[18] Source: Ministry of Agriculture and Cooperatives (DDPM Situation Report from November 22, 2011)

Region	Number of affected provinces	Number of affected crops farmers	Number of affected livestock farmers	Number of affected fishery farmers	Total number of individual farmers	Average land affected/farmer for crops (rai)
Central	14	127,979	91,137	26,919	246,035	12.62
North	4	125,633	33,646	13,595	172,874	9.04
Northeast	8	225,857	23,364	19,392	268,613	15.19
Total	26	479,469	148,147	59,906	687,522	12.86

Source: Ministry of Agriculture and Cooperatives, Thailand www.moac.go.th as of November 21, 2011

Table 5: Population engaged in agriculture and affected by floods in 26 provinces

Inland fisheries, mainly aquaculture – which is a major source of cash income for subsistence fishermen – were largely affected. Damage to fisheries assets such as cages, nets and other gear were reported. Some hatcheries also reported damage to their infrastructure. Large stocks of fish and brood stock fingerlings were reported lost. A total of 261,065 rai of inland aquaculture ponds have been affected.

In the short term, it is extremely important to facilitate the return of farmers to their fields, fishermen to their water ponds and agriculture-based entrepreneurs to their enterprises. Needs are enormous, and appropriate interventions are urgent. In some circumstances, farmers and fishermen may not be able to recover from the disaster without assistance. With machinery and stock damage, inputs lost and no access to credit, many small farmers may not be able to cope with the disaster. The estimated needs presented in this chapter recommend appropriate and effective assistance. Facilitating farmers to get affordable and good quality inputs such as seeds and fertilizer would assist them in getting back to their daily business. In addition, a strong monitoring system would need to be applied, with possible participation of non-government actors, to ensure that the short-term support measures extended by the government are properly managed. Similarly, actions need to be taken to look at interventions for the medium- and long-term, giving due importance to disaster risk reduction and preparedness.

Table 6: Agriculture sector – Damage, losses and needs in Thai baht, millions

Sub-sector	Disaster Effects			Ownership		Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Agriculture	5,184	31,135	36,319	0	36,319	7,703	1,009	0
- Food crops	5,028	27,129	32,157	0	32,157	-	-	-
- Perennial crops	156	4,006	4,162	0	4,162	-	-	-
Livestock	344	2,771	3,115	0	3,115	174	67	0
Fisheries	137	809	946	0	946	53	27	0
Cross cutting sector						521	513	20
Total	**5,666**	**34,715**	**40,381**	**0**	**40,381**	**8,451**	**1,616**	**20**

Sector Context

In Thailand, the Ministry of Agriculture and Cooperatives is the major stakeholder in the agriculture sector. Within the Ministry of Agriculture and Cooperatives (MOAC), there are 15 Departments, five state-owned enterprises and three public organizations. Furthermore, the Bank for Agriculture and Agricultural Cooperatives (BAAC), under the auspices of the Ministry of Finance, reaches almost 90 percent of the farmers in Thailand and

provides short- and long-term credit. The National Economic and Social Development Board (NESDB) is responsible for agricultural and natural resource management and planning. Other relevant agencies involved in the agriculture sector include the Ministry of Natural Resources and Environment (MNRE), Ministry of Science and Technology (MOST), Thai Research Funds (TRF) and the National Research Council of Thailand (NRCT).

Share of agriculture in the national GDP is about 8 percent in Thailand. The total area used for agriculture in Thailand is 139.8 million rai (22.37 million hectares), which accounts for approximately 43.6 percent of total land in the country. Twenty-two percent of agricultural land is irrigated. Most of the 26 assessed provinces are situated in the Central Plains and the lower northern region of the Chao Phraya River Basin in which there are 15 dams, three of which are major dams.

The agriculture sector provides adequate food for the population and produces substantial surpluses of some commodities for export. Roughly 40 percent of Thailand's labor force is employed in agriculture. Rice is the country's most important crop, and Thailand is a major exporter in the world rice market. Other agricultural commodities produced and exported in significant amounts include tapioca, rubber, corn, cassava, chicken, animal feed, fruits, vegetables, sugar, fish and fishery products. Exports of processed foods such as canned tuna, canned pineapple, and frozen shrimp also hold a large share in the world market.

The type of agriculture farmers are engaged in – whether cash cropping, subsistence farming, or a combination thereof – varies from region to region and within regions. In the Central Plains, there are farmers who mainly farm cash crops such as maize, sugarcane, cassava, vegetables, and fruit. In the rice bowl region of the Central Plains, farmers grow rice as the main crop for sale.

Agriculture is dominated by smallholders, most of whom have either outright title to the land or effective possession of it; tenancy is widespread in parts of the Central Plains. The average national land holding size is 20 rai[19] (3.2 ha), and the average land holding size in the Central Plains is 29 rai (4.64 ha) (2006/7).

Farmers in Thailand are accustomed to heavy rains and flooding, which normally occur between late August and early September. Cropping patterns are accordingly planned around the expected flood. For example, farmers in flood-prone areas in the central region (e.g. Ayuthaya) grow rice earlier so that they can harvest before the flood arrives. In the past, the farmers generally grew low-yield varieties of floating rice. Today, most farmers grow short-duration cycles that can be harvested in late August. However, the 2011 flood arrived much earlier than normal, with excessive amounts of water and waves, which severely impacted the livelihoods of several million farming families in the Chao Phraya River Basin.

In general, female farmers in Thailand have predominant economic roles in the agriculture sector, particularly in terms of investment, harvesting, marketing and trading. Male farmers take responsibility for the plowing and making decisions on major farm investments. Gender roles are normally well defined in the agriculture sector, which was verified during the field surveys and interviews with farmers. Families interviewed confirmed a clear division of labor between male and female family members. In Thai society, the family relationships are matrilineal as lands are inherited to daughters. This is consistent with anthropological literature on Thailand. When asked about the costs and revenues of farming related activities, the responses mainly came from the female farmers, who articulately responded to the practical questions on agriculture production, investment, marketing and trade.

[19] 1 hectare (ha) = 6.25 rai

Damage and Losses

Damage

Flood water took over crop fields, inundated houses, submerged poultry farms and livestock barns, washed away aquaculture ponds, damaged the farm machinery, silted irrigation canals, damaged other irrigation infrastructure, and caused damage to machinery in slaughter houses and fish hatcheries. The quantity of water was more than an ordinary farming household was able to manage. Farmers and livestock entrepreneurs visited in Nakhon Sawan and Lop Buri provinces explained how they fought the water for a few days by putting sand bags and pumping the water continuously with a view to saving their machinery, equipment, and other assets. However, they just had to give up as their pumps stopped working and the water level kept on rising.

The major damage caused to the agriculture sector can be summarized as follows:

Crops

Damage to farm machinery such as tractors, plows, threshers, and farm tools was reported. Many tractors and power tillers were moved to higher ground, but many other machines that could not be relocated remained under water for long periods and during the field visits, many machines were seen lying in need of repair. The farmers reported that actual damage to the machinery could not be calculated as there are no mechanics available in the villages to assess the costs of repairs. The estimated value of damage to machinery is THB 5.2 billion, assuming that the cost of repair will increase due to the urgency of the repairs and the lack of mechanics at village level[20]. For permanent crops, thousands of rai of fruit trees drowned from being under water for more than a month. During field visits, the team observed farmers felling and heavily pruning mango trees that would no longer bear fruit.

Farmers hoped to return to their fields by January 2012, and that the floods will have deposited fine silt on their farms, which would help produce better yields during the next harvest. This will not be known, though, until the quality of soil can be assessed after floods have receded. But this will largely depend on the quality of water that the floods brought. If the water brings in sediments only, it will help boost the production the following year, however, if it carries toxic materials from industries it may lead to lower production.

[20] See assumptions in Annex 3

Temporary shelter for pigs in Nakhon Sawan

Temporary shelter for pigs in Nakhon Sawan
Damage to farm roads and land holding could not be assessed due to a lack of data, and the fact that many areas were still under water during the assessment period.

Livestock

Reported damage to the livestock sub-sector are mainly on farms for animals such as layer chickens and swine. Respondents reported major damage to assets and equipment in the livestock barns, poultry farms, hatcheries (for chicks and fingerlings), animal shelters and small tools privately owned by the farmers. During field visits in two provinces, the team observed damage to cooling units, fans and back-up power supply units in poultry farms, walls and roofs of animal shelters, and to equipment in hatcheries and slaughter houses. Owners of large-scale commercial swine farms and cattle smallholders reportedly moved their animals elsewhere before the flood arrived, and therefore experienced less damage.

Fisheries

The floods heavily affected subsistence fisher folk and professional fish farmers. When water came into their houses, they were able to move their fishing gear to upper floors. However, the nets around the ponds were damaged and many could not be reused. Not much damage to the ponds was reported, however many of the fishponds are still under water and actual damage in the ponds can only be assessed once the water recedes. Table 7 illustrates the summary of damage in the agriculture sector, covering all the three sub-sectors.

Table 7:
Agriculture sector – Total damage by ownership, in Thai baht, millions

	Public	Private	Total
Crops	0	5,184	5,184
Irrigation and drainage systems	0	283	283
Agricultural machinery and equipment	0	4,252	4,252
Storage and buildings	0	511	511
Value of plantations	0	138	138
Livestock	0	344	344
Animal life	0	11	11
Poultry barns and machinery	0	333	333
Fisheries	0	137	137
Hatcheries and machinery	0	137	137
TOTAL	0	5,666	5,666

Source: Estimates based on data from MOAC and field survey
**Note: The damage is calculated based on replacement cost; however, if it is calculated based on repair cost of only ploughs, the value will reduce to THB 1.1 billion.*

Losses

Crops

The flood severely affected crops in all areas that were flooded. According to the assessment findings[21] of the 26 assessed provinces, huge losses were incurred to major agriculture crops, such as wet season rice, sweet corn, vegetables, flowers such as orchids and marigolds, and fruits including bananas, guava and mangoes. Other affected crops include sugar cane, maize, cassava, coconut, and other fruit trees. Wet season rice – the main seasonal crop in the Chao Phraya River Basin, normally planted in August and harvested in November/ December – was the most affected crop. Some medium-sized farmers (about 50 rai) reportedly sold some premature rice [22] (up to 30 percent) that had not flowered properly before flooding started[23] in order to generate some operational cash. However, small farmers (about 10–20 rai) lost most of their rice crops. Given the length of time the crops have been under water – and are projected to be under water after the assessment – it is very unlikely that any rice crops will be salvaged. Toward the end of the assessment some farmers had restarted farming in fields from which the water could be pumped, but the percentage of such land was low compared to the overall area of damaged rice crops.

The assessment team estimates[24] total losses to the crop sub-sector in 2011 accounts for about THB 27.5 billion.[25]

Livestock

The communities were informed in advance about the flood through different media sources. Thanks to the timely early warning the farmers were able to move their large animals, such as cattle and pigs to higher ground, which reduced losses for these farmers. Nevertheless, a portion of the animal flock was lost in all areas due to either drowning or stress. Many households reported selling a few heads of livestock after the floods to generate cash, though at a significantly lower price than normal. In addition to their livestock, farmers reported losing their feedstock and vaccines. Cows producing milk also produced less milk due to high stress.

[21] Ministry of Agriculture and Cooperatives (MOAC), Office of Agriculture Economics (OAE), Bank for Agriculture and Agricultural Cooperatives (BAAC), Satellite Imageries, direct observation and interaction with farmers during the field visit, discussion with village heads, and government officials, etc.
[22] Premature rice produce is used for animal feed production.
[23] From first week of September.
[24] See assumptions in Annex 3
[25] It is important to note here that the estimate of loss carried out by the agriculture sector team is lower than the loss and damage reported by the farmers in 67 provinces, which totaled THB 28,463 million. This figure, as reported by the MOAC also includes the loss of production and damage to permanent trees.

Chickens could not be moved anywhere even after the farmers saw the water coming in, especially inside the poultry farms. Poultry entrepreneurs suffered major losses as most of their broilers and layer hens died during the flood. Farming families also reported losing many of their fighting cocks –, which were good sources of cash – to shock and thirst.

The estimated total overall loss in the livestock sub-sector is reported to be around THB 1.9 billion in the 26 affected provinces.

Fisheries

Inland fisheries/aquaculture and artisanal fishing livelihoods play an important role in in-land communities by providing protein as well as source of cash income to local households, whilst using very little land[26]. The assessment revealed significant losses in the fisheries sector. In most cases, a large number of fish, many of them grown for export, were reported lost. The most common species for domestic sale and export[27] produced in the 26 assessed provinces suffered major losses.

Of the 26 assessed provinces, the total losses to the fisheries sub-sector are estimated to be roughly THB 809 million in 2011. Table 8 summarizes the total losses, disaggregated by commodity for each year from 2011 to 2014.

Table 8:
Agriculture sector – Estimated losses in 2011–2014 by commodity, in Thai baht, millions

	2011	2012	2013	2014
Crop	27,522	1,927	1,204	482
Rice	26,645	0	0	0
Sugar cane	288	0	0	0
Fruit trees	227	1,927	1,204	482
Flowers	144	0	0	0
Maize	16	0	0	0
Other	202	0	0	0
Livestock	1,997	0	0	0
Poultry	1,159	0	0	0
Swine	46	0	0	0
Cattle	722	774	0	0
Other	70	0	0	0
Fisheries	809	0	0	0
Tilapia	319	0	0	0
Catfish	256	0	0	0
Shrimp	234	0	0	0
Striped snakehead fish	1	0	0	0
Total	**30,328**	**2,701**	**1,204**	**482**

Source: Estimates based on data from MOAC and field survey
**Note: Total Losses in 2011 consists of three components; (1) Total production losses (2) Higher production cost and (3) Losses due to forced early sale. Total losses in 2012–2014 consist of losses of production of permanent trees, and losses of meat and egg production due to death of animals.*

[26] Some artisanal fishers visited in Nakhon Sawan and Lop Buri provinces had 2 rai of fishponds on average without land ownership. Nakhon Sawan is the largest producer of fresh- water fish as it is the home to the largest swamp in Thailand — the Bueng Boraphet. Fishers and real estate developers have illegally encroached on the swamp, reducing its area from more than 300,000 rai to less than 100,000 rai today.
[27] Major species of fish reported to have been lost were catfish, tilapia, stripped snakehead fish, white shrimp and tiger shrimp.

Table 9 summarizes the total damage and losses in the agriculture sector covering all three sub-sectors in 26 provinces.

Table 9:
Agriculture sector – Damage and losses by province in Thai baht, millions

Province	2011			2012	2013	2014
	Damage	Losses	Total	Losses	Losses	Losses
Ang Thong	53	297	350	55	0	0
Ayuthaya	552	3,906	4,458	97	4	2
Bangkok	81	788	869	10	0	0
Chachoengsao	248	1,962	2,210	99	34	14
Chai Nat	21	166	187	25	4	1
Kalasin	9	55	64	26	8	3
Khon Kaen	759	2,612	3,370	229	125	50
Lop Buri	89	883	972	123	6	2
Maha Sarakham	22	86	107	3	0	0
Nakhon Nayok	19	172	191	3	0	0
Nakhon Pathom	71	593	664	37	8	3
Nakhon Sawan	102	461	563	217	92	37
Nonthaburi	37	362	399	4	0	0
Pathum Thani	189	1,645	1,834	47	22	9
Phitsanulok	299	1,258	1,557	53	28	11
Phichit	77	323	401	42	8	3
Prachinburi	54	476	530	27	6	3
Roi Et	1,383	6,335	7,718	248	128	51
Samut Sakhon	31	344	374	300	187	75
Saraburi	108	1,184	1,292	57	9	4
Singburi	8	112	120	20	0	0
Si Sa Ket	864	3,621	4,485	682	421	168
Suphan Buri	111	792	902	71	1	0
Surin	249	1,124	1,373	17	3	1
Ubon Ratchathani	189	609	798	135	69	28
Uthai Thani	41	163	204	72	41	16
Total	**5,666**	**30,328**	**35,994**	**2,701**	**1,204**	**482**

Source: Estimates based on data from MOAC and field surveys

Reconstruction and Recovery Requirements

The recovery and reconstruction initiatives proposed in this chapter are aligned with the overall priorities, plans and policies of the Royal Thai Government. Further consultations at the community, district, provincial and central level are recommended, as well as taking into account cross-cutting elements such as social and environmental sectors, in order to set a strategy that holistically addresses the reconstruction needs of the country.

Response to the Floods

The Ministry of Agriculture and Cooperatives (MOAC) and the Bank for Agriculture and Agricultural Cooperatives (BAAC) rolled out a short- and medium-term plan to alleviate pressure from agriculture related damage and losses[28]. Some of the main plans are listed here.

[28] http://www.moac.go.th/ewt_news.php?nid=7465&filename=index (accessed November 17, 2011)

MOAC aims to provide inputs such as livestock breeds, seeds and animal feed to help farmers get back to farming quickly. At the time of writing, the MOAC was attempting to secure about THB 1.7 billion to procure 71,200 metric tons of rice seeds for distribution. Under the plan, farmers that lost 50 percent or more of their crops would get up to 10 kilograms of seeds per rai, with a maximum compensation of 10 rai per farmer.

BAAC introduced a three-year debt suspension scheme for farmers with less than THB 500,000 in loans, and introduced a new program that allows farmers with less than THB 100,000 in loans to apply for new loans.

Another short-term relief initiative the government is undertaking is to provide a holistic assistance to farmers such as provision of veterinary services and cleaning of damaged areas.

Programs providing compensation for damage in crop, livestock and fishery sub-sectors are as follows[29]. The government plans to provide compensation for rice crops, field crops, and permanent crops based on the number of rai a farmer farms. This planned assistance aims to cover 100 percent of damaged lands. Similarly, fisher folk are eligible to receive compensation for every rai of fresh water aquaculture, inland aquaculture ponds, up to a maximum of 5 rai per household, as well as for aquaculture cages lost or damaged. In the livestock sub-sector, the planned compensation amount varies by animal, and by age of animal, with cattle and calves, swine and piglets all receiving varying rates of compensation – and all of them being capped at a maximum. Additionally, the Department of Disaster Prevention and Mitigation (DDPM) announced plans to provide compensation for damaged houses, loss of farm equipment and barns.

Three observations should be noted here. First, the compensation for the loss of crops and animals does not distinguish between the cost of damage (to property, livestock and permanent trees) and production losses. Second, farmers will have to file many compensation claims forms for access to assistance from various departments, which means that some farmers may not access the compensation for which they are eligible. Finally, the local governments, the district and provincial or regional administrations, are compiling the aggregated information on estimated losses, damage and claims. This could result in a lack of detailed information on damage to farm machinery and household level assets as only the aggregated information are recorded.

The recovery and reconstruction efforts in the agriculture sector are to be coordinated and facilitated by the Royal Thai Government through relevant line ministries and departments. MOAC will be the lead implementing agency, through its Department of Agriculture Extension (DAE), Department of Livestock Development (DLD) and Department of Fisheries (DOF), and in close collaboration with the BAAC. Collaboration could be made with national and international CSOs, research institutions, foundations, and other relevant institutions in this endeavor.

The private sector plays a dominant role in the agriculture sector in Thailand and has been largely affected by the floods through damage to small-, medium- and large-sized entrepreneurs, traders and agri-industry owners. Commercial rice mills, poultry farms, fish hatcheries, pig farms, etc. need to restart business, for which they need immediate access to capital, and BAAC and even commercial banks would have an important role in recovery and reconstruction efforts.

[29] See Annex 2 for further detail.

Challenges to Recovery and Reconstruction

A majority of the rural Thai population makes their living out of a combination of farming and off-farm activities, including some off-farm employment and small businesses (shops, local trade, etc). This assessment registered severe damage and losses to croplands, fishponds, and livestock as well as damage to irrigation systems, and these are likely to have serious socio-economic implications on the livelihoods of the people who were affected. Damage to critical rural infrastructure such as rural roads and bridges would potentially limit mobility and access to markets of people in the affected provinces. Small businesses including home-based agri-businesses have also been affected. At the time of the assessment visits, prices of food and meat were reported to have risen significantly above the pre-flood level. Similarly, the price of animal feed rose after the floods, and farmers speculated a high price increase for rice seed, fingerlings and other inputs. Meanwhile, due to urgency of cash requirements for daily household expenses farmers were forced to sell some of their livestock assets to generate cash at a much lower price than would be expected during this time of year. During the field visit, one female farmer reported to have pawned her gold jewelry to pay for the preparation required for the next cropping season. Artisanal fisher folk feared that the middlemen may only offer fingerlings and fish feed with more pre-conditions attached, and that they would not receive timely support for the preparations for the next season.

Farmers in different provinces practiced inter-family lending and borrowing, and borrowing from local cooperatives at different interest rates. Systems also existed for borrowing seeds and seedlings, and such systems looked to be working well in the communities. However, farming families with access to banks for credit reported holding debt, and were much relieved after getting the news on debt suspension from the banks for the next two-to-three years. The farmers however were still found to be under stress from the amount of damage and losses to their enterprises and for fear of the accruing interest on loans. Most of the farmers confirmed paying the interest on their loans regularly, but very few of them claimed to be able to pay the capital loan back, even in installments. Thanks to the resilient nature of Thai society and culture, a high level of confidence for rebuilding their livelihoods was observed in the farmers. However, with the given scale of damage and losses, there is a significant socio-economic impact on the livelihoods of the rural farming families and fisher folk, and the size of support needed to ‘build-back-better’ will be enormous. Immediate measures therefore are vital for recovery and reconstruction.

Recommendations for Reconstruction, Recovery and Resilience

The floods started affecting Thailand from May 1, 2011, and the government has since introduced a myriad of measures to alleviate the losses and damage. Table 10 below summarizes the government’s initiatives related to the agriculture sector and identifies plausible limitations based on information gathered during the field visits and observations. Recommendations regarding each policy are included here, and subsequently a detailed discussion of the short-, medium- and long-term recommended activities.

Table 10: Agriculture sector – Summary of government's compensation plan in agriculture sector, limitations and recommendations

Problem	Government Responses	Limitations	Recommendation
Crops			
Loss of crops and inability to grow in the regular season	- Government compensation for 100% damaged production (unlimited amounts of land) - Rice: THB 2,222 /rai - Crop Fields: THB 3,150 /rai - Permanent Trees: THB 5,098/rai - Partial damaged, the compensation is THB 2,549 /rai	- Unclear policy of who will receive the compensation whether farmers (tenants) or land owners - Lack of transparency of implementation plans - Mixed quality of inputs provided by the Government and the private sector	- Target distribution of the compensation to vulnerable farmers - Limit the maximum amount of compensation - Provide support to fill administrative request forms - Strengthen the monitoring process by involving Non-Government agencies - Ensure reasonable quality of inputs to serve the farmers' demands - Provide seedlings to shorten the growing season, if possible
Damaged lands	- With landslide, the compensation is THB 7,000/rai, maximum of 5 rai - THB 400/rai for cleaning up the lands, maximum of 5 rai		
Higher price of inputs	- Government promises to provide seeds to farmers i.e. 10 kgs of rice seeds for 1 rai with a maximum of 10 rai.		
Livestock			
Loss of livestock **Higher cost of inputs**	The amount of compensation varies depending on the types of the stocks and their ages e.g.: Swine: less than 1 month: THB 1,200 / head, more than 1 month: THB 2,500 / head, maximum of 10 heads per each farmer	- Currently no compensation for the declining health and production of the livestock, e.g. cow milk production - No distinction between compensation for damaged assets and loss of income	- Ensure access to veterinarian services - Assist in the reconstruction or compensation of damaged barns of broilers, swine, etc. - Provide assistance to fix machinery
Livestock's illness	- Providing veterinarian services and supplements to the livestock		
Fisheries			
Loss of fish stock **Higher price of inputs**	- All fish lost: THB 4,225/rai, maximum of 5 rai - Shrimps, Craps and Crams: THB 10,920/rai, maximum of 5 rai - Fish caged: THB 315/sq.m, maximum of 80 sq.m	- Current compensation focuses on cash, not input support	- Provide breeder fish for farmers from other provinces - Provide quality fisheries inputs to restart during the new season
Overall			
Debt	- BAAC introduced 3 years' debt suspension and extension for new loans for up to maximum of THB 100,000	- The new capital is limited to the existing collateral. - Farmers continue to have informal debts	- Provide emergency flood relief loans with utmost flexibility
Damaged machinery	- The government has established a "fix it" center to help fix damaged machinery	- The program does not cover the costs of machinery spare parts	- Provide financial assistance to cover some parts of machinery and equipment
General recommendation: Strengthen existing community cooperatives or local organizations to 1) monitor the government's implementation processes to distribute the compensation packages; 2) assist farmers to receive better information for completing the administrative requirements; and 3) disseminate information for alternative crops, breeds or alternative career options to improve their livelihoods.			

Strategy for Short-, Medium- and Long-term Recovery

As already mentioned earlier, it is extremely urgent to help the flood-affected rural population re-establish their normal livelihoods, for which an urgent injection of cash and other inputs are necessary. While, at the time of writing, some farmers had already begun to return to their farms and begin their new seasons of short duration cash crops (i.e., marigold flowers, chili and other vegetables), others were still waiting for the water to recede.

The Short-term Recovery Strategy (up to 6 months)

A.) Equitable Cash Compensation

Accelerate equitable cash compensation in some areas.

- It is not clear whether farmers with unwritten land rent contracts will be eligible for government compensation. This needs to be urgently clarified.
- Disseminate the information and publicize the details of all compensation programs to the public, especially farmers, through various media sources.
- The central government should instruct local governments and provincial administrations to collect data on damage by types of assets and farm equipment and compile them properly in a disaggregated way. This information will help policy/decision makers to identify the needs for repair of farm machinery and the needs to replace other farm equipment. It will also enable the machine manufacturers to plan their expansion of production capacity.

B.) Provision of Inputs – Cash, voucher or in-kind support

- The government should accelerate the process of distribution of agriculture inputs, either in-kind or in form of cash/voucher.
- Provision of rice seeds: Currently, the Department of Rice is trying to provide 30,000 to 40,000 tons of rice seeds, which aims to cover about 400,000 rai of farms; additional demands can be met by the market. However, seeds provided by private companies often face quality issues. The lack of uniformity and quality of seeds is a major problem that requires urgent attention. Hence, an effective monitoring process with possible involvement of non-government actors to monitor the quality of seeds sold in the market and release necessary information for the farmers is necessary.
- Provide seeds and seedlings for other crops and ensure an effective monitoring system. Providing necessary information to the farmers on where to get seeds and seedlings should be a priority so that they can plant on time and thereby shorten the cropping season.
- Provide improved livestock breeds, animal feed and animal health services complemented with necessary awareness on types and effects of animal diseases.

- In order to stabilize input prices, the government may need to intervene in the input markets in some areas where the input prices have risen exorbitantly.

C.) Support to repair or replace damaged farm machinery, fishing gear and livestock barns

- Accelerate the delivery of cash transfers in some areas that have not yet been distributed.

- Coordinate with vocational schools to mobilize mobile units of mechanics and technicians at the local levels in all provinces. These activities should be carried out in close cooperation by the provincial administration and local governments.

D.) Other livelihoods support

- Create public works or employment programs for farmers and unemployed persons. Cash-for-work can create employment as well as support agricultural livelihoods, through cooperation with the irrigation and social sectors.

The Medium-term Recovery and Reconstruction Strategy

Though medium-term activities in principle are meant to start after the first six months of early recovery phase, there is no clear boundary line between the two phases. Ground works for the medium-term activities therefore need to start as soon as possible. The medium-term recovery strategy could be summarized as follows:

A.) Government Cash Compensation

- There is confusion between the loss of income, properties and capital. Therefore, in future, there should be a clear distinction between compensation for losses and damage. This distinction is necessary for the loss of income or the damage of capital or assets. For example, the costs of breeders or hens are higher than that of fingerlings and chickens. Necessary policy work, therefore, should be carried out to review and clarify compensation policies.

- There should be a limit on cash compensation for affected farmers for all damaged products and inputs. Currently, affected farmers can claim 100 percent compensation for damaged lands, while there is a maximum limit of compensation for livestock, fisheries and farm machinery (see Annex 2).

- Streamline the administrative processes for compensation application. Currently, a household that happens to be involved in more than one type of activity is required to submit several compensation forms to different government line agencies. Streamlining these procedures into a single form and supporting affected households by providing information about the procedures and how to fill the forms would help families considerably.

B.) Limit cropping intensity

- In the past, farmers in flood-prone areas grew floating rice. However, the yield was low. After the development of the short-duration paddy, farmers in irrigated areas began to grow five crops in a two-year time frame. Crops in the Chao Phraya River Basin, which are grown in the wet seasons, are always vulnerable to floods and significant losses are experienced almost every year. Therefore, the government should discourage farmers from growing more than two crops a year, particularly in flood-prone areas. To compensate, alternative cropping or other means of livelihood would be necessary, which would require some technical and policy work.

C.) Research and Development

- The government should invest on Research and Development (R&D) on the floating rice with higher yields and quality. Floating rice is less vulnerable to flood risk than the short-duration rice, and an improved variety of floating rice could be more attractive to farmers than the short-duration rice in flood-prone areas.

D.) Disaster Risk Reduction and Management (DRRM)

- The government should improve the weather forecast capacity and establish an effective early warning system. For effective system, local governments with connected territories must work together and become more proactive in providing the information to the rural farming community and fisher folk. This should link with action from the recommendations in the DRM chapter.

- The government should support farmers' adaptation techniques such as changing cropping patterns and the cropping calendar, and improving farm management.

- Strengthen information management systems. There should be a compilation of detailed information on damaged agricultural and other assets provided by affected farmers. The government should streamline the procedures of compensation claims by asking farmers to file only one single form that contains complete information on the impact of disasters. In addition, the government should also initiate a comprehensive disaster information system. For example, GISTDA should be encouraged to carry out an in-depth ground-truthing survey, which will allow the government to validate the damage reported by farmers and make more accurate estimates of the agricultural production as well as the extent and degree of real damage and losses.

E.) Crop Insurance

- The government has already initiated a crop insurance program in Thailand, however the program still needs momentum and increased popularity among Thai farmers. Due to the damage and losses incurred in this flood, farmers have shown a keen interest in participating in such a program and expressed their willingness to pay premiums. This opportunity needs to be tapped and necessary work needs

to be done together with private insurance companies to translate it into practice. See the recommendations regarding disaster and agricultural insurance in the DRM chapter of this paper for a framework for assessing feasibility.

Strategy for Long-term Recovery and Reconstruction

Agriculture is very much dependent on water management. Proper water management would therefore be a key to better preparedness and risk reduction against flood disasters in agriculture sector. The long-term strategy would therefore be as follows:

A.) Water Management

- Water management for agriculture must adopt a holistic approach that takes into account water management issues related to floods and drought. The Flood, Irrigation and Drainage chapter of this paper provides recommendations with regard to the overall Integrated Water Resources Management that would facilitate this holistic approach.

Table 11 presents a summary of needs for implementing short-, medium-, and long-term recommendations in the agriculture sector.

Table 11: Activities and costs for short-, medium- and long-term recovery and reconstruction needs in Thai baht, millions

Type of Activity	< 6 months	6 - 24 months	2-5 years
Repair irrigation system and drainage system	283	0	0
Repair agricultural machinery and equipment	4,252	0	0
Repair destruction of storage and other buildings	491	491	0
Provide agriculture inputs and other support (Transferred in kind or cash/voucher for input, repair of machinery, etc)	3,168	1,009	0
Provide livestock inputs and other support	174	67	0
Provide fisheries inputs and other support (provide restocking of fingerlings or cash for inputs, fishing gears, machinery, etc)	53	27	0
Cross-Cutting programs	15	11	10
Cash for work	11		
All Crops/livestock/fishery Insurance Program	0	4	10
Monitoring and Research Study Works related to study of limiting crop intensity, DRR/DRM	4	7	0
Total	**8,451**	**1,616**	**20**

Disaster Resilience in the Agriculture Sector

Policy Recommendations

Farmers are integral to feeding a population of 65 million in Thailand as well as export rice to a significant percentage of the world's population. Meeting this demand whilst being challenged with natural disasters and climate change has put enormous pressure on the agriculture sector to provide food, income, employment and ecological services. To address the impact of disaster and climate change in the agriculture sector, concerned line ministries have put a number of policies and plans into action.

The Disaster Prevention and Mitigation Act of 2007, Regulation of Emergency Relief Assistance for Disaster Affected Farmers (2009), and Animal Epidemic Act (1956) are some of them. Similarly, the National Plan for Disaster Prevention and Mitigation (2010–2014), Integrated Plan for Mitigating Impacts of Global Warming in Agriculture Sector (2008–2011), Plan for Disaster Response in Agricultural Sector for fiscal year 2010, and Operational Guidelines for Centre for Disaster Monitoring and Mitigation in Agriculture Sector at Provincial level, and National Master Plan on Climate Change (2010–2019) are some of the key disaster risk reduction plans formulated by the Ministry of Agriculture and Cooperatives (MOAC) and Ministry of Natural Resources and Environment (MNRE) to address disaster risk and climate change that are expected to impact the agriculture sector now and in the future.

Natural disasters have both direct and indirect impacts on the agriculture economy, social well-being and the environment. Direct impacts in the agriculture sector are direct physical damage and losses to crops, livestock, and fisheries caused by extreme hydro-meteorological events. Indirect impacts refer to loss of potential production due to disturbed flow of goods and services, lost production capacities, and increased costs of production. Some of the policy recommendations to enhance resilience of the farming communities and fisher folk in Thailand against any future natural disasters could be briefly summarized for different sub-sectors as follows:

Crops

(1) Enhance national and local governance systems for sustainable agriculture development by implementing context specific policy reforms such as land management, Integrated Water Resources Management that focuses on river basins, intensifying crop diversity, use of flood and drought resistant crop varieties, integrated pest management, developing crop insurance schemes for small-scale farmers, enhancing people participation for policy discourse and program planning and implementation.

(2) Create a conducive environment for the Department of Agriculture Extension to prepare department specific Disaster Risk Reduction (DRR) plans in accordance with the broader DRR and Climate Change Adaptation (CCA) framework and plans of MOAC. Target the land use change and biomass produced from the agriculture sector, which are the key sources for Green House Gas Emissions, and formulate policies, plans and practices to address them.

Livestock

(1) Enhance national and local governance systems for sustainable livestock production by implementing context specific policy reforms such as developing livestock insurance schemes for small-scale farmers, enhancing people participation for policy discourse and program planning and implementation.

(2) Formulate an inclusive policy to accommodate both large- and small-scale livestock farmers for insurance schemes.

Fisheries

(1) Develop and implement policies and programs to maintain and restore coastal and inland habitats, improve fisheries management and the well-being of people involved in fisheries and fisheries-related activities (coastal and inland fisheries, commercial fishing, processing and post-harvest).
(2) Review indicators on how the above policies would contribute to climate change adaptation (through the Southeast Asian Fisheries Development Centre).
(3) Enhance national and local governance systems for sustainable fisheries and aquaculture development by implementing context-specific policy reforms such as coastal management, developing fishery insurance schemes for small-scale fishery farmers, enhancing people's participation for policy discourse and program planning and implementation, and promoting community participation in coastal management.
(4) Formulate an inclusive policy to accommodate both large- and small-scale fisheries communities for insurance schemes.

Natural disasters and climate change could stall much of the progress made to date in the agriculture sector. The challenge must be addressed in a more holistic way and should integrate mainstream DRR into agriculture sector programming, agriculture development planning and strategies for addressing natural disasters and climate change in the agriculture sector. Each department under MOAC should be encouraged to prepare department-specific DRR plans following the broader DRR framework. Key sources for the Green House Gas Emissions in agriculture sector should be targeted, and plans and practices should be formulated to address these causes.

Efforts at raising public awareness of DRR and CCA and their impacts in the agriculture sector should be stepped-up. A regional DRR framework should also be established to support south-south technical cooperation and information sharing in the agriculture sector among neighboring countries in Southeast Asia and the role of regional cooperation in promoting good policies and practices should be expanded, sharing information and knowledge on disaster risk reduction and management. There is also a need to ensure active involvement of the Geo-Informatics and Space Technology Development Agency (GISTDA) for the use of geographic information system (GIS) and satellite imageries for agriculture and disaster sector program planning. A more holistic approach needs to be adopted to build the adaptive capacity of vulnerable groups and localities and their resilience to shocks, including developing their capacity to diversify local economies, livelihoods, and coping strategies.

Industry Sector[30]

Summary

The objective of this chapter is to provide a preliminary assessment of damage and losses incurred to the industrial sector by the 2011 flood. The overall sector's assessment was led by the United Nations Industrial Development Organization (UNIDO) in conjunction with the World Bank and the ABAC Poll (Assumption Business Administrative College) team who conducted the field survey in five provinces as a part of the Damage and Loss Assessment (DALA) methodology of the United Nations (UN). Given the short period of time, collecting detailed data from each of the industries, especially those industries that are not a member of the Provincial Federation of Thai Industry, was not possible. The team relied on macro data gathered from multiple sources at the provincial level, being officially-announced data from websites such as the National Economic and Social Development Board (NESDB), the Bank of Thailand (BOT), United Nations Development Programme (UNDP), Ministry of Commerce (MOC), Ministry of Industry (M-Industry), Federation of Thai Industry (FTI), National Statistics Office (NSO), and the Office of SME Promotion.

The industry sector, a major contributor to GDP, has been heavily hit by the floods. Damage to buildings, equipment and machinery is estimated to be THB 513.9 billion. The latest national capital stock data at current price from the NESDB was used to check the reasonableness of the estimated damage figures. Data validation was done by visiting the affected provinces and meeting with the private sector stakeholders to get first hand information.

As estimated, the total damage to buildings and machinery were largely on electrical components such as motors, electrical panels and expensive diagnostic equipment for the five provinces surveyed are worth THB 285 billion with Ayuthaya being the worst affected. Stocks and inventories were also damaged to a lesser extent. As for losses, the figure includes production not obtained and sales not made, higher operational costs, lower revenues and unexpected expenditures such as humanitarian assistance to employees and the surrounding communities. In conjunction with the Ministry of Industry's report, the losses are estimated to be THB 493 billion in the medium term.

For the short-, medium- and long-term needs, the monetary requirement is for mitigating macroeconomic and individual impact at the industry level. This includes income generation, temporary shelter provisions, provision of grants, temporary tax relief and temporary exemption of taxes on imports toward the recovery effort. Consideration of supply-chain linkages both within the industrial estates and outside is also emphasized. The total needs estimate at THB 209 billion for 26 provinces, based on the five provinces under study.

Industry Overview

Often referred to as the manufacturing sector in the national account system, the industrial sector contributes to 38.6 percent of Thailand's GDP and is one of the main drivers of Thailand's exports. The flood has had a devastating effect on the industry sectors, especially for the SMEs who may not be able to resume operations without timely financial support.

[30] Based largely on the initial assessment conducted by ABAC Poll and the analysis by UNIDO.

Within the framework of the Rapid Assessment, five provinces were selected for initial assessments[31] : Ayuthaya, Bangkok, Nakhon Sawan, Pathum Thani and Samut Sakhon. These provinces account for almost 41 percent of the whole industry sector in Thailand with Ayuthaya, Pathum Thani and Samut Sakhon having an industrial make up of Gross Provincial Product of more than 75 percent and above while Bangkok and Nakhon Sawan at the low 20 percent. In terms of contributions to the country's GDP, Bangkok generates 26 percent while Nakhon Sawan stands at about 1 percent. Out of 26 provinces affected by the flood[32] , the five selected provinces account for more than 70 percent of the industry sector.

There are approximately 14,243 factories in these five provinces where Samut Sakhon has the most factory locations with 4,711 in the food processing, fishery, and manufacturing industries. The combined strength of the employed workforce in the industrial sector in these five provinces is estimated at 1,428,873 of which Samut Sakhon accounts for 509,958. Samut Sakhon's industry structure is geared toward labor-intensive industry such as fishery and food processing; it is not surprising to see high employment density in the province.

Although some of the main roads have become accessible, secondary roads leading to the factories are still inundated with water to the height of 1.5 meters in some areas. For this reason, some industries stopped production altogether as they cannot transport raw materials for production into the factory and move finished goods out of their premises. The restoration of electricity and water are in full swing in order to allow the private sector to get back to business. The Ministry of Industry, responsible for overseeing the sector, has passed emergency measures to assist business enterprises in the short term. These measures are aimed at providing speedy recovery efforts and resuming productive activities of the flood affected areas.

Damage and Losses

Disaster Effects			Ownership		Needs		
Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
513,881	493,258	1,007,139		100%	172,640	668,045	13,671

**Based on UNIDO's calculations and the Ministry of Industry*

Table 12: Industry sector – Estimated total damage, losses and needs in 26 affected provinces, in Thai baht, millions

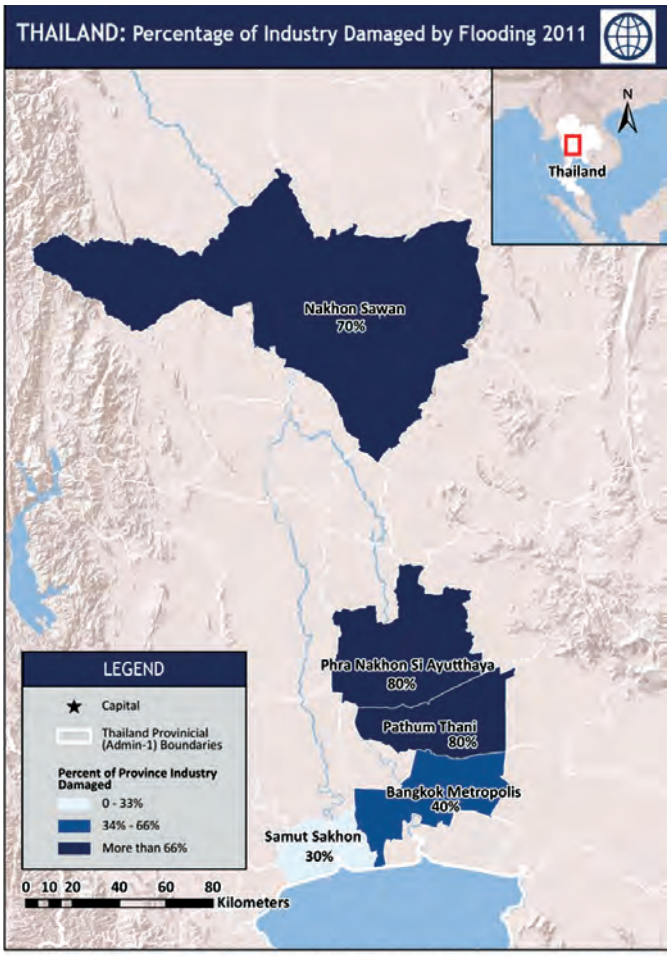
[31] The initial assessment was done in conjunction with the recognized ABAC Poll (Assumption Business Administrative College) team, who conducted the field survey in five provinces, collated data during the field trips which was conducted during November 12–17, 2011.

[32] The 26 provinces consist of Phitsanulok, Phichit, Nakhon Sawan, Uthai Thani, Kalasin, Khon Kaen, Maha Sarakham, Roi Et, Si Sa Ket, Surin, Ubon Ratchathani, Chai Nat, Singburi, Ang Thong, Ayuthaya, Lop Buri, Saraburi, Suphan Buri, Nakhon Pathom, Pathum Thani, Nonthaburi, Samut Sakhon, Chachoengsao, Nakhon Nayok, Prachinburi, and Bangkok.

Damage

The total damage to buildings, equipment and machinery for the five provinces have been estimated at THB 221 billion. Ayuthaya is the highest at over THB 90 billion, where Bangkok is estimated at almost THB 40 billion in damage. The average damage in in Thai baht per size of industry had been obtained through ABAC field surveys and this figure is used in conjunction with the estimated number of factories broken down by size to extrapolate the end result. The extent of damage to equipment and machinery varies from province to province. Enterprises in the upper northern region like Nakhon Sawan and Ayuthaya experienced more damage than those lying to the south, as there was less time for business enterprises to relocate expensive equipment to higher floors.

Figure 3: Percentage of industry that incurred damage in the floods



Layer Sources: Basemap (ESRI), Admin. Boundaries (DIVA-GIS), Industry Sector Damages (Authors). [Created by GFDRR]

Disclaimer: The borders and country names used are indicative and do not represent the views of The World Bank Group.

The Ministry of Industry also estimates damage in various industrial estates (i.e. Saharat na Nakorn, Rojana, Hi-tech, Bang Pa-in, Factoryland, Nawanakorn and Bang Kadi) to be approximately THB 237.4 billion, and in affected provinces (i.e. Chai Nat, Nakhon Sawan, Nonthaburi, Pathum Thani, Ayuthaya, Lop Buri, Ang Thong, and Uthai Thani) to be THB 237.3 billion. Combined with the results from the survey, which includes Bangkok, the total damage is estimated to be THB 513.9 billion.

Losses

The losses come from business stoppage, higher operational costs, lower revenues and unexpected expenditures. The average losses in baht per size of industry are obtained through ABAC field surveys and this number is used in conjunction with the estimated number of factories broken down by size to extrapolate the result. According to our discussion with the private sector, the estimated length of time for production stoppage is about 2–3 months for small to medium enterprises and 3–5 months for large enterprises. As large enterprises are capital intensive and utilize more technically advanced equipment, foreign experts are sought to assess the extent of the damage to these equipment in order to decide whether or not to repair or replace them.

Similar to the damage, the Ministry of Industry estimates the losses from reduced production in the aforementioned industrial estates in Ayuthaya and Pathum Thani to be around THB 328 billion. Combined with the surveyed data in the other of the five provinces and extrapolated[33] for 26 affected provinces according to the industry sector GPP data, the losses are estimated at THB 493 billion.

Sub-sector/ Component	Disaster Effects			Ownership		Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Ayuthaya	92,907	17,137	110,046		X	5,999	57,064	5,350
Bangkok		20,064	59,182		X	7,018	13,465	1,000
Nakhon Sawan	39,131	7,238	27,302		X	2,533	9,008	500
PathumThani	20,051	17,117	86,389		X	5,991	38,985	2,500
Samut Sakhon	69,272	1,922	1,922		X	673	0	500
Total in THB	**221,374**	**63,467**	**284,841**			**22,214**	**118,522**	**9,850**

Table 13: Industry sector – Estimated total damage, losses and needs in the five assessed provinces, in Thai baht, millions

Assumptions:

- Estimations made for only five provinces as case studies
- Baseline data resulted from ABAC Poll field survey for about 360 enterprises comprising small,medium, large; no. of enterprises in each province and percentage of damage & loss in each province
- Damage and losses as per percentage of GPP, percentage of industry contribution to overall GDP
- Nature and percentage of economic activities in each province
- Needs specifically in the long term are calculated based on percentage of industrial activities affected by the flood in each province & also for preparation, resilience of the province with high industrial activities
- Needs calculations include soft technical assistance and hard: infrastructure requirements based on damage and losses

Recovery and Reconstruction Requirements

Needs

The recapitalization needs to take care of production losses, credit lines recapitalization, cash grants and temporary targeted tax relief measures is estimated to be THB 172.6 billion. These recapitalization needs should be sufficient for the first six months since the start of the crisis. The number is obtained through applying a determined coefficient (based on DALA Methodology) to the total losses. It is recommended that

[33] The five provinces account for about 72 percent of industry sector GPP for the 26 provinces. The extrapolation of the remaining 28 percent is to provide an estimate of country-wide impact for further macroeconomic analysis.

blanket tax holidays not be provided, as this would significantly erode the tax base and adversely impact the fiscal position. Instead it may be more feasible to provide for accelerated depreciation of capital stock and inventories damaged by floods.

For the medium-term, the needs are estimated by applying a determined DALA coefficient to find industrial reconstruction needs and equipment replacement needs and the total amount is estimated to be THB 668 billion. The amount should be sufficient in helping enterprises to obtain more technologically advanced machinery for more productive output in the future.

For the long-term needs, an estimated figure is about THB 13.7 billion. The majority of the amount is for building dams and dikes around seven industrial estates in Ayuthaya and Pathum Thani. A fraction of the amount goes into long- term institutional capacity building activities on rural and urban planning and water management system training, which should be planned for a period of 3–5 years.

Again, the needs are extrapolated for macroeconomic analysis of all 26 provinces. The total estimated needs for the short- (~6 months), medium- (6–24 months), and long-term (>24 months) are THB 172.6 billion, THB 668 billion, and THB 13.7 billion, respectively. The grand total becomes approximately THB 854.4 billion.

Challenges to Recovery and Reconstruction

Supply chain recovery, not only within industrial estates. The current effort by the government is focused on draining water from the strategic economic zones, such as city areas and industrial estates. However, SMEs located outside the industrial estates are of equal importance. These SMEs play a part in the value chain by supplying parts and components to enterprises within the industrial estates. As more and more water is pumped out of the industrial estates, it may further aggravate the flood situation already experienced by the SMEs. Based on observations during the field visits, the real challenge is to recover the entire supply chain, and not only to protect the industrial estates. A comprehensive view of 'water flow management' needs to be considered, so that the recovery and reconstruction of SMEs is in synchronization with the large enterprises.

Maintaining employment. Of equal importance is the sufficiency of the labor force during the recovery and reconstruction period in which a certain percentage of labor had returned to their hometowns and might have relocated to work in other provinces altogether. Some enterprises are already experiencing labor shortages during the recovery process. In this regard, the Ministry of Labor has stepped in to help enterprises by providing salary subsidies of THB 2,000 per worker to encourage enterprises to keep their employees employed in order to maintain high employment and reduce hardships experienced by the labor force and their families.

Implementation of government support. As far as measures meted out by the Thailand government through the Ministry of Industry are concerned, some of the temporary measures to help enterprises and the labor force are as follows:

1. Establish sentry posts at non-flooded industrial estates and ensure situation updates are made every hour to the command center;
2. Under emergency situations, allow BOI-promoted industries to relocate machinery and raw materials if their premises are flooded, by being flexible with the documentation. However it is important to track relocated machinery and raw materials, and to ensure these are transported back to the original project site the moment production is restored;
3. Exempt import tax only for replacement machinery and damaged raw materials, for those entities that were not insured against flood damage;
4. Facilitate visa applications for foreign experts in coming to Thailand during the recovery process;
5. Permit enterprise owners to delay paying utilities and telephone costs until the business is up and running again;
6. Beef up security teams to prevent theft within the flooded industrial estates and industrial parks;
7. Follow up with insurance companies in flood compensation claims in order to help enterprises recapitalize their operations;
8. Organize training courses for workers and provide food allowances during business stoppages and help source workers to work in industries facing labor shortages;
9. Rehabilitate business operators affected by the flood especially SMEs and OTOP businesses; and,
10. Provide loans to business operators through the Government Savings Bank and other commercial banks.

The abovementioned support has been approved by the Cabinet. The challenge now lies in the details and selection, as there are conditions applied in screening enterprises to determine eligibility for this assistance package. Nevertheless, the government is aware and committed to facilitate the approval process. There are more assistance packages being considered by the government at the higher level to help enterprises in the recovery and reconstruction stages. Given that industrial input as percentage of overall country GDP is substantial, the impact to the country is wide ranging, with social, political, economic impacts which affect the stability of the country as a whole.

Recommendations for Resilient Recovery and Reconstruction

Strategy for Short-term Recovery (up to 6 months)

1. Improving access to finance and/or providing grants for micro- and small-size industries to accelerate recovery and reconstruction (especially to those with almost no productive assets left)
   - For repair or replacement of equipment, rebuilding facilities, and cleaning up efforts
   - To support liquidity of enterprises
   - To retain workers (such as compensation during business stoppages);
2. Provision of temporary shelters for employees/workers of industries, local enterprises;
3. Logistical support specifically for those in prolonged flood affected areas, so that they can continue to operate as a part of the supply chain;

4. Support for facilitation of skilled labor, dispatch of experts to support enterprises; and
5. Procurement of equipment needed for relief operations and monitoring systems to support the local industries

Strategy for Medium-term Recovery and Reconstruction

1. *Credit line facility* for recovery and reconstruction;
2. Government & private sector: Formulation of *disaster and recovery management framework* for industries including identification of better, safe sites for industrial firms, preparedness, measures, etc;
3. Promote better *concessions arrangements* – for duties to increase exports, waive import taxes in a targeted, transparent and time-bound manner;
4. *Rehabilitation of basic infrastructure* to support affected industries;
5. Prioritizing the building of better links between the government and private sector;
6. Job creation through promotion of *investment in the industrial sector;*
7. Support for *institutional capacity building* (industrial rehabilitation, local planning and preparation for future flooding which **can also be regarded as long term**); and
8. Strengthen government and *other stakeholders' capacities*: resilience, preparedness and recovery

Strategy for Long-term Resilience, Recovery and Reconstruction

For the long-term sustainability of the industrial sector and to also win back foreign direct investment in order to maintain Thailand as a manufacturing hub for the region, the following initiatives aim to cope and mitigate future risks:

1. *Institutional capacity* in rural and urban planning that would take strong consideration of safe industrial areas are to be promoted;
2. Given the relative affordability of SMEs on future insurance premium, *insurance schemes and support* from the government are to be made available to small enterprises;
3. Promote strong links between policy, research, and operational experts to *effectively transfer information and knowledge;*
4. Promote *partnerships between public and private sectors* (including not-for-prof it entities) which aims for the development of innovative risk management approaches in order to be more disaster resilient;
5. *Comprehensive flood protection system* are needed to be constructed in consideration of the supply-chain linkages around the industrial estates;
6. Invest in *comprehensive water management system* and relevant branches of governmental organizations need to cohesively work together to manage water flow (affecting industries and local communities in general); and,
7. *Improve land-use management,* where by similar business clusters are grouped in the same areas and allow sufficient land in the province to serve as a flood plain. The flood plain should be evidently marked on the provincial map and instituted in the provincial building code, where no residences are permitted.

Tourism Sector

Summary

Thailand's tourism is the envy of many Southeast Asian economies for its diversity and longevity. Key to its success is the economically productive leveraging of rich cultural offerings, stunning beaches and distinctive hospitality. The sector was noted as the top export for the country each year from 2008 through 2010. With attractive destinations spread throughout Thailand, it attracts a significant volume of foreign visitors and supports a wide range of informal and formal enterprises. However, integral to the sector's performance is its high volume of domestic travelers motivated by festivals and religious events tied to the country's 35,000 temples, the sunny beaches from Phuket to Pattaya, as well as the cool hillsides of Chiang Mai and the northern provinces. Both Thai and foreign travel consumption combines to create a globally competitive and integrated, high-profile sector that is tied to national pride and noted for its resilience.

Thailand's tourism sector is well versed in crisis response and recovery. Experienced in responding to health, political and natural crises such as SARS, the 2004 tsunami and the more recent May 2010 turmoil, Thailand's mobilization of public and private sector collaboration has enabled a pattern of impressive returns. These returns had reached pre-crisis levels before this year's flooding.

Even with this robust set of capabilities, the current disaster presents another challenge. Unlike the tsunami's sudden and immediately felt impact, the evolving temporal and spatial nature of the current flooding creates significant direct impacts in flood-affected provinces, as well as notable cascading effects across the country. This is reflected in the perceptions of potential travelers who translate specific local images into a picture that "all of Thailand is underwater". This change is happening in an increasingly competitive context as Malaysia aggressively promotes its tourism and Viet Nam continues to diversify its offerings following Thailand's successful tourism model. In addition, Myanmar's potential tourism prowess is noteworthy in this context. Thus, the current challenge for Thailand's tourism sector is not only to recover from damage. Its true mandate is to leverage this current crisis to build-back-better in order to continue to fully capture the sector's economic benefits and maintain competitiveness.

Damage related to the sector's lodging, attraction and services assets are still evolving and are highly province specific. In many locations, early awareness of possible flooding enabled the private sector to prepare and minimize damage. However, flood damage to lodging enterprises included primarily ground floors with capital-intensive public spaces, restaurants and kitchens. Damage to attractions ranged from minimal effects to structural impacts particularly with related assets not movable to higher ground. In addition, a typically underestimated effect is the impact of the flooding on the sector's forward and backward linkages. These include both formal and informal SME agribusiness, handicraft and tour guiding enterprises.

Reconstruction and recovery needs traverse efforts of differing rhythm and responsibility. Direct damage reconstruction is determined to be primarily private sector driven through insurance coverage and securing of soft loans. Recovery, however, calls for implementation by the public and private sectors of rapid, cohesive and on-going marketing and promotion

strategies. These efforts target the sector's consumers, suppliers and operators. Combined, these recovery initiatives will enable the crucial return of "traveler confidence". Build-back-better opportunities include improved preparation for the next crisis as well as strategic actions to address the shifting structural and competitive context.

Table 14: Tourism sector – Damage, losses and needs in Thai baht, millions[34]

Sub-sector/ Component	Disaster Effects			Ownership		Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Accommodation	978.7	21,476.8	22,455.5	0	22,455.5	829.3	216.3	0
Food and Beverage	1,004.2	13,537.1	14,541.3	0	14,541.3	848.1	217.7	0
Shopping	1,338.9	25,270.3	26,609.2	0	26,609.2	1,133.1	293.9	0
Entertainment	1,004.2	13,798.7	14,802.9	0	14,802.9	848.1	217.8	0
Sightseeing	0	4,586.4	4,586.4	0	4,586.4	1.5	2.3	0
Local Transport /Tour Operations	2.1	8,477.0	8,479.1	0	8,479.1	4.6	4.7	0
Others (i.e. Attractions)	806.3	2,527.1	3,333.4	403.1	2,930.3	678.1	170.6	0
TOTAL	**5,134.4**	**89,673.4**	**94,807.8**	**403.1**	**94,404.7**	**4,342.9**	**1,123.2**	**0**

Tourism Sector in Thailand

Tourism is a high-profile sector that is not only reflective of the country's pride in its culture, history and natural assets. It is also the economic engine of the country. In 2009 the proportion of tourism revenue to GDP was 10.14 percent, according to the NESDB and the Tourism Authority of Thailand, and each year, from 2008–2010, the sector was noted as the number one export sector.[35] According to the World Travel and Tourism Council, which reports country-level and regional travel and tourism data, direct employment in the sector of 1.858 million jobs underpinned the direct contribution of travel and tourism to GDP of THB 604.2 billion in 2010. Prior to flooding, travel and tourism in Thailand was expected to directly generate 4.7 percent of total employment.[36]

Tourism arrivals have grown over the past decade with the government's emphasis of supporting both domestic and foreign travelers. In 2010, over 15.9 million foreign travelers stayed 4.4 days on average while Thai domestic travel volume reached 122.5 million visits.[37] The country was ranked 14th worldwide in 2009 for its volume of international arrivals alone.[38] The sector has shown its resilience in bouncing back after widely publicized crises. It recovered from notable shocks such as SARS (2003), the tsunami of 2004 and the Avian flu crisis (January 2005). More recently, Bangkok-focused events such as the occu-

[34] It should be noted that, under the DALA methodology used in this exercise, damage and losses are largely estimated through economic modeling and due to time limits and data availability constraints, the team relied significantly on as sumptions and trends based upon previous experience. Other important aspects of losses, e.g. nuances related to business cycles and external factors such as events in tourism source markets and their resulting impact on tourism in Thailand, although considered, are not within the direct scope of this study.

[35] NESDB and the Tourism Authority of Thailand, 2010

[36] World Travel and Tourism Council, The Economic Impact of Travel and Tourism 2011, Thailand

[37] Thailand Tourism Authority, 2011

[38] UNWTO (United Nations World Tourism Organization), World Tourism Barometer, August 2011

pation of its major airport in December 2009 and central business district protests known as the May turmoil (May 2010) have challenged the sector's resilience. Unlike the impacts of the global financial crisis and airport closure, which depressed the number of tourist arrivals over nearly a year, recovery from the most recent political crisis of May 2010 was reached within six months. Prior to the floods, 2011 was expected to be a record-breaking year. For the month of February 2011 alone, arrivals reached a new high of 1.57 million, foreshadowing the prospect of a very strong year.

Tourism is a well-developed sector with foreign and Thai travelers visiting iconic destinations such as Phuket, Pattaya, Chiang Mai and Ayuthaya. Regional and long-haul travelers are drawn by Bangkok, the quintessential Asian city that appeals to young and old. In fact, Thailand is a popular destination for families, with recent data indicating that a high percentage of visitors are families. Key to the sector's vibrancy is its image of good value for money in a growing marketplace of attractive destination choices. A CNN International consumer survey found Thailand to be the "top value for money" destination in 2010 ahead of China and India. The size and dispersion of sector enterprises across the country over the years has enabled extensive cross-sectoral activity through tourism. And, perhaps the most enviable aspect of Thailand's tourism is its visitor loyalty with over 60 percent of all foreign travelers being repeat visitors.

In addition to beach and cultural offerings, Thailand has been a pioneer in the emerging high growth segment of medical tourism. For aging baby boomers in Thailand's source markets of Europe and North America, the cost and availability of medical care at home continues to be a challenge. Particularly for repeat visitors to Thailand, the opportunity to combine a medical procedure with a leisure visit is appealing. While other countries in the region have copied this approach, Thailand's ability to package desirable iconic destinations with recommended modern medical facilities, has given it a competitive advantage in this area.

Leisure travel is the primary driver of the sector with approximately 80 percent of arrivals designated as leisure travelers. Business travel is a small proportion although the Thailand Convention and Exhibition Bureau reported average business traveler stays of five–six days in 2009, roughly two days longer than leisure travelers. Similarly, the volume of meetings, incentives, conference and exhibition (MICE) segment is low compared to leisure travel, despite a number of convention center facilities in multiple destinations.

Access within the region and from major overseas source markets is strong. Airport improvements over the past five years, as well as planned expansion and upgrading, enable Bangkok to be recognized as a globally competitive gateway with a growing volume of domestic, regional and international flights. Most recently, Thailand has benefitted from the expansion of budget airlines attractive to both foreign and Thai travelers. Despite negative publicity during the Suvarnabhumi Airport closure and recent media clips of parked airplanes during the floods, Bangkok's primary international airport was rated as the #5 airport in the world for its services offering and delivery.

The size and resiliency of Thailand's tourism industry is an outcome of the sector's ability to answer to Thai as well as foreign traveler demands. Domestic travel spurs the Thai economy and is a focus of everyday life for many, with the highest volume of domestic travel typically in the months of December, April and October. The government has

encouraged at-home-travel through announcing special holidays and offering tax benefits for individual travelers using registered enterprises across Thailand. For example, in 2009, a specific promotional campaign, “Travel for your Nation”, was initiated to encourage Thai leisure travelers to see more of their country. This contributed to Thai leisure trips reaching a volume of more than 29 million trips in 2010, an increase of 7 percent from 2009 levels. Prior to the flooding, a growing percentage of Thais were not only able, but also inclined to fly to destinations within the country and across the region for leisure and business.

Fundamental to the sector’s longevity are the efforts of both public and private sector stakeholders. The two bodies working most directly in tourism are the Department of Tourism (DOT) and the Tourism Authority of Thailand (TAT), both under the Ministry of Tourism and Sports. DOT’s principal roles include tourism policy formulation and implementation, tourist facility licensing, some statistics collection, and industry training. Meanwhile, TAT’s priorities are marketing and promotion including the operation of overseas offices in key source markets as well as provincial offices throughout Thailand. In conjunction with these priorities, TAT collects and distributes key sector statistics. Representation of the private sector is led by its apex association, the Tourism Council of Thailand (TCT), which represents over 15 sector associations. Well-established travel and tourism associations range from the Thailand Hotel Association (THA), Thailand Association of Travel Agencies (TATA), Association of Thai Travel Agents (ATTA), the Federation of Thai Tourism Associations (FETTA) and the Thai Boats Association (TBA).

Going forward, particularly in the context of the 2011 floods, fundamental shifts in source markets and spending patterns are anticipated to be a priority for both the public and private sectors. In the near term, Thailand’s tourism will struggle with an emerging shift in demand patterns contributing to a decline in revenue per visitor. Following the global financial crisis, an emerging pattern of the composition of visitors to Thailand moving away from OECD economies and towards emerging East Asia, is contributing to a trend in decreased tourist receipt growth as noted in 2010 and early 2011.[39] This is in the context of noticeable increases of tourism growth of neighboring countries including Laos, Cambodia, Myanmar, and Vietnam, as some tourists are opting to include other destinations in their travels and spend a larger portion of their time outside of Thailand. In addition, early 2011 data suggested that tourists are spending less time in Bangkok, with foreign arrivals shifting to popular southern tourist destinations such as Krabi, Phuket, and Koh Phangan. Prior to flooding, the demand for rural destinations was seen to be rising as access to destinations outside of Bangkok became considerably easier with the advent of low-cost air carriers and the growing number of accommodation choices outside of the capital. Improved connections and expanded airline options, including budget airlines, has directly contributed to the growth of arrivals from India and Australia.

The decline in European tourists has been offset by a rise in regional tourism from ASEAN countries (predominantly Malaysia) and East Asia (Japan and Korea) who in January 2011 contributed a share of over 40 percent to tourist arrival growth. Chinese tourists have also become a large market for the Thai tourism sector following a waiver of visa fees for Chinese tourists in early 2009. The number of Chinese tourists rose 45 percent from 2009 to 2010. Although the boost in regional tourism has been a boon for the Thai tourism sector,

[39] The World Bank, Thailand Economic Monitor, April 2011

the trend of an increasing number of lower-spending East Asian tourists who tend to have shorter stays and spend less per capita, will challenge the sector to remain competitive and continue to grow.

Source Market	2003	2005	2010
1	Malaysia	Malaysia	Malaysia
2	Japan	Japan	China
3	South Korea	South Korea	Japan
4	Singapore	China	United Kingdom
5	China	United Kingdom	India

Table 15: Top source markets for Thailand's tourism (2003, 2005 and 2010)

Source: Tourism Authority of Thailand

Note: Malaysia arrivals include cross border day visitors and laborers

Increased regional competition and significant increases in international-standard lodging supply is likely to further challenge the sector to maintain growth in revenue and return levels.

Each Thai crisis enables competitive destinations, especially with strong campaigns such as "Truly Asia" for Malaysia, and "Incredible India" to try and gain more visitors. Singapore's investment in market research and its regular review of its strategies and positioning, aligning its tourism strategy with the country's long-term development vision, is a model for Thailand going forward.

Damage and Losses

Damage and losses to the sector are challenging to determine, as the flood waters had yet to fully recede at the time of writing. Damage entail physical impacts to tourism-related property and environment, while losses for the sector are determined to be the sum of business loss in the flood-affected and non-affected areas around the country. The services web of the sector (including lodging, food and beverage, attractions, entertainment, handicrafts/souvenirs, tours and transport) and seasonality patterns of foreign and domestic travelers all contribute to the analysis of loss. Typically for the tourism sector, damage is only 10–20 percent of loss amounts.

Thailand: One Year after the Tsunami

Thailand one year after the tsunami provides a reference point for the current damage and loss analysis. While the December 26, 2004 tsunami was temporally and geographically different to the current flooding, the tsunami had the greatest economic impact on people in the six directly-affected provinces. Prior to the tsunami, these six provinces generated 17 percent of total tourism revenue for Thailand. Following the tsunami, tourism revenues dropped dramatically in the first quarter and then started to slowly recover. Given the unexpectedly slow recovery of the tourism sector in the first three quarters of the year immediately following the tsunami, tourism revenues as a percentage of GDP were lower than initial estimates. One year after the tsunami, tourism revenue losses were recorded to be USD 1.4 billion, indicating a slower recovery than had initially been anticipated. When these losses are added to damage sustained by tourism infrastructure, estimated to be USD 340.9 million, the impact on the tourism sector was approximately USD 1.8 billion.

Source: The United Nations Country Team in Thailand, Office of the UN Resident Coordinator Tsunami Thailand, One Year Later (2006)

Damage

Reported damage to the sector was found to be primarily to attractions and lodging assets. Tourism attractions in Thailand include significant cultural assets such as temples, monuments and museums. In addition, natural assets of scenic beaches, parks and countryside areas make up damage estimates. A major manmade draw to Thailand is retail opportunities with "attractions" such as private sector shopping malls and village markets. In addition to privately held assets, Thailand's attractions include a variety of locally administered sites considered to be public domain. Individual provinces reported damage to locally administered attractions and tourism sites as noted below.

Table 16: Tourism sector – Damage in Thai baht, millions

Sub-sector / Component	Public	Private	Total
Accommodation		22,455.5	22,455.5
Food and Beverage		14,541.3	14,541.3
Shopping		26,609.2	26,609.2
Entertainment		14,802.9	14,802.9
Sightseeing		4,586.4	4,586.4
Local Transport and Tour Operations		8,479.1	8,479.1
Others (i.e. Attractions)	403.1	2,930.3	3,333.4
TOTAL	**403.1**	**94,404.7**	**94,807.8**

Of the 26 provinces under review, Ayuthaya experienced the highest level of tourism related damage at cultural heritage sites, lodging establishments and restaurants[40] . For other provinces, damage was determined to be site specific with many lodging entities able to prepare in advance. However, lodging establishments of various levels, which did experience flooding, reported estimates of high damage. This was attributed, in part, to flooding occurring on the ground floor of establishments. This is typically where the location of capital-intensive public spaces, food and beverage outlets, kitchens and mechanical and electrical systems are located. Private damage was estimated by sub-sector, based on proportions of damage reported in Ayuthaya and applying a lower rate of damage reflective of less damage in the subject provinces.

Losses

In the past, disasters and crises in Thailand have led to tourism losses when travelers either do not travel or change travel patterns. Although there are opportunities with the current disaster for increased activity, (such as through displaced persons taking up residence in hotels and recovery experts seeking lodging for extended stays) the general conclusion is that the sector will lose more than it gains. Losses vary from province to province as an outcome of actual damage and the impact of declining traveler confidence. This is illustrated by the case of Phitsanulok, a province north of Bangkok affected by the current flooding.

[40] Please see the Cultural Heritage chapter for details

Phitsanulok: Consideration of Tourism Damage and Losses at the Provincial Level

While Thailand's tourism sector leverages every province's assets in response to both foreign and domestic traveler demand, the sector's most common images are foreigners visiting beaches and iconic cultural sites. However, the sector's economic prowess and widespread value is also driven by the popularity of travel among the Thai people. In 2010, 15.9 million foreign travelers visited Thailand generating THB 592.8 billion. For the same period, the Tourism Authority of Thailand reported a volume of 122.5 million Thai traveler visits generating THB 402.6 billion in revenue. Beyond travel to top sites such as Phuket and Chiang Mai, Thai travelers journey to lesser known provinces and have significant impact.

One case in point is the provincial area of Phitsanulok. Supporting a population of 863,208, Phitsanulok is located in the central region of Thailand, north of Bangkok and Ayuthaya. Approximately a six-hour drive or 1.5-hour flight from Bangkok, it offers important religious attractions such as Wat Phra Sri Rattana Mahathat and nature-based tourism offerings such as the Dragon Boat Races on the Nan river the first weekend of each October. Famous for its noodles and other local cuisine, the province has more than 100 full-service restaurants and 50 registered lodging establishments supplying an inventory of 5,000 rooms. Phitsanulok, which is not an internationally or regionally recognized destination, attracts over two million visitors a year. Of note, 95 percent of these visitors are Thai.

Accustomed to responding to annual flooding, this year's flooding was managed such that impact was limited to certain areas away from the city center. Reported damage includes both physical damage and losses leading to worker layoffs, and was initially valued at the relatively small amount of THB two million. However, this does not tell the whole story for Phitsanulok.

With its excellent river resource, Phitsanulok benefits from annual Longboat Festival Races. This event attracts 20,000 visitors a day for two days and generates over THB 20 million of economic impact. This year, the event was cancelled due to flooding in provinces south of Phitsanulok and a lack of traveler confidence by attendees from Bangkok and its environs. The cancellation negatively impacted the area's economics and spirit. Going forward, losses are accumulating. The province's primary "source market" of Bangkok and environs is blocked by floodwaters, from where typically 60 percent of Phitsanulok's Thai visitors come. Since these Thai tourists currently are not confident to travel – despite the fact that Phitsanulok is fully "open for business" – the area continues to suffer losses.

Source: Tourism Authority of Thailand and The Comptroller General's Department, Phitsanulok and field research, Department of Tourism, Ministry of Tourism and Sports, Ministry of Foreign Affairs and http://www.phitsanulok.go.th/PP3.html

Where operations have a high proportion of fixed costs, cash flow problems are likely in lodging, and food and beverage operations. Also, other businesses indirectly serving the tourism sector can be impacted. It is unclear at this point how large the impact on employment will be; much depends on how quickly the industry recovers. For employees that depend on service charges for the majority of their income, the financial impact of lower occupancies will be significant even if jobs are maintained. On the government side, tax revenues will also suffer.

Pockets of increased activity are noteworthy. For example, hotels in Bangkok reported higher than usual occupancy as Thai people, displaced by the floods, moved in at discounted rates. Ayuthaya hotels are experiencing increased activity as companies previously located in now flooded industrial estates set-up offices in hotels and other lodging facilities. In addition, lodging establishments in and proximate to flooded areas are serving as residences for reconstruction experts and laborers. While this low-margin

business is welcomed, it does not cover typical revenues or the loss of usual business activities such as special events, group business and banquets. Other losses in the tourism sector, such as foregone income of tour operators, tourist transport and other tourism related businesses as well as the lost income of workers in the sector due to drop off or stoppages of business, continue to accrue in some areas.

Previous disasters in specific areas of Thailand, such as the tsunami, have indirectly impacted tourism across the country. Similarly, with the widely publicized images of the flooding, the sector is suffering in destinations outside the affected areas. An estimation of THB 12 billion, in addition to the total losses estimated for the 26 subject provinces below, is combined for the total estimated losses of THB 94.9 billion, shown in Table 17.

Table 17: Tourism sector – Damage and losses by province in Thai baht, millions

Province	Damage	Losses
Ang Thong	54.5	34.7
Ayuthay	104.0	2,447.4
Bangkok	328.6	68,884.9
Chachoengsao	111.8	238.0
Chai Nat	100.5	38.7
Kalasin	65.7	64.6
Khon Kaen	545.6	1025.0
Lop Buri	270.0	411.1
Maha Sarakham	58.1	49.7
Nakhon Nayok	347.9	294.2
Nakhon Sawan	321.6	343.5
Nakhon Pathom	188.3	251.8
Nonthaburi	205.5	345.4
Pathum Thani	202.8	151.1
Phitsanulok	50.1	45.2
Phichit	437.6	729
Prachinburi	238.2	285.7
Roi Et	121.7	122.9
Samut Sakhon	81.6	57.5
Saraburi	249.3	484.7
Singburi	42.6	43.5
Si Sa Ket	64.5	205
Suphan Buri	263.8	216.5
Surin	134.9	206.4
Ubon Ratchathani	335.5	593.4
Uthai Thani	209.7	69.1
TOTAL	**5,134.4**	**77,639.0**

Reconstruction and Recovery Requirements

Fundamental to tourism sector reconstruction and recovery is coordinated public and private sector actions. Beyond repair of cultural heritage sites and transportation infrastructure (as noted in other chapters of this report), reconstruction in tourism is seen as primarily a private sector activity. Ability to quickly access funds for repairs will, in part, dictate the speed at which the sector returns to business-as-usual. While some businesses in the sector reported having insurance coverage for physical damage, it is not believed to be either prevalent or substantial in its coverage. In contrast, recovery

options mandate public and private sector efforts which build upon past experience and draw upon the experience of other destinations such as Japan and Australia.

Japan: Building Recovery Momentum

A fundamental aspect of crises is uncertain information. When credible information is not available, perceptions become the reality. For Japan, in the aftermath of its 9.0 magnitude earthquake on 11 March, 2011 and tsunami, news of the subsequent explosions at the Fukushima-Daiichi nuclear plant, triggered a more than 50 percent drop in arrivals over the following three months. While this was a serious human and natural disaster causing concern around the world, only five percent of the country's 6,892 islands are in the travel warning area. Since many of Japan's key destinations are outside of the affected region, critical tourism infrastructure was not damaged. Tokyo, one of the world's great cities for tourism and business, is 125 miles away from the Fukushima plant and is reported to be registering radiation levels similar to those typically found in New York City.

Overcoming the perception that Japan is unsafe and unhealthy for travelers is a continuing challenge. The Japanese government and the private sector have worked together in a cooperative manner to change the world's view and utilized some creative strategies that reflect the fundamentals of effective crisis recovery for tourism. Prior to the tsunami, Japan's tourism in 2011 was projected by the World Travel and Tourism Organization to generate a contribution of USD 120 billion to the country's GDP. In comparison, estimates for damage range as high as USD 300 billion.

Tourism's impact spreads far and wide in Japan. The sector's ability to generate income in rural and urban areas across islands contributes to the breadth and depth of its impact. Therefore, to be sure that all regions regained their tourism momentum, the Japan Tourism Authority has offered 10,000 free flights to attract tourists. While airfare is paid, tourists cover all of their vacation expenses seen to have important multiplier effects. Without the expense of airfare, tourists have more personal income to spend and are encouraged to travel throughout the country impacting all regions.

In addition to increased utilization of traditional and social media channels, the Travel Guide to Aid Japan released after this year's tsunami, features foreign celebrities' recommendations and testimonies of where to go, what to see and even what to eat in Japan. From fashion designers to prominent business people, personal recommendations urge travelers to return. Their comments are direct and honest including recognition of the tsunami. Such directness is a critical success factor to build traveler confidence and achieve expedient tourism recovery.

The Japan Tourism Authority has allocated USD 414.3 million, or 10 percent of its annual budget, for this effort to not only encourage travelers to Japan, but to do so in a manner that creates an immediate critical mass to achieve momentum vital to overcoming such a crisis. The momentum is building as visitor numbers begin to increase. And the recent independent selection of Kyoto as the best Asian City by travelers, through the Conde Nast Traveler's Readers' Choice awards, is one more testimony to the variety of tools which add momentum in the effort to return to pre-crisis levels.

Source: Merritt Gurley and the Pacific Asia Travel Association (2011)

Challenges to Reconstruction and Recovery

The damage and losses incurred by the tourism sector are basically private in nature except for the reported damage to government controlled or locally administered assets. The needs of the tourism sector coincide with the needs identified by other sectors, especially those involved in the rehabilitation of roads, restoration of water supply and electricity.

The recovery of the tourism sector will depend upon the expediency of the reconstruction of such facilities in addition to sector-specific assets. Tourists may be deterred from visiting provinces in the central region if the roads are seen to be rough, the water unsafe and electrical power unstable.

Although tourism-related businesses are private in ownership, they may need assistance from the government through extension of credit assistance for business recovery or the restructuring of debt repayments for those who have loans from government banks. In these cases, tax relief could be considered. Thailand has previous experience in these financial areas through utilizing of tools established in previous crises. However, the specific needs for credit or debt restructuring in the tourism sector are not determined or recommended in this paper. This will be subject to further analysis by the government.

Queensland, Australia: One Massive Flood with One Honest, Credible Voice

Five months of heavy rain from August 2010 set the stage for large-scale flooding in central Queensland, Australia in January 2011. Transportation networks were hit hard with more than 20,000 kilometers of roads flooded and 5,000 kilometers of rail tracks damaged. The news of Queensland's plight spread globally as the capital city of Brisbane was paralyzed with pervasive blackouts of electricity and crippled telecommunications grids.

Queensland, a large state in Australia's north, generates 20 percent of the country's economic activity including 28 percent of its fruit and vegetable production and 25 percent of Australia's total visitor nights. The rains and subsequent flooding, which garnered extensive media coverage, not only impacted transportation and lodging assets, but run-off water and sediment threatened the highly valued tourism asset of the Great Barrier Reef with cloudy waters and discoloration of coral. Overall, loss to tourism in just Queensland was estimated at AUD $50 million.

Successful recovery has proven to be a collaborative effort. A budget of AUD$12 million for post-flood tourism industry recovery was established with 50 percent of this contributed by the Australian federal government and 50 percent from the Queensland state government. About half of these funds were used for augmented marketing efforts. Funds were also used for various forms of travel industry support including assistance with repairs to travel industry related infrastructure, subsidies to affected tourism businesses and support for training. Private sector support further augmented this funding with both firm and destination-focused efforts.

Fundamental to achieving disaster response and recovery best practice in the tourism sector is speed and accuracy of information before, during and after a crisis. Filling this need for Australia's tourism sector was the Queensland Tourism Industry Council (QTIC), a private sector, membership-based, not-for-profit organization with over 3,000 members from all sectors and stakeholder groups. It became the focal point for all tourism industry updates and guidance. As a media voice for tourism, provider of information, disseminator of research findings and policy advocate, QTIC "does everything but marketing". This capacity enabled them to be uniquely able as a credible and singular voice for the sector during and after the crisis. With links to Australia's regional tourism organizations as well as 20 key sectoral associations, QTIC served the important role of an independent, credible and responsive voice for the tourism's public and private sector stakeholders.

While Queensland was able to return to pre-flood levels of visitor volume in about six months, "perception damage" to tourism beyond the state of Queensland stretched widely to impact both domestic and international demand in many regions not physically damaged by the flood. Globally recognized celebrities helped provide compelling images. For example, Oprah Winfrey's televised shows attracted attention to Queensland. The global broadcasts and internet messages enabled memorable images of Australia's tourism offerings – replacing those of the flooding – in a timely manner.

Recommendations for Reconstruction, Recovery and Resilience

The hidden opportunity in recovery efforts is "building-back-better" through decisive and forward- thinking actions by public and private sector leaders. Table 18 itemizes recovery and build-back-better actions recommended to enable the sector to recover. It also includes strategic actions to assure the sector will remain a leader in an increasingly competitive regional and global marketplace. Thailand's tourism sector is at a precarious point, susceptible to slipping from its current "value for money" status to a "cheap holiday" destination. Review of the "Amazing Thailand" positioning (initiated in 1997), support for the sector to offer new products for emerging and traditional markets, and a national commitment for alignment of vision with sustainable development is pressing – and key to building-back-better.

Table 18: Tourism sector – Recommended recovery and build-back-better actions

Recommended Recovery Actions	~6 mths	6-24 mths	Responsibility
Immediate Actions (Recovery): Estimated funding of THB 15.5 million			
Fast-as-possible cleanup of trash and debris	Utilize both volunteers and technical experts to do tourism-specific cleanup activities		Combined public and private sectors
Immediate and continuous information communication	• Support expanded TAT activities to improve capacity of crisis communication and emergency promotion • Prepare for possible future negative publicity (such as rumors of disease outbreaks and safety concerns)		Combined public and private sectors
Lift travel advisories	Utilize diplomatic channels to lift travel advisories		Public sector
Drop visa fees for leisure travelers for 12 months	Liberalize travel visa program and drop fees to further attract travelers	Continue to encourage travelers from specific markets through encouraging visa policies	Public sector
Longer-term Actions (recovery): Estimated funding of THB 60.0 million			
Encourage domestic travel	• Declare special holidays • Offer tax deduction programfor domestic travel		Public sector
Destination re-launch through mega event ("The World is our Guest") and augmented promotion to key foreign source markets (established and emerging)	• Review the effectiveness of previous special events/ campaigns • Return TAT and DOT budgets to pre-flood levels and augment funding to support international outreach and "back open for business" promotion activities	• Organize tourism sector nationally to implement a globally covered event • Showcase new products and build new image through renewed strategic positioning and alignment of marketing	Public and private sectors
Establish a crisis escrow account for rapid communication response to next crisis	• Define structure and trigger processes • Establish funding and build capacity for efficient launching at the start of the next crisis		Public sectors
Target festivals/events (CSR and groups) to improve Thai "traveler confidence"	Support communities recovering from the floods with special events and "celebration" days	Sponsor festivals and events to build destination identity and tourism product offerings	Public and private sectors

Recommended Recovery Actions	~6 mths	6-24 mths	Responsibility
Improve access to finance for registered tourism SMEs	Tourism sector assesses and prioritizes need for short-term access to finance for SMEs	Facilitation of access to finance on favorable terms for key tourism businesses by creating a guarantee facility managed through the Tourism Council in collaboration with TAT	Collaborative effort of the public and private sectors
Strengthen coordination of public and private sector collaboration	• Review bottlenecks and overlapping activities • Align resources with pressing needs	Streamline public sector organizational responsi-bilities to achieve clearer lines of responsibility and improved effectiveness	Public and private sectors
Define zoning policies to assure sustainable development	Review best practices for sustainable tourism zoning	Develop zoning guidelines; Enforce zoning in urban and rural areas to protect green areas and develop sustainably	Public sector with private sector participation
Actions for a Globally Competitive Sector (Build-Back-Better): Estimated funding of THB 40.0 million			
Improve infrastructure for access to tourism sites and facilities	As determined by local and national authorities		Public sector
Strengthen coordination of public and private sector collaboration	Use current cross ministerial task force to define policies enabling improved coordination between public and private sector	Implement policies enabling improved tourism sector such as expanded immigration services; streamlined taxation of the sector; support for SME innovation and growth	Public and private sectors
Improve statistical collection and research to align source market demand and new product development	Assess capacity in tourism data collection, dissemination and market research for domestic and foreign segments	Review brand positioning and re-launch to assure global competitiveness and sustainability of the sector	Public and private sectors
Support sector sustainability through "greening"	Continue current programs for "greening" of the tourism sector	• Increase awareness of sustainable development • Incentivize use of renewable energy sources and green technologies	Public and private sectors
Enhance access and establish additional global gateways within the country beyond Bangkok	Reduce landing fees and passenger airport tax	Expand access to Thailand with increased flights into other major airports (i.e. Chiang Mai and Phuket)	Public and private sectors
Expand capacity for crisis management with tax incentives for private sector participation	Build awareness of tourism crisis management	Expanded training and certification program for managers to be qualified in tourism crisis management and response	Public sector in conjunction with private sector

Policy Recommendations

Tourism throughout Thailand occurs at all levels — from individual communities to the provincial and regional levels. This strength (i.e., to reach all levels of the population) mandates increased awareness of the sector and its specific challenges in times of crisis. The uniqueness of the 2011 flooding (i.e., unfolding slowly and lasting over an extended and uncertain period of time) has revealed coordination gaps, information/data gaps as well as constraints on ability to forecast and predict accurately impacts on the sector. At a minimum, recommended policy implementation strategies[41] are the following:

- The existing provincial and local administrative structures suffer from lack of coordination within the public sector as well as with firms and associations in the private sector. Therefore, training and capacity building at the community, sub-district, district and provincial level for better disaster preparedness in the future is advised.

- Expanded public-private partnerships, including with the media, to strengthen coordination and collaboration is requisite for minimizing impacts and facilitating fast recovery of the sector in future disasters and crises.

- Review and updating of zoning, land use regulations and institutional mechanisms is advised to increase sustainable development that enables the sector to demonstrate best practice and improve competitiveness.

While Thailand's tourism sector has an admirable record for "bouncing back" from previous natural disasters and political crises, the challenges of recovery from the current flooding are particularly daunting. However, the combined commitment of the Thai people, their government and the private sector is a powerful force that can respond adeptly now and in the future to be the proud hosts of a globally competitive tourism sector.

[41] These are developed in parallel with overall UN recommendations as most recently noted in Thailand – Flood Situation Report No.12 (November 24, 2011) prepared by the United Nations Country Team in Thailand

Financial and Insurance Sector

Summary

It is noted that very little tangible data was available during the rapid assessment to determine losses and needs of the financial sector. Thus the figures in this report should be considered as indicative and preliminary. These figures have helped identify key issues for focus, but not the exact level of the problem. It is highly desirable that more exact figures be obtained in the months to come, and to this end, questionnaires that could not be meaningfully completed by large enough samples at this early stage are included in Annex 10.

The assessment determined that damage to banks, specialized financial institutions (SFIs), insurance and other companies appears to be minor in comparison to the assets of these sub-sectors. Also comforting is that the commercial banking sector has ample liquidity to not only absorb their portfolio and interest rate losses, but also to offer the necessary financing to creditworthy borrowers to counter the impact of the floods.

SFIs are a pressing issue in large part because they are being asked to fund research on the impact of this crisis on many of their clients, without being given the funds needed to do this up front. This further blurs the distinctions between banking and public financing. At the same time, some SFIs are increasingly competing with private banks, without being subject to the same conditions. This is important as it may erode the credit culture in many parts of the country and weaken some key SFIs. It is especially worrying as SFIs comprise around 25 percent of the banking system and yet are not supervised fully by the Bank of Thailand (BOT).

This report suggests that the financial sector is responsible for a total of approximately THB 1,357 billion in damage and losses to the economy. This can be compared to a figure for liquid assets [42] in the banking sector of THB 2,100 billion.[43] Regardless of the proportion of the damage and losses that the private sector will seek to finance through banks, this would suggest that the commercial banking sector (not including SFIs) would have more liquidity than necessary to finance reconstruction, meaning external funding would not be necessary. However, this does not take into consideration the banks' willingness to lend to many of those impacted by the floods.

Insurance is a very concerning issue, and the high level issues and possible solutions are discussed in the Disaster Risk Management chapter. This chapter, however, focuses on the impact on the financial sector. Despite the significant level of claims expected from these floods, it appears that around 95 percent of the claims are re-insured abroad. From this, one would expect that all insurance companies would be able to honor these claims. Nevertheless, some local insurance companies are expected to be heavily impacted, and the only local reinsurer, Thai RE, has already seen the value of its shares fall 43 percent.

[42] Defined by the BOT as: eligible securities, deposits with BOT and cash-at-hand. The eligible securities comprise Thai Government Securities, Bank of Thailand bonds and debt instruments guaranteed both principle and interest by the Ministry of Finance or FID.

[43] Taken from the BOT website, as of September 20, 2011. Of that figure, THB 1.5 trillion would be in the hands of Thai commercial banks.

Sub-sector/ Component	Disaster Impacts					Ownership		Recovery and Reconstruction Needs				
	Damage		Losses		Total	Public	Private		~6 mths	6-24 mths	> 24 mths	% govt.
Commercial Banking Sector	minimal		20,685	∞	20,685	10%	90%	∀	64,300	110,000	-	24%
SFIs	minimal		67,197	⌂	67,197	100%			58,812	75,430	48,870	100%
Leasing Companies	minimal		minimal		minimal		100%		TBD	TBD	TBD	100%
Credit Card Companies	minimal		2,514	₲	2,514		100%		1,257	1,257	-	0%
Village/Urban Funds	minimal		8,153	₴	8,153	59%	41%		34,000	-	-	0%
Cooperatives	943	Δ	7,587	₣	7,587		100%	ǂ	2,631	1,220	4,522	100%
Insurance Sector	minimal		9,140	Ω	9,140	0%	100%		9,140	-	-	0%
TOTAL	minimal		115,276		115,276			Ф	170,140	187,907	53,392	57%

Table 19: Financial sector – Damage, losses and needs in Thai baht, millions

Assumptions and Comments

∞	Taking BOT figure of loan portfolio (excluding loans to financial sector) as of September 2011 from BOT website; assuming 0.5% extra NPLs from floods (as per Association); assuming 56.7% of these NPLs are written off (as per Doing Business data); assuming 3 months of interest (at avg. 7% p.a.) is lost on remaining 43.3% of extra NPLs.
⌂	Taking BOT figure of total loans for Deposit Taking SFI as of September 2011 from BOT website; assuming 5% extra NPLs from floods for all SFIs except one large SFI which experiences low NPL ratio; assuming 0.5% extra NPLs (as per commercial banks); assuming 56.7% of these NPLs are written off; assuming 6 months (3 months for exception SFI) of interest (at avg. 7% p.a.) is lost on remaining 43.3% of extra NPLs.
₲	Taking BOT figure of Credit Card Loan Portfolio from BOT website, then deducting 80% as this is the proportion held by banks, according to BOT. No figures were available on the NPLs for this portfolio, but provisionally assume twice the NPL ratio that is used do for SFIs, i.e. 10% – this because credit cards are uncollateralized, and credit card companies' ability to follow up with clients is proportionally much weaker. As with the banks, it is expected that 56.7% of these extra NPLs will never be paid back, whilst the remaining 43.3% would be delinquent for 6 months on average, with the late interest being written off/forgiven. Assumed interest rate of 20%.
₴	Nationwide VF+UF+MF loan portfolio stated to be 80% of total assets of all VFs+UFs+MFs (THB 170 billion). Increased NPLs as a % of portfolio outstanding for the nationwide portfolio are assumed to be 10% (as they are not supervised, and follow-up tends to be less than with banks); other assumptions in terms of % of NPLs written off, and average duration of delinquency for the others, are the same as for SFIs; average interest rate taken to be 15%.
₣	Taking Cooperative Promotion Department's nationwide loan figure as of November 2011 of THB 759 billion; assuming 10% extra NPLs from floods (as per Village Funds) for all Co-ops except the main Savings Coop (loans of THB 666 billion), as this one has mainly salary loans, thus assuming 0.5% extra NPLs there; assuming 56.7% of these NPLs are written off; assuming 6 months of interest (at avg. 15% p.a.) is lost on remaining 43.3% of extra NPLs.
Δ	These are just the damage refunded by the Cooperative Promotion Department - the team had no figures for total damage.
∀	Note that this does not include any of the loans that will be required from commercial banks, and not facilitated by any government program, even though this will be a far larger figure. This is because it is impossible, with the data available, to calculate what the volume of such loans is likely to be.
ǂ	This only includes the government funding the team heard about. No amount is included for additional loans funded entirely from Cooperatives' existing capital/liquidity, as it was impossible to obtain such a figure. Also note that this amount includes THB 144 million for two programs to strengthen the MF sector overall, included here as Cooperatives are currently the largest group in that sector.

Ω	Taking the overall figure for insured losses as being THB 182.8 billion (bottom of the range, assuming all areas at risk get flooded); assuming that 5% of these losses will be absorbed by the insurance sector in country (the maximum stated by OIC) Note that this does not include any increase costs of insurance, even though costs for flood insurance clearly will be more expensive in 2012 and beyond - this is because it is impossible to say, at this early stage, how more expensive it will be.
ω	Also note that the recovery and reconstruction figure merely includes recovery of the amounts lost from claims that were not reinsured abroad. The much larger needs associated with establish the recommended catastrophe risk insurance pool are included in the DRM chapter.

Sector Context

As of Quarter 3 of 2011, bank loans, stock and bond markets contributed 89, 74 and 65 percent of GDP, respectively. In the Thai banking sector, the Bank Financial Institutions can be divided into two main categories: commercial banks and specialized financial institutions (SFIs), which are majority owned by the Government of Thailand. As of the end of September 2011, total assets of commercial banks is THB 12.8 trillion while the deposit taking SFIs have THB 3.8 trillion in assets. Despite being hard hit during the Asian Financial Crisis in 1997, all Thai commercial banks are well capitalized, resilient and well immunized to the recent crisis. At the end of September 2011, capital adequacy ratio (CAR), Tier 1 ratio, gross non-performing loan (NPL) and net NPL to total loan ratio for the whole commercial banking industry were 15.67, 11.81, 2.82 and 1.46 percent, respectively. In terms of the six banking SFIs, the CAR and NPL ratio as at the end of the financial year ending 2010 were 13.2 and 8.2 percent, respectively; with the Government Savings Bank (GSB) and Small and Medium Enterprises Development Bank of Thailand (SME Bank) in the respective outliner positions. On average, every Thai citizen maintains at least one deposit account with formal banking institutions, however access to finance remains a challenge in the lower end of society. Cooperatives and village funds were established to fill this gap and provide simple financial services to these underserved people. Similar to SFIs, the government also utilizes both cooperatives and village funds for policy lending purposes. As shown below, however, these institutions face serious challenges in trying to successfully ensure widespread access to microfinance.

Bank loans as a proportion of GDP used to be very high, but have come down in the last fifteen years, with stocks and bonds showing a healthy increase. In 1997, for example, the stock and bond market jointly equaled 36 percent of total GDP while bank loans represented 128 percent of GDP. The bond and insurance markets have grown particularly fast in the past decade. As of October 2011, the market capitalization of the Stock Exchange of Thailand (SET) was THB 7.9 trillion with average turnover value of THB 30 billion a day, while the bond market has THB 7 trillion worth of bonds outstanding with average outright turnover value of THB 74 billion a day.

Though the insurance market has doubled in size in the past few years (from THB 204 billion in 2003 to THB 489 billion in 2011), its outreach is still very limited. The insurance penetration rate or percentage of insurance premiums, to total GDP, was still only 4.67 percent in 2011. It is estimated that less than 1 percent of private dwellings are insured against natural disasters, and particularly floods.

Damage and Losses

Commercial Banking Sector

Damage to physical assets of the banking sector appears to have been minimal. The majority of the damage that has been incurred would, in any case, be insured. Although no precise data about the replacement cost of assets that have been irreparably damaged was available, nor of the costs of renovations and refurbishments, the banks, associations and regulators interviewed agreed that the magnitude of damage will be minimal compared to assets of the sector. This is in part because the vast majority of branch banks had sufficient time to get their expensive equipment, or the expensive part of immovable equipment (such as the electronics within ATMs), out of harm's way before the floods struck. Thus, even though 631 branches[44] (out of a total of 6,138 bank branches nationwide) had to be closed for some period of time[45] , and 493 ATMs were out of commission at some stage, the actual cost of damage is reportedly very small.[46]

In terms of losses incurred by the banking sector due to the closure of branches, as with the rest of the financial sector, the team was not able to collect enough data to estimate this with any confidence on a sector-wide scale.

It is clear that, by far the biggest losses suffered by the banking sector are bank loans that need to be restructured or temporarily given grace periods, and will, thus, generate less income and reduce liquidity. Additionally, losses will come from those loans that will never be repaid and will be outright losses.

For the private banking sector, third quarter forecasts by the Bank of Thailand indicated that total loans for the private banking sector stood at THB 9.4 trillion, or THB 7.2 trillion if loans to the financial sector are excluded. Once again, detailed data on losses from this portfolio were not available because planned interviews and surveys were suspended due to banks preoccupation in dealing with the impact of the floods.

The most important information obtained from the Thai Bankers' Association and from one of the largest banks in the country is that they estimated the increase in their non-performing loan ratio (i.e. loans with payments over 3 months late, as a proportion of total loans outstanding) due to the floods would be around 0.5 percent.[47] This reportedly held true both for that particular bank, and for the sector as a whole. They also admitted that these figures were a rough estimate, as many of their clients could still not reach their property to assess the true extent of the damage.

[44] As per discussion with a Senior Director at the Bank of Thailand.

[45] The proportion of branches that had to close was much lower for the four banks that we met who had this data, i.e. of the 2,183 branches that they jointly held, 107 (i.e. 4.9 percent) had closed at some stage. In the case of one of them, only one of 80 branches had significant damage to report.

[46] As per discussion with representatives of the Thai Bankers' Association.

[47] This is after offering grace periods of up to 6 months, and restructuring loans as needed, both allowed by the BOT for flood-impacted borrowers (see table below).

These figures were extrapolated to show that total increase in NPLs due to the floods could be around THB 21 billion. Such a low figure is explained by the fact that a large proportion of the damage was considered to be in the industrial estates, and that the vast majority of the assets of these companies were insured for floods. In terms of consumer loans, these are mostly accorded to individuals with reliable salaries, and few of these salaries are expected to go unpaid as a result of the floods.[48]

Another reason why this estimate is so low is that banks are willing to restructure loans for borrowers in affected areas who can realistically still be deemed viable borrowers. Furthermore, after only one repayment following such restructuring, such loans can be considered current. Finally, banks, both private and SFIs, intended to offer additional loans to any client affected by the floods that has a good repayment track record. All these factors mean that the forecasted average duration of the delinquency of NPLs is expected to be relatively short, at 3 months.

However, the flip side of most of the viable borrowers being able to quickly escape NPL status, is that of the loans that do not manage to escape NPL status, a significant proportion are likely to fail entirely. In this respect, the Doing Business Resolving Insolvency Loss ratio of 56.7 percent was applied in this estimation.[49]

Therefore, by using the stated average interest rate of 7 percent, these assumptions result in an estimated loss for commercial banks of THB 20.7 billion.

Specialized Financial Institutions (SFIs)

SFIs, of which there are eight[50] , are financial institutions owned by the government and with specific (though not always exclusively adhered to) development mandates. Damage to physical assets of SFIs is reportedly also minimal compared to the size of the sector.

Estimates of losses to SFIs are of the order of THB 67 billion (though it must again be underlined that these figures are merely indicative). It would appear that the BAAC and SME Bank[51] would be particularly badly hit, as micro, small and medium enterprises (MSMEs) (including farmers) are expected to have the most trouble repaying their loans, and they

[48] Of the THB 7.2 trillion in total loans by the private banking sector, the BOT tells us that roughly 35 percent are to large corporates, 35 percent to SMEs, and 30 percent to consumers/individuals (any lending to microfinance by the private banks is disguised as consumer finance)

[49] See: http://www.doingbusiness.org/data/exploreeconomies/thailand#resolving-insolvency. Note that this applies to cases where a borrower is clearly insolvent, which would normally be pessimistic for an entire NPL portfolio. However, in this case, given the many options for any even vaguely viable borrower to escape NPL status, it seems wise and objective to use this ratio.

[50] In order of asset size: Government Savings Bank (GSB); Bank of Agriculture and Agricultural Cooperatives (BAAC); Government Housing Bank (GHB); Export Import Bank of Thailand (EXIM Bank); Small and Medium Enterprise Development Bank (SME Bank); Islamic Bank; Thai Credit Guarantee Corporation (TCGC, formerly Small Business Credit Guarantee Corporation); Secondary Mortgage Corporation (SMC).

[51] BAAC's function is to provide loans at low interest rates directly to farmers, and through agricultural cooperatives and farmers' associations. BAAC has assets of THB 899 billion, total loans of THB 577 billion, official NPL ratio as of March 31, 2011 of 6.57 percent; however, the World Bank believes that the true level was closer to 23 percent before the floods. With an additional 5 percent of NPLs, total NPLs would thus come up to THB 159 billion. SME Bank's mandate is to promote SMEs through the provision of loans, guarantees, venture capital, counseling etc. SME Bank has assets of THB 94 billion, total loans of THB 81 billion, official NPL ratio as of March 31, 2011 of 20.46 percent. With an additional 5 percent of NPLs, total (official) NPLs would thus come up to THB 21.8 billion.

are the main borrowers of these two institutions. Based on meetings with these two banks, additional NPLs due to floods are estimated at around 5 percent of the total portfolio. This ratio was applied for the overall portfolio of SFIs, with one exception – it was important to distinguish between one SFI, which could demonstrate the basis for its low forecasted increase in NPLs[52] , and the others.

For the proportion of NPLs that are total losses, and for average interest rates, the assumptions used were the same as for commercial banks. The only difference is in average duration of the delinquency, where calculations used the same three months for the SFI with the lower risk profile, but six months for the others, as their clients were more likely to have lost revenue generating ability for a longer period, and/or lost value of their real estate such that repayment ability was lowered.

The estimated losses for SFIs thus amounted to THB 67.2 billion.

Microfinance Institutions

For village funds and cooperatives, there was too little information to assess damage. Data was gathered from 17 Village Funds, all of which reported damage to their physical assets equaling 2 percent of their assets. It is hard to determine how representative this sample is; however, there is no reason to think that damage to these financial institutions is unbearably high.

Despite being outside the focus of the banking sector, microfinance is far larger than all other non-bank finance institutions combined (insurance aside). The largest player in microfinance in Thailand is the much-maligned cooperative sector. According to the Cooperative Promotion Agency, the total portfolio of the cooperative sector is THB 759 billion. To assess the losses to cooperatives, the Cooperative Savings Bank is treated separately from the rest of the cooperative sector. As the Cooperative Savings Bank has a different risk profile, given it is more focused on (usually salary-linked) consumer/individual lending, it was assumed that the increase in its NPL ratio would be only 0.05 percent, the same assumption as for the large SFI that has a similar portfolio. For the rest of the cooperative sector, a 10 percent increase in NPLs was assumed, i.e. double the rate for SFIs. This is based on the fact that cooperatives are not regulated and do not tend to follow-up on late loans like banks do. The assumed interest rate for this sector is 15 percent. The resulting estimated losses for the cooperative sector come to THB 7.6 billion.

The village fund sector is also significant. There are around 80,000 village funds in the country (including the 3,528 urban funds (UFs) and the 738 military funds (MFs)), with total assets of around THB 170 billion. Their total portfolio is estimated at THB 136 billion (it is noted, however, that the National Village Fund does not have precise figures, as reporting is incomplete). To be consistent with the cooperative sub-sector, using the nationwide portfolio as a base, a 10 percent increase in NPL ratio due to the effect of the floods is assumed, and the stated average interest rate of 15 percent was used. Losses for village funds (and other funds) are estimated at THB 8.2 billion.

[52] We used an assumed additional NPL ratio of 0.05 percent, in line with commercial banks, even though the management of this SFI was arguing quite convincingly that it could be closer to 0.02 percent.

There are also numerous NGO microfinance institutions, but they appear to be very fragmented and on average very small, and have not been included in this assessment.

Non-Bank Finance Companies

At the time of writing, the leasing sector was not very developed, particularly if vehicle leasing and hire purchase are excluded. For example, there are only 16 members in the Thailand Leasing Association, with total assets of around THB 100 billion, and only half of those are involved in industrial leasing. Though banks are beginning to get involved in leasing, not least because joint ventures are now subject to stricter related lending limits, even within banks this is still a nascent business sector.[53] As with the other sub-sectors, very low assessments of damage to the physical assets of leasing companies were reported.[54]

As an example of the scale of possible losses, one leasing company with assets representing around 10 percent of the industry had a total of 80 clients affected by the floods, with a total of THB 1.5 billion outstanding, but most of these clients were well-insured.

Data for vehicle leasing was not available although it would appear that such vehicles would be well-insured, and therefore losses for this product would also not be significant.[55]

Credit card companies also represent a tiny fraction of the financial sector. According to BOT figures, total credit card debt amounts to THB 206 billion. Of that amount, banks hold 80 percent, and this amount is already counted under total bank loans. Of the remaining THB 41.2 billion, a rate of additional NPLs that is twice that of SFIs is assumed, i.e. 10 percent, given that (a) there is no collateral involved, and (b) credit card companies' clients tend to be the less obviously creditworthy ones, who may well have tried but failed to get bank credit cards. Write-offs and lost interest are then calculated as with SFIs, except for an assumed interest rate of 20 percent.

Stock and Bond Markets

Damage to the stock and bond markets, and associated traders, are negligible. The impact of the floods on the stock market appears to be temporary and reversible. Although the Stock Exchange of Thailand (SET) index and trading volumes have reduced since July, this is likely more to do with international events than with the floods. For example, the SET index was down 13.2 percent by end of October, compared to end of July – but this is about the same as Hang Seng's 13.8 percent or Nikkei 225's 13.1 percent for the same period.[56] In terms of average monthly trade volume, the SET was down 19.8 percent in October compared to July, but this compared favorably to the Kuala Lumpur Stock Exchange's 44 percent drop or to the Hang Seng's 22.6 percent drop.[57]

[53] As per discussion with the Chairman of the Thailand Leasing Association
[54] As per discussion with the Chairman of the Thailand Leasing Association
[55] This assumption is subject to verification
[56] Though Kuala Lumpur Stock Exchange was an outlier with only a 4.9% drop for the same period
[57] No figures found for trading volumes for the Nikkei 225.

The bond market[58] became more active in August and September (the latter being more than 30 percent higher in terms of trade volume than July), and although October was down by 3 percent compared to July, the yields on all tenors were down compared to September, suggesting that the markets were relieved that both the floods and the political situation were under control.

Insurance Companies

For the insurance sector, there are a limited numbers of branches which are, on average, far smaller and less expensively equipped than banks. Not surprisingly, there was no significant damage reported for the insurance sector either.

As the floods were ongoing at the time of writing, with the potential for the overall situation to get worse, any estimation of the property and business interruption insured losses is premature. Loss assessors could not access most of the damaged properties. However, in the context of the early rapid assessment, some calculations relying on expert judgment can be conducted to derive the preliminary estimated insured losses. Those preliminary estimates build on (i) the total sum insured as reported in the insurance policies and (ii) assumptions on the damage ratio for similar events in other countries.

Total sum insured (TSI) of the property insurance policies for (i) industrial estates and (ii) households and SMEs properties (including automobile) have been provided by the Office of the Insurance Commissioner (OIC) of Thailand. Property insurance policies underwritten by firms located in the industrial estates usually cover both the building and the content (e.g. expensive machinery) and include a guarantee against natural disasters including floods. Some firms have also purchased business interruption insurance. Property insurance policies underwritten by households and SMEs are usually limited to fire insurance, but it is estimated that about 10 percent of them also include an extension of guarantee against floods.

It is estimated that these catastrophic floods will cause a damage ratio between 20 and 30 percent: preliminary insured loss estimates are between 20 and 30 percent of the TSI. Assuming that the floods will cause business interruption of 3–6 months, those firms that also have business interruption insurance will be compensated for 3–6 months (out of 12 months) of their TSI associated with business interruption. Lower and higher estimates of insured losses are derived as follows: lower estimate assumes that the damage ratio is 20 percent and the business interruption is 3 months; higher estimate assumes that the damage ratio is 30 percent and the business interruption is 6 months.

Based on the above, Table 20 gives preliminary insured loss estimates under two scenarios: (i) areas already flooded, and (ii) areas already flooded and areas at risk of getting flooded.

If the flooded area does not expand further, preliminary insured loss estimates are between THB 109.9 and 165.7 billion, where the vast majority (85 percent) of the insured losses are from damage on the industrial estates.

[58] Where government bonds usually represent 99 percent of traded volume.

If the floods also affect the areas currently at risk, the preliminary loss estimates are between THB 182.8 and 275.1 billion, where the insured losses in the industrial estates represent 75 percent of the total insured losses.

Table 20: Preliminary insured loss estimates

	TSI (THB billion)	Lower estimate (THB billion)	Higher estimate (THB billion)	Lower estimate (USD million)	Higher estimate (USD million)
Scenario 1. Areas already flooded					
Industrial estate	464.0	93.2	140.6	3,105	4,688
Households and SMEs	83.5	16.7	25.1	557	835
TOTAL	547.5	109.9	165.7	3,662	5,523
Scenario 2. Areas already flooded and areas at risk being flooded					
Industrial estate	696.1	139.6	210.3	4,653	7,009
Households and SMEs	216.2	43.2	64.9	1,441	2,162
TOTAL	912.3	182.8	275.1	6,094	9,171

Industrial estate: insurance coverage includes property and business interruption.
Households and SME: insurance coverage includes property only.

For the overall Damage and Loss table, a total claims figure of THB 182.8 billion was assumed, i.e. the more optimistic end of the more pessimistic scenario (i.e. all areas at risk of being flooded).

Only that share of insurance claim 'losses' that were not reinsured outside the country was included in the calculations. The OIC's estimation is that no more than 5 percent of this risk has remained in-country[59] , which results in an estimated insurance sector loss of THB 9.1 billion.

It should be noted that all of these estimated losses for the financial sector should be considered as additional to the loss in GDP resulting from the floods. Despite the fact the damage to property and income of the borrowers will also be reported in other sections, these reductions in the profits of banks and insurance companies are not reflected elsewhere.

Recovery and Reconstruction Requirements

Clearly, as with any natural disaster, it is vital that the financial sector be in a position to finance any creditworthy client that needs financing to counter the impact of these floods. The commercial banking sector, given its strong profitability pre-floods, appears in a good position to do this for its existing clients. However, it does not seem that the necessary measures are in place to pull private banks out of their usual comfort zones, and finance many flood victims that were previously not already considered to be profitable clients.

The RTG expects SFIs to carry a great burden to support the victims of these floods, but the measures proposed so far are not optimally targeted. More importantly, they may be both mortgaging the financial solidity of SFIs, whilst simultaneously damaging commercial banks through unfair competition.

[59] Note that some representatives of private insurance companies believe that the real figure is much higher, but also that it is immeasurable, as this data is not kept. Nevertheless, they believe a significant proportion of the risk sold to foreign reinsurers is then reinsured again back in Thailand. However, there was no firm data to support this position.

Microfinance, including micro-agricultural finance, is a sector that has particularly high needs in comparison to the small (and uncertain) levels of funding usually available. This is a sector that merits particular attention.

Leasing companies and credit card companies will have their roles to play in the recovery, but they will be relatively small, and there is no government subsidy that would be justified here.

The most important part of the financial sector, in terms of ensuring resilience and that future financing is not impeded, is the insurance sector. To avoid excessive increases in the cost of catastrophe insurance, it is recommended that the government seriously study and prepare for the establishment of a catastrophe insurance pool. Further discussion and costing is included in the Disaster Risk Management chapter, whilst in this chapter we will only look at the needs of the private insurance companies in order for them to return to a pre-flood situation, leaving aside the issue of the catastrophe insurance pool.

Sector Context

Banking and Related Sectors

Both commercial banks and SFIs are already very busy trying to estimate the losses to their borrowers, and trying to ensure that any viable borrowers are helped to get back to productivity as soon as possible. Hundreds of thousands of clients are being contacted, being informed of the moratoria[60] on their loan payments where applicable and that they should borrow from banks rather than loan sharks (when applicable).

The Bank of Thailand appears to have been very active in trying to minimize the impact of the floods on its banks, without encouraging needless risk-taking. For example, during the worst of the crisis, the Central Bank held videoconferences with all of the major banks to review the flood situation as it impacted the financial sector.[61] Similarly, the Ministry of Finance has taken dynamic measures. The next section will discuss how some of these might be altered to increase impact or reduce potential damage to the private banking sector.

Below is a list of all the government measures designed to lessen the impact of the floods on impacted clients (or future clients) of the financial sector that the team is aware of. This list of measures alone amounts to a potential cost to the government of THB 234 billion, with parallel private sector contributions of up to THB 131 billion (not including commercial banks' independently funded new loans to flood victims).

[60] Commercial banks can, at their discretion, offer flood victims grace periods of whatever duration they see fit, without changing their provisioning status. However, the Thai Bankers' Association recommends that these grace periods be no longer than 12 months.

[61] "BOT, Banks ready with back-up plans", The Nation, October 27, 2011.

Table 21: Government measures in the finance sector

Government Measure	Status	Details
3-year loan suspension on small loans from 6 SFIs	Any loan to a borrower who has a total of loans (all FIs included) of under THB 500,000, and who has been impacted by the flood, is granted a grace period (on both principal and interest payments) of three years. This applies to borrowers of BAAC, GSB, GHB, SME Bank, Islamic Bank, and Secondary Mortgage Corporation. Reportedly, the potential portfolio involved is THB 90.5 billion, of which write-offs of 50% after such a long grace period, plus interest subsidies (at 4%) of THB 10.9 billion were assumed. Thus cost to the government for this intervention is assumed to be: Short-Term (S-T): 1.8 billion; Medium-Term (M-T): 5.4 billion; Long-Term (L-T): 48.8 billion.[62]	Approved by Cabinet
3-year loan suspension on agricultural loans from cooperatives	All Cooperative loans to farmers are subject to the same three-year grace period as BAAC. The Cooperative Promotion Department estimates that it will have THB 7 billion of loans eligible (of which, again, the team assumes 50% will not ever repay), requiring interest rate subsidies to cooperatives of THB 2.5 billion, plus loss to the Cooperatives of 3.5 billion: (S-T: 0.6 billion; M-T: 1.0 billion; L-T: 4.4 billion)	Passed by Cabinet, now in effect
New loans and grants for flood-affected cooperative members	The Cooperative Promotion Department approved THB 0.1 billion in new loans to flood-affected members for 2011, and expects to approve another THB 0.2 billion in such loans for 2012. This is on top of THB 0.9 billion in grants to replace damage of cooperatives, and THB 1.0 billion in grants to affected members (THB 5,000 each). (In total, S-T: 2.0 billion, M-T: 0.2 billion)	THB 2.0 billion already approved, THB 0.2 billion pending
New loans to flood victims of SME Bank	Up to THB 2 billion of new loans by SME bank will be fully guaranteed by the government, i.e. any losses will be reimbursed.[63] Loans can be up to THB 1 million each with a fixed rate of 6 percent per annum, for a period of six years and with a 2-year grace period. A separate Public Sector Service Account was set up for this program. Full THB 2.0 billion expected to be spent in the first six months.	Approved by Cabinet
Low-interest loans for impacted farmers through BAAC	Loans amounting to up THB 60 billion being offered through BAAC (BAAC did not know how much interest rate subsidy they would get, nor when they would be paid for this[64]). Farmers would also receive free seeds/breeding stock, and veterinarian help. (S-T: THB 20 billion; M-T: THB 40 billion)	Approved by Cabinet
Loans for flood-impacted large companies from GSB	THB 15 billion in loans to be made available to large enterprises impacted by the floods, for rehabilitation of their business facilities and development of flood prevention measures. No information on loan parameters. Funds to be fronted by GSB, unclear if would be refunded by MOF. (S-T: THB 10 billion; M-T: THB 5 billion)	Approved by Cabinet
Retail loans to be made available through GSB	THB 20 billion of new retail loans to be available to flood-victims through GSB. No other details available. Assuming GSB will have to front the funds, unclear if/when these would be refunded by MOF (S-T: THB 10 billion, M-T: THB 10 billion)	Approved by Cabinet
Housing loans for flood-impacted borrowers, via GHB and GSB	THB 30 billion of new housing loans for flood victims reportedly to made available, through GHB and GSB. Funds not fronted by MOF. No further details available (S-T: THB 15 billion, M-T: THB 15 billion)	Approved by Cabinet
Loans by private banks to SSF members or companies	For up to THB 10 billion in loans, the Social Security Funds (SSFs) deposits funds with commercial banks, once the loan has been approved on both sides. Only SSF-listed companies (1 million maximum) and SSF members (THB 50,000) are eligible. Conditions unknown, but take-up is very slow.[65]	Already implemented

[62] As per "Debt relief for farmers, small borrowers", The Nation, November 16, 2011. Other reports suggest that the government believes this measure will cost under THB 11 billion, this figure only reflects the cost of reimbursement of lost interest – it assumes 0% write-offs.
[63] According to representatives of SME Bank.
[64] Indeed, it seemed that BAAC would have to raise savings to pay for these loans, inciting them to offer higher interest deposits (up to 4 percent per annual) – as per "BAAC offers high-interest deposits", The Nation, November 2,2011, and as per meeting with senior managers at BAAC.
[65] We are told that only a few million have been disbursed so far. Applications only accepted until April 2012.

Government Measure	Status	Details
Loan guarantee for private bank loans to SMEs impacted by the floods	Up to THB 100 billion in new commercial bank loans to flood-impacted SMEs will be guaranteed by the Thai Credit Guarantee Corporation (formerly SBCGC). These loans have an interest rate cap of 3 percent for the first three years. NPLs on these loans do not need to be provisioned for the guaranteed part (proportion guaranteed increased gradually, 7 percent by end of year 1 to 30 percent by year seven, maximum duration of the guarantee). The guarantee is free for the first three years – but the government will reimburse TCGC for the lost fees (of 1.75 percent) for those three years. The maximum cost to the TCGC is reportedly THB 23 billion.	Approved by Cabinet
Soft SME loans for flood victims, offered via commercial banks	THB 20 billion being made available from GSB to commercial banks for loans to SMEs impacted by the floods. Cost of funds 0.01 percent, but must be matched 50:50 with private bank's funds (i.e. total of 40 billion in new loans). Three percent interest cap for first three years of the loan. NPLs must be provisioned for normally.[66]	Approved by Cabinet
Ability of all banks to restructure loans to flood victims, and rapidly re-classify as current	All banks may restructure loans to viable, flood-impacted borrowers. These restructured borrowers can be taken off the NPL list after merely one payment under the new schedule, as opposed to three payments previously. Unclear if there are tenors limits. Possible cost, if all the 0.5% of total loan portfolio loses six months of 7% interest rate, would be THB 1.3 billion, borne by the private banks.	Already put in place by BOT
Decrease in maximum loan to value postponed	The BOT has postponed a planned measure to reduce the maximum loan to value in effect for mortgages. Unclear what the impact will be.	Already put in place by BOT
Minimum credit card payments waived	The usual minimum payment of 10% of credit card balances has temporarily been waived, in order to help the cash flow of flood victims. This measure expires in June 2012.	Measure in place
Fees waived on inter-provincial ATM transactions	Banks were told to waive their fees on inter-provincial ATM transactions, but only for the period from November 4–30, 2011. Unclear what the cost to the banks of this measure will be.	Measure in place

Insurance Sector

The insurance sector will have financing needs to return to their pre-flood position. As noted in the previous section, losses to the insurance sector are estimated to be around THB 9 billion, after reimbursement from re-insurance companies, and assuming that the OIC is correct when stating that around 95 percent of claims for these floods were reinsured abroad.

Given the size and scope of this catastrophic event and the number of policyholders affected, the loss adjustment and the claims handling will require a large number of loss adjusters and insurance experts, beyond the apparent capacity of the domestic insurance market. Japanese reinsurers, who reinsure many of the firms located in the industrial estates, have already sent Japanese loss assessors. In addition, it is understood that the domestic insurance companies have agreed to conduct joint loss assessment; a loss assessor sent in a given area will assess the damage of all insured properties located in this area on behalf of all the insurance companies.

[66] There was a report that soft loans to SMEs are hard to obtain, due to too many requirements, including in terms of collateral – as per "Red Tape Cut Urged for Recovery", Bangkok Post, October 27, 2011.

Challenges to Recovery and Reconstruction

Banking and Related Sectors

The Ministry of Finance and the Bank of Thailand should be commended for their rapid and decisive actions aimed at minimizing the impact of flood-related losses and maximizing access to new financing when needed. This is particularly important given that so many of the worst-affected flood victims would not normally have access to formal finance, and this would add to the tensions linked with perception that the rich in the Central Business District have escaped the flooding, whilst much of the poor population have not.

The main concern in relation to these measures, putting aside the disaster risk issues covered in the DRM chapter, is with the design of some of the interventions to give debt relief to SFI clients, and to try to facilitate new loans through commercial banks. This is despite the commendable steps that the MOF has already taken to encourage SFIs to respond more concretely to BOT recommendations, and to stick more closely to their stated mandates.

In terms of the government measures that are focused on SFIs, it appears clear that SFIs' liquidity and capital ratio will be severely and negatively impacted,[67] as the monetary volumes involved are very large, yet the ability of the government to provide the funds to the SFIs up front is very questionable. Thus, the lion's share (THB 183 billion) of what the team estimates to potentially be over THB 240 billion in government-mandated spending (or loss absorption) related to the financial sector will be bank-rolled, for an undetermined period of time, by the SFIs.[68] These interventions will also focus a greater proportion of SFIs' activities to policy lending or grant-giving, which will make it increasingly difficult to separately understand and assess SFIs true banking activities from its government subsidy distribution role.[69] SFIs will be even further than before from a position where they could be supervised and judged on an equal footing as commercial banks, as recommended in the 2011 Modular Financial Sector Assessment Program, which focuses on SFIs. Finally, the advantages granted to SFIs which have not also been offered to commercial loans, most notably the three-year grace period for all flood-impacted borrowers, further undermines the competitiveness of commercial banks, as borrowers will be tempted to move their borrowing to SFIs in the hope of getting a suspension on their loan repayments next time there is a disaster. All these issues had been raised as concerns at the time of the last Modular Financial Sector Assessment Program, but they are now more worrisome than before.

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[67] The Modular FSAP (2011) on SFIs noted that "The government has responded to the credit contraction from commercial banks in the first half of 2009 with an increase in the lending target of the SFIs, from THB 625 billion to THB 927 billion, and by introducing a Portfolio Loan Guarantee Scheme to help offset credit risks carried by lenders. In order to implement these facilities in a timely manner, the government approved a capital increase of THB 14.5 billion for the SFIs in the financial year ended 2009 and THB 6 billion in financial year ended 2010". Nevertheless, SFIs such as the SME Bank are under the minimum CAR, others maintain significant account receivable pending government reimbursement. This situation also worsens the situation outlined in the modular FSAP where "holdings of MOF in the financial services industry far exceed that required for purposes of overcoming market gaps and promoting market development".

[68] The best example of SFIs being short on capital because they have not been reimbursed for past spending on government programs is BAAC. In 2009, it had (around THB 130 billion in accounts receivable and overdue from the Ministry of Finance, and off balance sheet, the World Bank's assessment was that there was around another THB 50 billion overdue from the government.

[69] E.g. the Modular FSAP mentions "Some of the advantages include tax breaks, and differences in treatment and standards are with regards to supervision, governance, and accounting. This creates an unlevel playing field and may enable the SFIs to crowd out or deter commercial banks from entering certain market segments." Another point of contention is GSB and BAAC being allowed, and no other banks, to offer a lottery scheme as part of some of their deposit products.

Aside from the impact of the proposed measures on the structure/capital adequacy/competitiveness of SFIs, it would also appear that the measures as currently designed might not have optimal impact. This needs to be looked at thoroughly and over more time than has been available for this rapid assessment, but some initial thoughts on what could be improved are included in the next section.

The assessment did not uncover any current government schemes specifically focused on microfinance. There was mention in the press of a THB 90 billion package (as a subcomponent of the THB 325 billion funding package) to fund micro-entrepreneurs, but this was never corroborated in any meetings or other research.

The ability of the government, including the National Village Fund or the Cooperative Promotion Department, to determine the needs of its members, appears to be woefully inadequate. A lack of reasonable management information systems, insufficient computerization, and apparent disconnect between the central office and the actual MFIs mean that degree of need is unknown.

Another challenge linked with this sector is the reputation that cooperatives and village funds are not distributing funds equally, but rather to those who are close to the heads of villages or of cooperatives.

Insurance Sector

This catastrophic event may lead the international reinsurance market to reconsider Thailand as a high-risk country subject to catastrophe risks for the reinsurance season starting January 1, 2012. This would imply limited reinsurance capacity, and/or lower coverage limits and/or higher reinsurance premium rates. The capacity of the government of Thailand to manage major floods so that the international reinsurance market does not think that such an event can happen again or at least too frequently is critical to restoring confidence of the reinsurance market.

According to the OIC, the vast majority (95 percent) of 2011 flood-related property catastrophe risk insurance business underwritten by the domestic insurers is reinsured. This means that the net retention of the domestic insurers should not exceed THB 15 billion. (In fact, it is estimated that it will be closer to THB 9.1 billion, as per the previous section.) The domestic insurers should then be able to pay their claims in full, although some of the smaller insurers may see their capital significantly depleted and thus may face the problems of capital adequacy.[70] Thai RE[71] is the only reinsurer in the country, and 5 percent of all insurance policies in Thailand must be reinsured by Thai RE. It was not possible to uncover what proportion of this risk is then re-reinsured abroad, but it is a worrying sign that between August and November 2011, Thai RE's share price tumbled from THB 7.0 to 3.9 per share. What the team heard, though, is not that Thai RE would not honor claims, but rather that it would very possibly need additional capital to stay above minimum CAR

[70] According to representatives of the Thailand Reinsurance Brokers' Council. It was not possible to get any estimates of the assets of these companies, nor of the level of funding they would need to remain above the minimum capital adequacy ratio.
[71] Thai RE is a publically traded company that is 30 percent owned by Thai insurance companies.

levels, and this may be problematic as many of its shareholders' liquidity will be challenged by their flood-related pay-outs.

In order to be able to sell similar volumes of policies in 2012, most of these insurance companies will have to find a way to raise the same amount of funding as they lost during these floods.[72] As a result, it is assumed that the recovery costs for the insurance sector are the same as their losses, i.e. THB 9.1 billion. Note that this does not include the costs for the recommended catastrophe insurance pool, as this is included in the Disaster Risk Management section.

Recommendations for Resilient Recovery and Reconstruction

Strategy for Short-term Recovery (up to 6 months)

There are two main recommendations for the first six months following the end of the flooding: (a) to split out all subsidized assistance programs from other SFI lending, and (b) to revisit the design of existing government initiatives to finance flood victims or flood proofing.

As mentioned above, an issue that continually comes up when the World Bank analyzes Thailand's financial sector is the high proportion of this sector (e.g. 25 percent of total assets) taken up by SFIs, and the ability of SFIs to, in some instances, compete directly with commercial banks, whilst at the same time not having the same standards required of them.[73]

It is clear and understandable that after a disaster such as this, helping the population and private sector to cope with the impact of the flooding is a perfectly justifiable addition to the mandate of SFIs. However, it should not detract from the desirability of fully segregating SFIs subsidized or policy lending/grant allocating, from their normal banking activities, as only in this way can their performance and the safety of their deposits be determined.

In order to do this, it is recommended that any of the government measures listed in Table 20, if they are to proceed, be funded up front, in separate Public Service Accounts, even if this means a need for further borrowing. This will not only make SFIs' banking activities more transparent, but will also help the government to assess more precisely the cost and progress of their grant or subsidized lending schemes.[74]

[72] In fact, reinsurance is expected to be more expensive next year due to the losses caused by the 2011 floods, but (a) these would be borne by the end client, and (b) in any case, at this stage it is impossible to know how much more expensive this reinsurance will be.
[73] See special conditions listed in footnote no. 69
[74] THB 2 million is included in the needs budget for MOF to hire an international finance specialist to assist with this exercise. The cost of the actual measures proposed, as well as we understand them, are already included in the needs table. The only other costs would be administrative restructuring, and perhaps hiring staff for the new agencies, if ever it is determined that there is not spare capacity in SFIs to provide these staffing resources. Note also that pre-flooding government initiatives that still owe money to SFIs are not included in this assessment.

Suggestions for short-term measures are summarized as follows (see details in Table 22):

- Conduct more visible marketing and a knowledge dissemination campaign, so the public is better aware of the financing/debt relief options to them. The low up-take on programs such as the soft loans for SSF members is partly being blamed on lack of awareness. Note that this measure should take place after the issues below have been explored and addressed;
- Three years debt suspension for six SFIs borrowers of under THB 500,000: this appears to be a very long grace period, and most importantly, that is available to any small borrowers in flooded areas. Previously, some of the debt relief schemes were to be limited to those borrowers who could demonstrate that they lost more than 50 percent of their productive assets – this would be sensible in this case also. Different grace periods, depending on industry, would also be sensible. Finally, an interest grace period (even if restructured and lower) of only one year would also help to ensure borrowers remain used to making payments;
- Same recommendation as above for the 3 year debt suspension for cooperative loans;
- Little information on microfinance was available beyond a THB 90 billion soft loan program that was mentioned in the press on October 26, 2011. However, the lack of further mention may mean that it has been dropped. Rather than disburse THB 90 billion to micro-entrepreneurs, it is recommended that the government explores the possibility of using it as a guarantee to catalyze private banks' wholesale funding of MFIs who can demonstrate good governance;
- Low interest rate loans to farmers via BAAC: this is a prime example of an SFI being put in a precarious position by having to provide a large volume of loans (THB 60 billion, i.e. 10 percent of their assets), without these funds being provided by the government, and thus not being able to separate these loans out from other activities. Another issue to be explored is whether such loans, in the case of rice farmers, should only be made available to rice farmers who do not grow more than two cycles (to avoid flood risk);
- Thai Credit Guarantee Corporation (formerly the SBCGC) guarantees facility for a portfolio of up to THB 100 billion of commercial bank loans to counter the floods. It is suggested that a guarantee aimed at SMEs that have been damaged by flooding would need to be much higher than 20 percent to have a significant impact on private banks' willingness to lend. It is recommended to look at the possibility of starting with a more strict eligibility criteria (e.g., again, only SMEs that can prove significant damage), but offer a guarantee of 50 or even 75 percent, throughout the period of the loan. Then, if the take-up is slow, the eligibility criteria can be loosened. Otherwise, it is feared that only a very small proportion of this potential portfolio will actually materialize; and
- The THB 20 billion of virtually free loans being made available to commercial banks to on-lend, on a 50:50 capital sharing basis, to impacted SMEs will report edly have very few takers amongst commercial banks. This is because the usual lending rate for SMEs is closer to 9.0–9.5 percent[75], which would mean that even if half the capital lent is almost free, the resulting blended cost of funds would remain

[75] This is based on one commercial bank's Minimum Retail Rate of 8.0%, and the fact that they lend amounts of under THB 200,000 at this rate + 1.5 percent. Considering banks typically classify SME loans as a type of household loan, it is expected that lending rates to SMEs would be around this level on average.

too high for the 3 percent interest cap on these loans to be considered fundable by private banks. If commercial banks only had to use 25 percent of their own funds, the blended rate would become comparable to usual rates. Better still would be to focus attention on the loan guarantees, but to design these so that the resulting risk share is truly attractive to the banks.

See the DRM chapter for recommendations linked to the insurance sector.

Strategy for Medium-Term Recovery and Reconstruction

The main suggestions for the medium-term are linked to SFIs and to microfinance. To deal with weaknesses enumerated above, the team proposes three main recommendations:

(i) In order to more effectively distinguish between SFIs' banking role and government assistance role, it is strongly recommended that transparent agency structures be established to enable SFIs to respond to disasters (such as the 2011 floods) through their networks on behalf of the government. SFIs have been the first responders to most crises in recent years, and are suffering because of it. Given the uncertainty created in international markets about Thailand's creditworthiness following this crisis, it would help the government's position if it could move away from the current position of having very significant off-balance sheet public financing operations, and opt, instead, for a more transparent approach. Splitting off the operations requiring grants and/or subsidized loans, and having them run through agencies that are coordinated or overseen by the SFIs, would be a positive step in this direction. This is in line with the recommendations in the 2011 Modular Financial Sector Assessment Program (FSAP).[76]

(ii) Conduct a broader study of the microfinance sector, to determine whether the cooperatives and village/urban funds have the capacity and willingness to adequately provide most of the microfinance needed in the country, or whether introducing one or several nationwide microfinance institutions would be beneficial. If included in the recommendations of the aforementioned microfinance study, the government could subsidize the establishment of a large microfinance institution (possibly the expansion on an existing NGO program).

(iii) If supported by the proposed study, take steps to strengthen the management information system (MIS) and the corporate governance of both village/urban funds and cooperatives. In the first instance, this should include:
   a. Training at national level of staff in corporate governance.
   b. Training of trainers who can then go to the field to train the staff of cooperatives and village/urban funds on how, and why, to strengthen corporate governance.
   c. Conduct a SWOT[77] analysis, amongst both cooperatives and village/urban funds, of their MIS, general management and oversight systems, capacity of not only the national level but the individual organizations.
   d. Fund the lion's share of the costs of implementing the major recommendation of these studies.
   e. Once the above has been implemented, provide preferential levels of financing or other support to those cooperatives and village/urban funds who comply with the new standards established.

[76] Note that the needs budget does not include funding for this purpose, as further discussion will be needed to determine the preferred approach.
[77] SWOT analysis identified strengths, weaknesses, opportunities and threat.

See DRM chapter for recommendations linked to the insurance sector.

Strategy for Long-term Recovery and Reconstruction

See DRM chapter for recommendations linked to the insurance sector.

Table 22: Financial sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Category	Type	~6 mths	6-24 mths	> 24 mths
Private banks				
	Independent funding of new, flood-related loans[78] (100% private sector)	TBD	TBD	TBD
	Funding new, flood-related loans using government loans or guarantee[79] (S-T: govt. 18.0 billion, private 46.3 billion; M-T: govt. 24.9 billion, private 85.0 billion; L-T: N/A)	64,300	110,000	0
SUBTOTAL		**64,300**	**110,000**	**0**
Specialized Financial Institutions				
	Approved SFI-disbursed government interventions[80] (see Table 21 above 100% state funded)	58,810	75,430	48,870
	Review and adjust government interventions (funded by International Financial Institution (IFI)/bilateral grants)	2	0	0
SUBTOTAL		**58,812**	**75,430**	**48,870**
Micro-finance Institutions (Cooperatives, Village Funds, etc.)				
	Interest subsidy on Cooperative Agricultural Loans' debt relief	580	1,000	4,450
	New government-funded loans to affected Cooperative members, plus grants to flood victims (100% government)	2,039	160	0
	Cooperatives' independent funding of new, flood-related loans[81] (100% private sector)	TBD	TBD	TBD
	Village Funds' independent funding of new, flood-related loans (100% private sector)	34,000	0	0
	Funding new, flood-related micro-loans using government support (perhaps a THB 90 billion program in place, but no information available)	No data	No data	No data
	Strengthening of Cooperatives' and Village Funds' management information systems, and corporate governance (government/IFI funded)	12	60	0
	Funding study and implementation of strengthening of microfinance sector (government/IFI funded)	0	0	72
SUBTOTAL		**36,631**	**1,220**	**4,522**
Credit Card Companies[82]				
	Replacing losses from flood-impacted defaulters (100% private)	1,257	1,257	0
SUBTOTAL		**1,257**	**1,257**	**0**
Insurance Companies				
	Replacing losses from non-reinsured paid-up insurance claims (100% private)	9,140	0	0
SUBTOTAL		**9,140**	**0**	**0**
Increase Disaster Resilience				
TOTAL	**(for all periods combined: 411,439)**	**170,140**	**187,907**	**53,392**

[78] The estimation should be calculated after the crisis is over and the full Rapid Assessment is conducted.

[79] This is the amalgamation of: (a) SME loans by private banks, guaranteed by the TCGC: first 6 months, THB 34.9 billion lent by banks, backed by THB 8 billion of guarantees; 6 to 24 months, THB 65 billion lent by banks, backed by THB 15 billion of guarantees; (b) SME loans by private banks via GSB (this is assuming that the parameters are changed to make these loans more attractive, both to banks and borrowers); (c) loans to SSF members/companies via private banks; (d) includes THB 1.3 billion (S-T) of estimated loss in interest to commercial banks due to the encouraged restructuring of loans. See details in table above.

[80] See table above for assumed break-down per period, per intervention.

[81] The estimation should be calculated after the crisis is over and the full Rapid Assessment is conducted.

[82] Note that we do not include leasing companies in this graph as their recovery needs appear to be minimal.

Disaster Resilience in the Financial Sector

Policy Recommendations

Most policy recommendations are directly applicable to government support for disaster risk financing which are included in the Disaster Risk Management (DRM) chapter.

Otherwise, all the recommendations above contribute to disaster resilience indirectly by helping to finance the private sector (especially SMEs) to return to a pre-flood level, to strengthen the SFIs by insisting on standards equal to those of private banks (at least in terms of their 'true' banking activities), and by strengthening MFIs. All of these actions would help the respective beneficiaries to be capable of facing another similar disaster, in the hope that this will not be necessary for decades to come.

2.5 Infrastructure Sectors

Flood Control, Drainage and Irrigation

Summary

The objective of this chapter is to provide a preliminary description of the flood event and of the damage incurred to the flood control, drainage and irrigation infrastructure with a special focus on the reconstruction needs likely to emerge once the relief phase is over. It will provide the government with an initial assessment of short-, medium- and long-term intervention needs.

The 2011 floods affected many parts of the hydraulic infrastructure. Floodwater damaged the main dikes of the Chao Phraya River and the associated hydraulic structures including the drainage and irrigation canals and small hydraulic structures. Major dike breaches occurred in Nakhon Sawan, Chai Nat and Lop Buri provinces. Over 11 percent (about 213,000 ha) of the present irrigation and drainage areas (totaling about 12.2 million rai or 2 million ha) in the 26 assessed provinces has been damaged. The King's dike, the Ring dike and associated flood control structures were also damaged. The main and secondary drainage pumping stations and the main waterways were also damaged due to heavy siltation and clogging. The total damage to the flood control, drainage and irrigation infrastructure is estimated to be THB 8.7 billion. This estimate does not include damage to the on-farm irrigation and drainage infrastructure, which is included in the agriculture chapter.

Table 23: Total damage in the flood control, drainage and irrigation sector, in Thai baht, millions

Component	Disaster Effects			Ownership	
	Damage	Losses	Total	Public	Private
Royal Irrigation Department	7,723		7,723	7,723	
Maritime Dept.	242		242	242	
Bangkok MA	750		750	750	
TOTAL	**8,715**		**8,715**	**8,715**	

The needs for recovery and reconstruction are estimated at THB 43.1 billion.

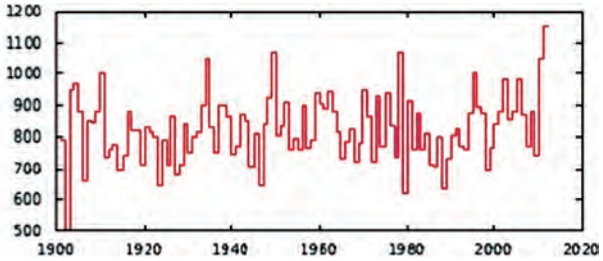
The reconstruction strategy recommends immediate, short-term requirements as well as several medium- and long-term activities. Short-term needs include restoring the existing drainage capacity and irrigation supplies for the forthcoming dry season crops by completing the ongoing efforts to close canal breaches, completing temporary repairs to structures, de-silting canals, and strengthening vulnerable and damaged components of the dikes, barrages and river training works. Most of these works do not require new designs; the structures can be restored to their pre-flood condition. However, a design review based on new modeling may be required for certain critical flood embankments such as the King's dike and the Ring dike (for the industrial parks), drainage canals and pumping stations. This will require hydrological and river morphological analyses and design reviews. There is no damage to the major dams in the north of the basin. However, there is an urgent need to carry out dam safety reviews for three large dams and update the reservoir operations procedures. From a public safety perspective, the dams need to be

systematically analyzed using accepted international methods of dam portfolio risk assessment. There is also an urgent need for a good river-reservoir optimization model and a flood early warning model with improved weather forecasting.

Behind the Floods

Over the course of the monsoon season from June to October 2011, Thailand experienced floods due to heavy rainy in the mountains to the north. The total rain for July, August and September was about 1,156 mm – the highest amount of rain recorded since recordkeeping began in 1901. The probability of such a rainy event has been estimated at 1 in 250 years.

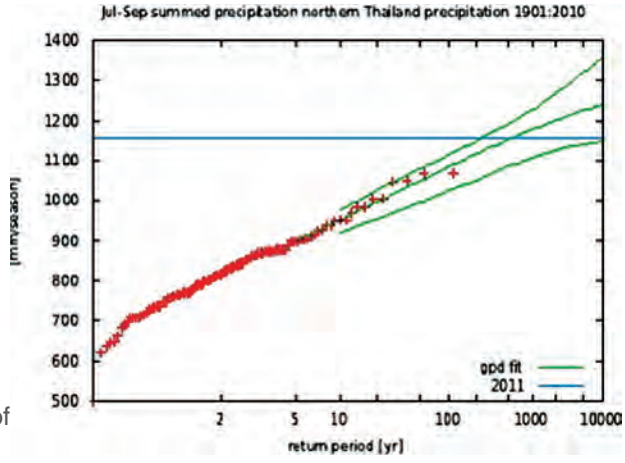
Figure 4: The observed quantity of rain in July, August and September in northern Thailand



Source: GPCC v5 analysis 1901–2009, monitoring/first guess analysis 2010–2011. From: knmi.nl accessed November 2011.

This high-intensity rainy generated unprecedented flood peaks in the Chao Phraya River Basin near Nakhon Sawan of about 4,686 m^3/s against the maximum river capacity of 3,500 m^3/s (figures 4 and 5).

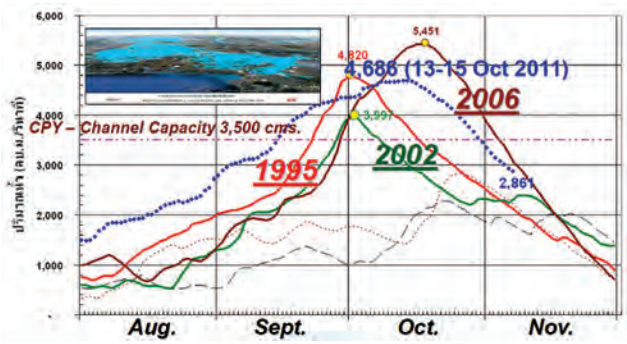
Figure 5: Extremes statistic of rainfall in July, August and September in northern Thailand.
Under the assumption that the climate does not change, the return period of the quantity rain as measured in 2011 is higher than 250 years (upper green line of the 95% reliability interval). The middle green line indicates the extrapolation of the observations over 1901–2010, the blue line indicates the value of 2011.



Based on the current river discharge it has been estimated that the 2011 flood event is a 1 in 50–100 year event. However, there is a need for further analysis. The preferred approach would be to analyze rain level statistics for the entire Chao Phraya catchment and translate these into discharge and overland flow volumes by means of a hydrological model of the river catchment. There is also a need for a flood risk analysis including the quantification of probabilities of rainy, river discharge and sea water level, as well as their influence on water levels in the river/drainage system and on inundation depths in the city of Bangkok.

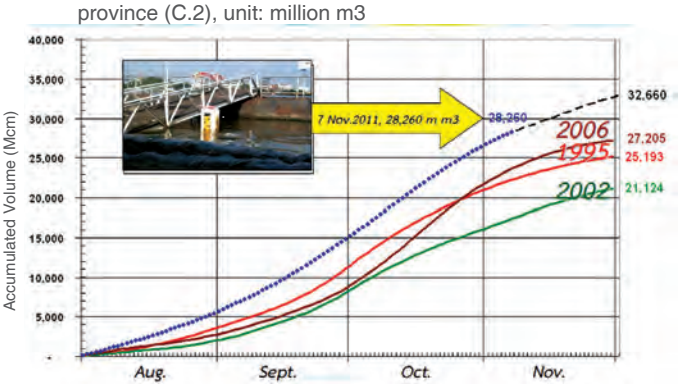
Furthermore, the flood risk analysis should also include an analysis on the probabilities of dike breaches, as well as the influence of human interventions (e.g. reservoir operations). A major difference between this flood and other severe flood events was that water levels rose at a slow, steady rate, and flood water persisted in some areas for almost 70 days before receding. The main cause of the flooding was the low flow capacity of the river, which resulted in river dikes overtopping and breaching in many river arms. Also the river's capacity decreases downstream, which implies that spillage from the river channel gradually occurs in the upstream areas when a large-scale flood occurs. Some questions were raised regarding how the major reservoirs where operated. But as the preceding sentences show, there was simply much more water upstream than the downstream channel was able manage, and the surplus water flows had nothing to do but flow across country. Floods in Bangkok and surroundings were caused by: (i) high discharges from the upstream Chao Phraya River, some of which reached as far as Bangkok via the flood plains; (ii) releases from the main upstream reservoirs; (iii) high sea water levels in the Gulf of Thailand; (iv) high intensity rainy in the city, exceeding the capacity of the drainage network and; (v) the compounding of i to iv.

Figure 6: Runoff statistic measured at Nakhon Sawan province (C.2), unit: m3/second.



Source: RID

Figure 7: Runoff statistic measured at Nakhon Sawan province (C.2), unit: million m3



Source: RID

Sector Context

Thailand's water sector is complex, with many agencies involved, but without significant coordination amongst them, or sufficient legislation to support the establishment of a single agency with oversight of the sector as a whole. The result is fragmentation, resistance to change and inefficiencies in the overall water resources management structure. This section presents a brief overview of the sector's legal framework and key players and issues related to institutional arrangements. A more comprehensive analysis is provided in Annex 8.

Water Laws and the Policy Framework

Thailand has many water related laws, administered by over 30 departments in eight ministries (Annex 8). There is no umbrella legislation to link these laws and codes, and consequently there is no legislative backing for any organization to undertake integrated water resources management. In practice, this leads to erratic and ad hoc engagement between agencies. While many of these agencies are involved in managing the delivery of water, there is no single agency that has overall responsibility for managing water resources in an integrated manner. The absence of a modern, comprehensive water resources law

is probably the most significant factor inhibiting the implementation of integrated water resources management (IWRM) in Thailand.

The current Water Policy has resulted in development plans for a number of river basins, but due to the lack of budget allocations, disagreements with local communities have led to the stalling of many of these plans. Additionally, administrative boundaries are often not drawn along water catchment or river basin lines, which leads to fragmentation of responsibilities and uncoordinated between different administrative areas, within a single river basin.

In efforts to rectify some of these issues, a new water bill has been drafted which outlines the policy framework to guide integrated water resources planning and management, focusing on planning for overall and sub-catchment river basins. However, the draft bill does not provide a suitable basis for promoting good IWRM, for developing a comprehensive approach to river basin management, or an adequate mandate for any agency to be the national water resource manager. Due consideration should be given to the notion that flood control measures and policies should focus on mitigating floods and associated damage, rather than flood prevention.

Finally, at a higher level, good water governance and appropriate environmental laws, acts and ordinances are more likely to lead to sustainable economic development and to reduce the risk of environmental degradation.

Institutional Arrangements

A plethora of government agencies is involved in water resources management and use. Under the Prime Minister's Office, there are six national boards and committees that are responsible for policy planning and coordination of water resources at the national level. The three dominant players in terms of water management and flood control are the Ministry of Agriculture and Cooperatives, the Ministry of Natural Resources and Environment, and the Electricity Generating Authority of Thailand (EGAT). The responsibilities of each are described in brief below.

It should be noted that many agencies are involved in and hold responsibilities regarding the construction and maintenance of river dikes and embankments, such as the Bangkok Metropolitan Administration, the Ministry of Transport, the Royal Irrigation Department, and local authorities at provincial level.

The Ministry of Natural Resources and Environment (MNRE) is responsible for management of natural resources (including surface water, groundwater, forestry, protected areas, mineral resources, and coastal resources) and the environment, including pollution control and Environmental Impact Assessment (EIA) reviews. The Department of Water Resources (DWR), established in 2002, is the lead agency under MNRE responsible for integrated water resources planning including fostering IWRM implementation. With such a broad set of responsibilities, effective cooperation among key agencies within MNRE is critical for forging effective IWRM implementation.

The Electricity Generating Authority of Thailand (EGAT) controls the two largest dams in the headwaters of the Chao Phraya River Basin. Each year, EGAT and RID allocate the available water to the various users (irrigation, major urban and industrial, salinity intrusion,

navigation, etc.) throughout the basin, based on water budget planning deliberations. The main responsibility of EGAT in this cycle is to assess resources to plan allocations.

The Ministry of Agriculture and Cooperatives (MOAC) has more than twenty departments or offices, of which the Royal Irrigation Department (RID) is the most important and critical in terms of water management and provision. RID is the main agency involved in water project investment planning, design and construction in Thailand – thus making it a key player as water resources manager. It also plays a principal role in flood mitigation issues as its canals and water regulation devices are utilized for flood protection and drainage during the wet season. RID is also responsible for maintenance of some river dikes. RID, jointly with EGAT, plays a key role of allocating access to water resources, by determining total water demand requirements of all users and comparing this to overall seasonal water availability.

The role MOAC plays as manager will only be complete when water legislation that clearly defines a water rights and allocation system for individual and cross-sectoral needs is in place. It should be noted that there is the potential for conflict of interest and poor accountability if irrigation provision and water resources management functions were to be held within a single organization.

In line with international best practice that is used to streamline WRM work, and improve coordination and oversight within specific river basins, **River Basin Organizations (RBO)** have been established. The key challenge to this system is not the will to coordinate and plan in an integrated way, but the lack of a mechanism to connect these RBOs with the budgeting process. Lack of political support, administrative mechanisms and funds have limited the capacity of the RBOs to effectively manage resources in a comprehensive manner.

Linking other sectors with the Integrated Water Resources Management Plan will be of ultimate importance for maintaining the integrity of the IWRM system and ensuring its holistic approach. Plans for urbanization, infrastructure development, transportation and roads, industrial expansion, etc. will all impact the water resources plans and flood management strategies. For example, prior to such vast urbanization in Thailand, there was a greater lag-time between intense rainfall and peak stream flow. Since, the lag-time has reduced, peak flow is greatly increased, and the total run-off has been compressed into a shorter time interval, thus creating the conditions for intense flooding. Ensuring an integrated approach to water resources and flood management will help manage these effects.

Technical Gaps

This section explores some of the key technological challenges and gaps that exist related to flood management, and sets the ground for recommendations in the following section.

For infrastructure, the combination of **ageing and deferred essential maintenance** is the primary reason for structural failure and breaches of the flood protection embankments along the Chao Phraya River. Immediate attention to this critical infrastructure is now required, as well as the adoption of more comprehensive inspection protocols for critically important dikes, drainage canals and pumping stations (similar to the inspection protocol for dams) than is now in place. Finally, the impact of climate change, expected to cause more frequent extreme flood events in the future, needs to be taken into account while reviewing structural designs, and maintenance requirements and procedures.

To support the monitoring and maintenance of this critical infrastructure, **a strong data and information management system** is essential. Establishing a centralized point to hold river basin information is critical to assessing the health of the basin, its ability to withstand development stress and detect emerging trends and potential challenges. This can also be linked with the flood early warning system.

Finally, the **revision of land use policies** may be necessary to avoid further, inappropriate encroachment onto flood plains and will be a key point for the IWRM policy framework to address.

Effective flood forecasting and early warning systems that communicate flood forecasts and emergency information to the public is essential. New knowledge of the climate system is beginning to make these medium-term forecasts more feasible and accurate on the national and sub-national scale. Several river basins in Europe have flood early warning systems that combine meteorological forecasts with detailed knowledge of the local hydrology and topography to forecast the occurrence of floods some days in advance.

Dikes, dams and other structures regularly, successfully protect lowland inhabitants from floods. It is likely that they will continue to be an important means of coping with increasingly frequent and high river flows resulting from climate change. This is very relevant in Thailand's Chao Phraya River Basin, though alone, insufficient; there is a strong need to **improve flood water management.** One clear, prudent option is to improve water retention through an increased number and capacity of water reservoirs. The country has at present about 1,000 cubic meters of water storage capacity per inhabitant whereas the United States and Australia have over 5,000 cubic meters. The dams of the Colorado River in the United States and the Murray-Darling Rivers in Australia, for example, can hold 900 days of runoff. By contrast it has been estimated that the dams in Thailand can store runoff for just 100 days. Additionally, creating 'room for the river', as is recommended in the Royal Initiative for Flood Mitigation would allow for increased areas for flood waters to roam. Figure 8 describes an example of best practice for this type of initiative.

Figure 8: Room for the River – Best Practice from the Netherlands

Figure 8: Room for the River – Best Practice from the Netherlands

High discharge rates from the Rhine and Meuse Rivers in 1994 and 1995 led to a significant shift in managing river flood safety in The Netherlands. The age-old practice of raising and strengthening embankments along the rivers was replaced with a new approach, which gives more room to high waters. This so-called "room for rivers " policy contains a wide range of measures, such as lowering floodplains, the creation of side channels, lowering of groynes, river dredging and the realignment of dikes. As opposed to past practice, dike strengthening has become a last option, only to be considered if other interventions prove to be technically or financially impossible. Most of these measures will have significant consequences on regional and local spatial planning, making public participation in planning of flood management strategies crucially important. It also calls for a more integrated approach to planning, combining safety objectives with other policy and development goals, such as nature development, landscape quality improvement and economic prosperity. The new management policy is now being implemented across the Dutch areas of Rhine and Meuse in a multi-billion Euro program. In addition to practical innovations in river management, the program has taken a creative approach to planning its 'central direction and decentralized implementation' arrangements. This has created opportunities for innovative public-private partnerships, such as Design & Construct agreements, in which planning and implementation is dealt with through one contractor. This approach has required great adaptation skills from both contractor and government agencies, and led all on a path of trial and learning. The program is expected to finish in 2015.

Source: Deltaris

Flood events have worsened in recent years, and indications suggest this change is due to both natural and human induced factors. Despite the substantial knowledge on hazards in Thailand, and on flooding in particular, further analysis is required to **assess the possible changes in the hazard risk and vulnerability profile** of the country. It is essential to understand the evolving flood patterns, and the possible causes for change and their implications, particularly if improved standards and specifications are to be applied to housing, critical facilities and infrastructure. As part of the process, it will be relevant to assess the possible secondary impacts of flood control structures, some of which seem to have contributed to the drainage problems appearing in certain areas of the country.

Damage and Losses

More than 480 kilometers of river dikes (total length of existing dikes is about 960 kilometers) were partially damaged (see images in Annex 6), and there was severe damage to the main and secondary irrigation and drainage canals and the lower-order irrigation infrastructure linked to the river. This includes serious siltation of the main canal and distributaries (about 969 kilometers of irrigation canals and 400 kilometers of drainage canals), breaches and siltation of smaller canals and water courses, and destruction of hydraulic and other water control and drainage infrastructure such as regulators, sluices and culverts. The damage, with related losses and needs for recovery and reconstruction are summarized in Table 24.

Over 11 percent – equally roughly to 213,000 ha – of the present irrigation and drainage areas (total about 12.2 million rai – 2 million ha) in the 26 assessed provinces has been damaged. Indirect losses such as the disruption of irrigation supplies, siltation and water-logging of agricultural land, are covered in the agriculture sector in this assessment report.

Table 24: Water resources management - damage, losses and needs requirements in Thai baht, millions

Sub-sector/ Component	Disaster Impacts			Ownership		Recovery and Reconstruction Needs		
	Damage	Losses	Total	Public	Private	Short term	Medium term	Long term
Royal Irrigation Department	7,723		7,723	7,723				
Maritime Dept.	242		242	242				
Bangkok MA	750		750	750				
TOTAL	**8,715**		**8,715**	**8,715**		**2,133**	**9,486**	**31,486**

Recovery and Reconstruction Requirements

Needs for reconstruction and recovery can be largely categorized into two broad categories: technical and organizational or institutional. They are presented in these groupings here, but listed on a timeline in Table 25 so as to show financial needs allocations for the short, medium and long term.

Some recommendations here are similar to those in the DRM chapter and the Transport sector chapter and coordination amongst responsible agencies will be necessary to avoid overlap and duplication of efforts.

Technical Reconstruction Recommendations

Rehabilitate hydraulic assets and increase the drainage capacity in order to restore and improve flood control structures to a safe operating standard, in line with the Royal Initiative for Flood Management. In conjunction, systems should be established to ensure regular review of the critical flood control infrastructure status, both by the operator and by independent review panels, to examine problems relating to sustainable operations and maintenance.

Undertake a design review of critical flood embankments such as the King's Dike in Bangkok, and the Ring Dike around the industrial parks (Figure 6), drainage canals and pumping stations in order to strengthen the structures from 1/50 year to 1/100 year flood structures. This will require new modeling of hydrological and river morphological analyses and design reviews.

Carry out dam safety reviews for the three large dams, including updating the reservoir operations and maintenance procedures. In order to ensure the utmost in public safety, dams should be systematically analyzed using an internationally accepted method of dam Portfolio Risk Assessment.

Engage a panel of local and international flood experts to: 1) conduct an analysis of the 2011 floods to establish an understanding of the likelihood of a similar event occurring in the future, and highlight lessons learnt, and 2) provide recommendations to the recently established Strategic Committee on Water Management regarding preparedness measures that would allow Thailand to effectively manage extreme flood events in the future. During the review, particular attention should be given to the collapse of dikes – particularly around the Ayuthaya industrial estates – in order to learn lessons on how to improve the quality of such flood defense works in the future.

Strengthen the flood forecasting and early warning systems that would refocus the system on monitoring and hydraulic modeling that incorporates climate change models, and is based on hazard mapping that focus on the entire basins in line with recommendations on establishing the river basin model[83]. A clear decision support system for reservoir operations would need to be built into the operational framework.

Accelerate the implementation of the Royal Initiative for Flood Management which provides a framework for water resources and flood risk management.

Update and implement the Integrated Plan for Flood Mitigation in the Chao Phraya River Basin.

Invest in floodwater management systems such as small and medium reservoirs, providing space to rivers, and community watershed management programs.

[83] Please see the DRM recommendations for linkages and coordination with other possible hazard mapping activities.

How to Strengthen the Ring's Dike – Industrial Estates

- o The total dike length around the 7 industrial estates is about 200 km.
- o Typical height of the dikes is 2–3 meters, steep slopes 1:2 – 1:3, typical crest width 1–2 m; typical footprint is 10–15 m.
- o Inundation depth at estates was 1.5–3 meters, for example at Rojana/High Tech.
- o Tentative estimates of the return period of this event are in the order of 1/50 – 1/100 year.

Some dikes were raised just before the flooding to prevent the areas from flooding (which in the end happened due to breaches in the dikes at some locations and also overflow at low spots). This raise was carried out with material just next to the dikes (poor quality). These dikes need a substantial re-design/re-construction since most of the material being used was not appropriate for levee construction.

Tentative cost: THB 15 billion (for a protection of 1/100 year flood)

The required level of protection depends on measures upstream/along the Chao Phraya River Basin. If the dikes along the river system are strengthened/raised, then the industrial estates could have lower dikes for the same level of protection and vice versa. Another thing which may form part of the solution is the inclusion of temporary flood defenses (e.g. sand bags but also other temporary flood defense systems). If the option is being considered to raise the dikes around the estates north of Bangkok substantially to get, say, a 100-year level of protection, thorough analysis of the entire river basin should be part of the initial assessment.

It is also important that the government study how to protect the homes of the employees of these estates.

Institutional and Policy Recommendations

All recommendations for institutional and policy recommendations are bound up in **reviewing and passing through parliament the new water bill.** This would institutionalize and strengthen the integrated water resources management approach and produce the most strategic and holistic changes for the sector. Specific recommendations for consideration in this review include:

- **Establish an effective river basin model** that follows best practice and institutionalizes the River Basin Organization structure for each main and sub-basin.This model would provide a basis for all modeling, water resources management activities and related development activities in the basin.
- **Appoint a high-level "champion" for water management** to bring all stakeholders together and move the existing water basin authority to a central position under the champion.
- **Accelerate the implementation of the Royal Initiative for Flood Management** considering social impacts and land use compensation

Suggested Timeframe for Recommendations

The following are recommendations on timeframe prioritizations. Please note that activities may be started in the short term, and continue to the medium to long term, which has been reflected in the costing table below.

Strategy for Short-term Recovery (up to 6 months)

- Rehabilitate and reduce the maintenance gap of hydraulic assets and increase the drainage capacity.
- Engage a panel of local and international flood experts to analyze the 2011 floods and provide recommendations to the strategic Committee on Water Management.
- Carry out dam safety reviews for the three large dams, including updating the reservoir operations and maintenance procedures.
- Strengthen the flood forecasting and early warning system.
- Update Integrated Plan for Flood Mitigation in the Chao Phraya River Basin (1999).
- Start re-investing in floodwater management systems such as small and medium reservoirs, space for the rivers and community watershed management programs.

Strategy for Medium-term and Long-term Recovery and Reconstruction (beyond six months)

- Accelerate the implementation of the Royal Initiative for Management considering social impacts and land use compensation.
- Undertake a design review with a view to strengthening critical flood embankments such as the King and Ring dikes.
- Review and approve the pending water bill that would improve the Integrated Water Resources Management policy framework.

Table 25: Flood control activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Activities	Short term	Medium term	Long term	Total	Public	Private
Rehabilitation of infrastructure						
• Royal Irrigation Department	1,545	3,089	3,089	**7,723**	7,723	
• Maritime Department	48	97	97	**242**	242	
• Bangkok Metropolitan Administration	150	300	300	**750**	750	
• Emergency mobile drainage pumps, maintenance equipment and spare parts	300			**300**	300	
Strengthen the flood forecasting system	60			**60**	60	
Emergency dam safety review	30			**30**	30	
Royal Initiative for Flood Management			2,000	**2,000**		
Drainage Channels		2,000	2,000			
Strengthening King's Dike		3,000	12,000	**15,000**	15,000	
Strengthening Ring's Dike		3,000	12,000	**15,000**	7,500	7,500
TOTAL	**2,133**	**9,486**	**31,486**	**43,105**	**31,605**	**7,500**

International Best Practice in Flood Management

Technical flood protection – For centuries, dikes, dams and other structures have protected lowland inhabitants from flooding and it is likely they will also be an important way to cope with more frequent and high river flows stemming from climate change. Many European regions continuously repair river or coastal dikes and improve drainage systems to protect against recurring floods. Now many nations are building their dikes thicker and higher as a hedge against the additional threat from climate change. In the long term, Thailand could invest in larger reservoirs.

Natural retention of floodwater – As the damage caused by floods increases around the world, many communities and regions are considering investing in costly dams, dikes and other technical measures to avoid a repetition of this damage. Because of the high costs associated with technical measures, another approach has been gaining popularity, namely to put aside parts of the river flood plain that can be flooded under high water conditions and serve as a temporary storage basin for flood flows. Many countries including Denmark, Germany, the Netherlands and Sweden are already setting aside riparian areas (side channels and wetlands) for this purpose. These are mainly recreational, farming, or undeveloped areas that can be inundated without great risk to human populations or their structures.

Improving insurance schemes and information – To compensate for the inevitable damage caused by floods it is possible to improve the type and coverage of insurance. In Belgium, recent legislation requires flood damage to be included in household “fire” insurance policies. Insurance for flood damage is possible in Germany.

Improving forecasting, monitoring, information – Europe is currently piloting one of the first examples of a continent-wide early warning system. The European Flood Alert System (EFAS) is currently in the last stages of development and is intended to provide forecasts 3 to 10 days in advance of high water events throughout Europe. EFAS will work in conjunction with the European Commission’s Joint Research Center at Ispra, and in direct cooperation with river basin authorities. The European Commission has proposed to set up a European Drought Observatory and early warning system by 2012. This would be an apparatus to combine meteorological forecasts, hydrologic data and other information to make medium-term forecasts of drought in Europe and allow authorities to prepare possible emergency measures.

Water and Sanitation Sector

Summary

Damage and financial losses in the water and sanitation sector in the 26 affected provinces taken into account for this assessment amounted to an estimated THB 5.5 billion (Table 26). Due to the rather slow onset of the impacts of the floods, water supply and wastewater utilities were able to prepare themselves for the disaster; the long time period of flooding[84], however, still had a substantial impact on the sector: around THB 3.5 billion are attributed to physical damage to water and sanitation infrastructure, mainly rural water supply systems and urban sewage treatment facilities. Around THB 2 billion has been attributed to losses of economic flows of the utilities, mainly due to lower revenues during the flooding as well as higher expenditures for treatment of more polluted raw waters, cleaning of wells or replacement mechanical and electrical systems.

Table 26: Water and sanitation sector – Damage, losses and needs in Thai baht, millions.

Sub-sector/ Component		Disaster Impacts			Recovery, Reconstruction and Needs	
		Damage	Losses	Total	~6 mths	6-24 mths
Water Supply	Urban	70.3	1,875.0	1,945.3	1,245.3	735.2
	Rural	1,783.2	107.1	1,890.3	107.1	1,783.2
Sanitation	Urban	1,643.6	1.4	1,645.0	1,645.0	117.0
TOTAL		**3,497.0**	**1,983.5**	**5,480.5**	**2,997.3**	**2,635.3**

Note: Sanitation in rural areas is almost exclusively provided through septic tanks, which are calculated under the housing section

Recommendations for the sector include a focus on short-term recovery and reconstruction of the service providers through repair of damage as well as short-term solutions to increase disaster resilience against future floods. This may include building flood protection for the facilities or storing equipment and chemicals on higher ground.

In the medium term, it is recommended for utilities and local governments to develop local disaster-resilience plans through revising all components of their system and discussing how to improve resilience with the resources available. This may include exchanging vertical turbine pumps with submersible pumps, elevating the base of the pumps to higher ground, and moving generators to higher ground or platforms.

In the long term, the sector's resilience should be improved by developing sector-specific Water Safety Plans and aligning these with the Strategic National Action Plan (SNAP) on Disaster Risk Reduction. Utilities should include disaster resilience into their business plans and adjust their systems to future risk projections. Increased monitoring and maintenance should be undertaken for high-risk areas and system components.

[84] In several affected provinces, floods have not yet receded and areas will most likely remain flooded for a few more weeks.

Sector Context

According the WHO/UNICEF Joint Monitoring Program, coverage of people with access to improved water supply and sanitation in Thailand is very high: 99 percent of the population in urban areas and 98 percent of the population in rural areas have access to improved water supply, and 96 percent and 95 percent have access to improved sanitation in urban and rural areas, respectively.

Water and wastewater services are supplied through public utilities, under the authority of the Ministry of Interior, the Ministry of Natural Resources and Environment and the Ministry of Public Health. In urban centers within the provinces affected by the floods, water supply utilities are operated through the Provincial Waterworks Authority (PWA) and in Bangkok City, Nonthaburi and Samut Prakan provinces through the Metropolitan Waterworks Authority (MWA). In addition to that, several municipalities throughout the provinces operate their own water supply systems individually. In several municipalities, concessions are given to private operators through Build-Own-Operate (BOO) or Build-Own-Operate-Transfer (BOOT) schemes. Both the Department of Water Resources (DWR) and the Ministry of Public Health (MOPH) are responsible for technology and quality standards. In rural areas, most people get their drinking water through small-scale community systems, which are supplied through groundwater wells or surface water.

Sanitation services in Thailand are also under the public authority of the Ministry of Natural Resources and Environment. Through the Wastewater Management Authority (WMA), wastewater systems in urban areas throughout the country are managed, whereas the Pollution Control Department (PCD) functions as a regulatory body. Wastewater is collected either through a piped sewerage system and treated in sewage treatment plants (in the case of Bangkok, this accounts for about 10–20 percent of domestic wastewater), or households have private septic tanks. In rural areas, no piped sewerage networks exist and septic tanks are prevalent.

Water utilities collect tariffs of approximately THB 6–15 per cubic meters of water provided. No fees are collected for sanitation services, as the management of the facilities is under the authority of local governments. Instead, the facilities are financed through government budget.

The main water sources for urban drinking water supply in Thailand are rivers and groundwater. In rural areas, about 65 percent of the water is taken from groundwater and 35 percent from surface water sources.

Damage and Losses

Damage

The water and sanitation sector is estimated to have incurred damage of approximately THB 3.5 billion, which is almost equally divided between the water supply and sanitation sub-sectors. In the water supply sub-sector, the biggest share of damage occurred to water surface systems or groundwater wells in rural areas (THB 1.8 billion), as well as to

water intake structures (THB 28 million) and water treatment plants (THB 31 million) in urban areas. Almost all damage in the sanitation sub-sector occurred in connection with urban wastewater treatment plants (THB 1.6 billion). For the purpose of this analysis, individual household septic tanks and related damage and losses are included in the housing sector, impacts of water quality on public health such as increased prevalence of water-borne diseases are calculated under the health sector, and impacts on environmental pollution through wastewater is included in the environment sector.

In the rural water supply sector, damage is estimated at approximately THB 1.8 billion. The reason for this relatively high value of damage compared to urban water supply is the almost exclusive reliance on wells or small-scale surface water supply systems (65 percent of which are groundwater wells and 35 percent surface water sources). Whereas some of this damage refers to damaged pumps or other control panels, some wells were damaged to such an extent that they needed to be shut down and replaced with new wells[85]. An example of types of damage is given in Table 27. Due to a lack of further data, estimations from damage and losses in two provinces (Nakhon Sawan and Chai Nat) were extrapolated to other flood-affected provinces.

For urban water supply, damage is estimated at THB 70 million. This assessment is based on information received by the Provincial Waterworks Authority at central level, the Metropolitan Waterworks Authority for Bangkok metropolitan area and observations made during field visits to Nakhon Sawan province as well as the largest MWA facility in Lak Si district of Bangkok. For public or private municipality-run water supply systems, no actual information on damage or losses was available at the time of the assessment at a central authority[86]. In order to include an estimation of the damage and losses incurred, the following estimate served as basis: 75 percent of urban water schemes outside the Bangkok metropolitan area are managed by the PWA, whereas 25 percent are managed by the municipalities (or respective private operators). The amount of damage and losses incurred per province was then calculated as an additional 33 percent of those estimated for PWA-run systems.

Due to sufficient prior warning and preparation time, MWA managed to protect all four Bangkok-based water treatment facilities[87] from major flood impacts. The October – November 2011 floods in Thailand reached the largest of the four facilities in Bangkok in mid-October. The last time the MWA had to prepare for a serious flood was in 1995; the 2011 floods are assessed as much more extensive.

[85] About 35 percent of the wells were completely broken and need to be replaced. The cost of replacing these wells represents about 80 percent of the total cost of repair.
[86] The number of municipalities within the affected provinces is not quite clear, but estimated to be at least several dozen. During the assessment, the team did not receive information by any central government agency on damage and losses among these municipalities. It was also not possible to contact each individual municipality for data.
[87] The water treatment plants (WTP) in Bangkok (all MWA managed) are: 1) Bangkhen WTP, with a maximum capacity of 3.6 m3 per day; 2) Samsen WTP, 550,000 m3/day; 3) Thonburi WTP, 170,000 m3/day; 4) Mahasawat WTP, 1.2 m3/day.

Province	Total No. of Wells	No. of Flooded Wells	No. of Wells with minor damage	No. of Unusable wells	No. of wells with damage to intake cover	Total damage (THB mill.)
Kalasin	153	49	20	10	56	8.1
Khon Kaen	177	48	51	19	72	14.9
Phichit	2,072	450	79	114	14	2.2
Chachoengsao	364	164	151	6	29	8.7
Phitsanulok	1,499	396	156	106	31	86.3
Ubon Ratchathani	1,340	635	135	30	38	34.3
Roi Et	395	187	110	22	32	20.2
Si Sa Ket	785	245	34	38	29	36.6
Nakhon Pathom	462	170	147	3	56	8.1
Samut Sakhon	204	156	79	7	72	7.7
Maha Sarakham	207	198	124	22	25	17.9
Total	**7,658**	**2,698**	**1,086**	**377**	**454**	**244.93**

Note: Estimation of total damage was extrapolated based on these figures.

Table 27: Examples of damage to groundwater water supply systems in rural areas

Damage to the urban water supply sub-sector remained relatively low: MWA reported that a siphon was damaged at the canal Khlong Bang Luang in Bangkok, the cost of which was estimated at THB 30 million. In addition to the siphon, various transmission pipelines may have been damaged around the city, because of rushed and unplanned excavations and sandbagging to prepare for floods. No cost estimations were provided for this damage. Apart from this damage, all Bangkok water treatment and distribution facilities are working normally, as are all 16 pumping stations across the city, thanks to the extensive protective measures employed.

In other urban areas across the remaining 23 affected provinces (excluding MWA-run facilities in metropolitan Bangkok, Nonthaburi and Samut Prakan), the main damage was concentrated on water intake structures and water treatment systems (THB 38 million total). Damage to conveyance, storage and distribution systems were significantly lower at THB 1.9 million. Out of five PWA-run water treatment plants in Nakhon Sawan province that take raw water from the Nan, the Ping and the Chao Phraya rivers, one was affected by the floods during September to November (totaling two months), damaging part of the pipe crossing the river.

Despite the lack of municipal-run water utility data, a field visit to Nakhon Sawan municipal water supply system offered an indication of damage: two high-pressure pump houses, including motors, pumps, a water quality control station and a control panel. Other damage included a drilling rig and other equipment in the maintenance house, a transformer, buildings, fences and pipes. This damage, although disruptive, did not seriously affect the service provision to customers.

Figure 9: Pump house during the flood at Tubkrit Water Treatment Facility in Nakhon Sawan (10 Sept 2011)

Figure 10: Tubkrit Water Treatment Facility in Nakhon Sawan (23 Sept 2011)

Figure 11: Building after the flood, Tubkrit Water Treatment Facility, Nakhon Sawan (16 Nov 2011)

Total damage for the urban sanitation sector is estimated at more than THB 1.6 billion. This number is based on estimations from the Wastewater Management Authority (WMA), which provided estimates for damage of nine wastewater treatment plants it oversees in 25 out of the 26 provinces (excluding Bangkok City Province). Another 10 wastewater treatment plants in these 25 provinces, operated by municipalities, are expected to be affected as well. Similar to the WMA assumptions, damage of those 10 municipal wastewater treatment plants was estimated at 20 percent of the replacement cost of the plants, 10 percent for aerated lagoon systems.

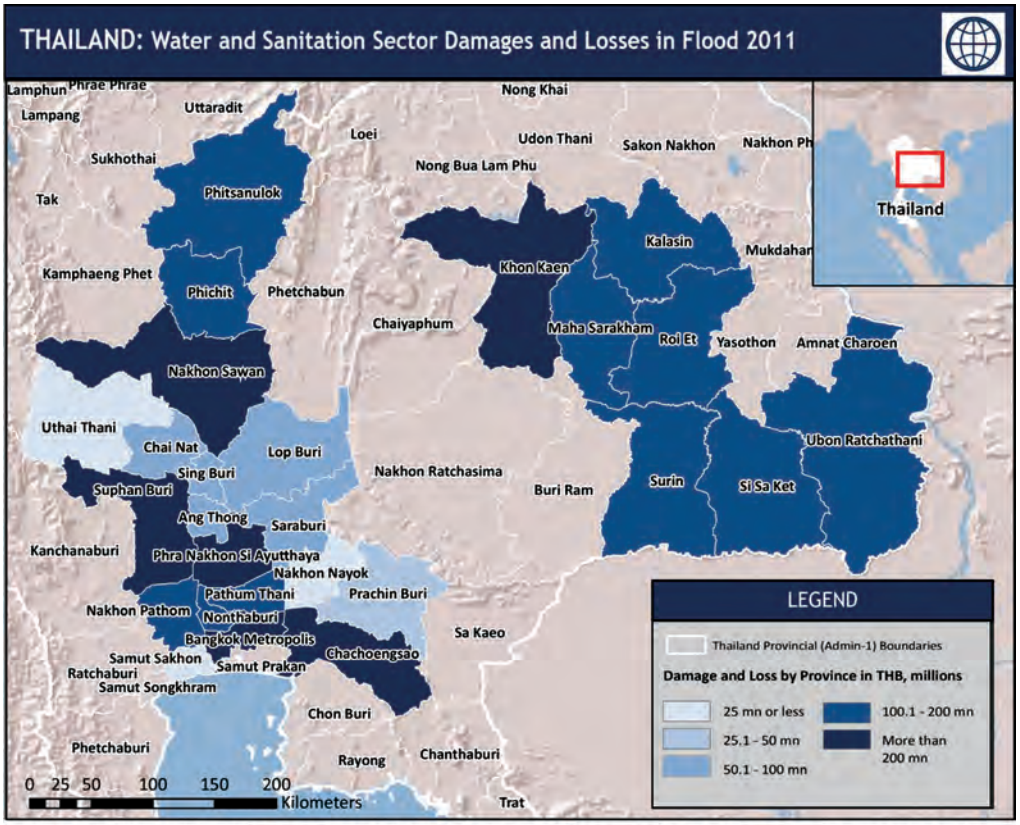
Figure 12: Aboveground damage from underground sewage pipe network subsidence (16 Nov 2011)

In the Bangkok metropolitan area, there are eight wastewater treatment plants whose initial investment cost was a total of approximately THB 25 billion. These plants are of particularly high value because of their high treatment capacity (more than 1 million cubic meters of water per day) and the technology they employ. Damage to these Bangkok based plants, however, was not as severe as in other provinces, as similar to water supply utilities, the wastewater utilities had sufficient time to prepare themselves against the floods. Total damage is therefore estimated at 1 percent of the replacement value of the plants, or THB 250 million (mainly including inundated electrical control systems and washed away biological material). Close inspection is recommended to verify the exact types of damage.

Sub-sector/Component	Total Damage
Water Supply - Urban	
Water intake structures	37.5
Water treatment plants	30.8
Conveyance systems	0.2
Storage systems	0.4
Distribution network	1.3
Water Supply - Rural	
Surface & groundwater systems	1,783.2
Sanitation - Urban	
Sewage treatment works	1,643.6
TOTAL	**3,497.0**

Table 28: Water and sanitation sector – Damage in Thai baht, millions

Figure 13: Water and sanitation sector – Damage and losses from flooding 2011



Layer Sources: Basemap (ESRI), Admin. Boundaries (DIVA-GIS), Water and Sanitation Sector Damages (Authors). [Created by GFDRR]

Disclaimer: The borders and country names used are indicative and do not represent the views of The World Bank Group.

Financial Operating Losses

Total losses in the water and sanitation sector are estimated at THB 2.0 billion. The majority of these losses are incurred in the urban water supply sub-sector due to lower revenues and higher expenditures, totaling THB 1.9 billion. Losses in rural water supply amount to THB 107 million, in urban sanitation to THB 1.4 million.

MWA-run water supply utilities in the Bangkok metropolitan area suffered the majority of the losses in the water and sanitation sector due to lower revenues from household water supply fees (approximately THB 1.2 billion) and higher expenditures for water treatment, customer service, etc. (approximately THB 670 million). Usually the MWA's Lak Si facility produces approximately 3.6 million cubic meters of water per day, out of a total supply of 4.8 million cubic meters for the Bangkok metropolitan area (75 percent). The three remaining facilities produce 25 percent of Bangkok's water supply. Because of the floods, the MWA is expecting lower revenues: production has fallen to approximately 3.1 million cubic meter of water per day (compared to 3.6 million before). This lower production is the result of reduced filter run time, as filters have to be cleaned every 24 hours, compared to every 48 hours before the floods, due to more algae in the water. As a result, the pressure of water is lower and hence households consume less; other households temporarily do not consume any water at all because residents have evacuated their homes. Costs of chemicals for water utilities have also increased approximately six times, primarily because of additional needs to treat raw water.

In other urban centers around the country, losses of water supply utilities amount to approximately THB 122 million and are attributable to lower revenues and higher treatment costs. PWA has indicated that across the PWA-run plants, future losses are concentrated on water treatment. At the Nakhon Sawan field visit, for example, losses were accounted for the additional use of chlorine gas, as well as for lost water due to broken pipes (amounting to 83,987 cubic meter or THB 1 million, calculated from an average tariff of THB 13 per cubic meter).

In rural areas, most water systems will require cleaning, disinfection, and flood protection measures, estimated at THB 107 million. Additional future losses may be associated with shutting down of wells that have been irreversibly damaged.

However, all these financial losses have to be balanced with savings as well as additional revenues. All water supply systems across the affected areas may experience an increase in water demand, as households start cleaning their houses from mud, garbage and debris from the floods. These additional costs represent revenues for the utilities and together with other savings are estimated at THB 118 million total to be subtracted from the actual financial losses.

For wastewater treatment, the financial operating losses are estimated to be a smaller fraction of the damage. Since wastewater fees are not yet collected in Thailand, the utilities do not generate revenues from their customers and disruption of service therefore does not result in financial operating losses. Nevertheless, some higher operating costs are to be expected. Most treatment plants (aerated lagoons, oxidation ditches, etc.) rely on a combination of air and microorganisms. Operating the aerators and recreating microorganisms (or recalibrating the systems) will require higher electricity costs in the short term. The total increase in losses for wastewater treatment systems was estimated at almost THB 1.4 million.

Damage and loss estimations are provided by affected authorities in Table 29 and by province in Table 30.

Sector	Authority	Damage	Losses
Water	PWA	30.3	39.6
	Municipalities	10.0	13.1
	MWA (Bangkok)	30.0	1,822.4
	MNRE (Rural)	1,783.2	107.1
Sanitation	MNRE-WMA	1,391.7	1.4
	BMA (Bangkok)	251.9	0.0
TOTAL		3,497.0	1,983.5

Table 29: Water and sanitation sector – Damage and losses by authority in Thai baht, millions.

Table 30: Water and sanitation sector – Damage and losses by province in Thai baht, millions.

Province	Damage	Financial Losses
Ang Thong	50.3	3.9
Ayuthaya	264.6	49.6
Bangkok	281.9	1,822.6
Chachoengsao	296.4	0.4
Chai Nat	86.1	1.4
Kalasin	121.1	5.7
Khon Kaen	267.2	10.8
Lop Buri	80.0	7.5
Maha Sarakham	167.1	7.3
Nakhon Nayok	24.1	0.3
Nakhon Phatom	123.3	-0.7
Nakhon Sawan	213.7	4.9
Nonthaburi	149.4	0.2
Pathum Thani	103.1	26.3
Phitsanulok	185.0	2.7
Phichit	117.8	2.6
Prachinburi	42.6	2.3
Roi Et	153.4	8.8
Samut Sakhon	20.2	-0.4
Saraburi	64.2	3.8
Singburi	66.5	-1.0
Si Sa Ket	133.1	7.9
Suphan Buri	210.8	1.4
Surin	102.9	5.6
Ubon Ratchathani	168.9	9.5
Uthai Thani	3.3	0.1
TOTAL	**3,497.00**	**1,983.5**

Recovery and Reconstruction Requirements

The floods that affected Thailand in 2011 were not sudden onset events at a single point in time, but burdened the country over a period of several months. Hence, most of the provinces were not unprepared for the floods. The government, the community as well as the water and sanitation service providers had time to organize their emergency response activities, rehabilitation, recovery and reconstruction requirements depending on their situation prior to and during the disaster.

The reconstruction requirements reflect the immediate needs to repair damage and bring systems back to functionality, as well as improve the system to be more disaster resilient. Recovery requirements include interventions to fully recover from the negative effects of the disaster. The reconstruction and recovery needs as well as measures to improve resilience are listed in Table 31, which quantifies these matters as a total value of THB 5.6 billion. This amount is disaggregated to around THB 1.2 billion for short-term and THB 1.6 billion for medium-term recovery and reconstruction needs in the water supply sub-sector and THB 1.2 billion for short-term recovery and reconstruction needs in the sanitation sub-sector. Needs to increase disaster resilience in the water and sanitation sector as a whole are estimated as THB 630 million in the short term and THB 1 billion in the mid-term.

Sector Context

For most of the affected provinces, water and sanitation service provision was not substantially interrupted. Water is still supplied to households, and despite damage to the housing infrastructure, most water meters are still calculating the flow of water to customers' connections. Damaged pipes in the network, however, do increase the non-revenue amount of water and contribute to higher losses of revenues. In some areas, the floods contaminated the groundwater that is used as the drinking water source by utilities. More treatment at a higher cost is needed to ensure that drinking water quality standards are maintained.

Based on the damage described in the sections above, reconstruction efforts are focusing on the reparation of the damage that occurred due to the floods. For urban water supply systems, this includes the repair and/or replacement of damaged infrastructure such as pipes, pumps, control panels, buildings, fences, etc. Rural areas mainly have to focus on repairing or replacing damaged well structures, and mechanical and electrical systems.

Recovery requirements are those related to losses and describe efforts to rehabilitate basic service provision. That can include, for example, expenditures for chemicals or microorganisms to treat wastewater that was spilled through the floods, or additional electricity costs to reestablish the microbiological balance in wastewater treatment ponds.

Key Challenges to Resilient Recovery and Reconstruction

In many cases, simple measures can prevent future damage to the system, such as storing equipment higher above the ground or building a wall around the facilities to protect them against future flooding. Improving disaster resilience against future threats, however, is a more complicated exercise that requires more than just technical measures. Disaster resilience plans need to be developed in a coordinated and organized manner that builds on existing best practices, are tailored to local circumstances, and involve a range of stakeholders.

Recommendations for Resilient Recovery and Reconstruction

Strategy for Short-term Recovery (up to 6 months)

Most urgently within the next six months, priority should be given to rehabilitation and reconstruction measures that repair infrastructure damage in order to restore services and prepare utilities against possible future floods on a provisional basis. This includes repairing highly damaged pipes, repairing and cleaning up wells (including disinfection) and other water sources, or building a brick or sandbag wall around the facilities. It further includes securing emergency service provision through increased storage of water for priority needs. This can include filling up storage facilities with drinking water, which in a case of service interruption can be delivered to households through tanker trucks or bottles.

In the case of the sanitation sub-sector, it is important to ensure the availability of chemicals and microorganisms necessary to clean up floodwater and raw waters contaminated with wastewaters. Sewer systems often have a designed overflow function to allow masses of water above the design capacity of the system to bypass the treatment plant and discharge directly into the receiving waters. Hence contamination cannot be entirely prevented, but the materials should be available to deal with cleaning it up afterwards.

Further, the availability of materials for securing equipment provisionally, as well as essential spare parts should be taken into account and planned for. This includes scaffolds to store equipment on higher ground, or store a sufficient number of electric fuses, replacement pumps, pipes and valves, etc., in order to be able to restore service provision quickly. It also includes more diligent check-ups and maintenance works after the current floods to ensure full functionality of the system.

It is recommended to conduct follow-up studies in relation to this disaster, approximately six months after the floods have receded:

1. One thorough investigation on the lessons learned about how the current disaster has been handled by various sector authorities at all government levels. This information would serve to be very valuable for future disaster resilience strategies.
2. Further, a thorough cost-benefit analysis should be prepared to investigate the economic advantages and disadvantages of individual resilience improvement measures outlined by the provinces and utilities.

Strategy for Medium-term Recovery and Reconstruction

There is the need for local disaster resilience strategies in the mid-term time period of approximately the next year. This strategy focuses on elaborating local disaster resilience plans that prepare the water and wastewater utilities to deal with floods depending on their locations and individual risks. These plans need to be developed through the participation of representatives of different stakeholders involved to increase their understanding and commitment.

To develop local disaster resilience plans, utilities and municipalities need to revise individual components of the water and sanitation system. Based on the specific disaster history of locations and funding availability resilience building options should be discussed. Depending on the specific location of the pumping station, the option might either be to exchange vertical turbine pumps with submersible type pumps in order to protect them from future flooding. Or if this is too costly or difficult to implement, the alternative might be to elevate the base of the existing pump.

Developing such coordinated disaster resilience plans is a task that should be assigned to a specific task force, led by the local government and involving representatives of different

decision making sections of government. It should include technical expertise both from water utility engineers and disaster risk management experts and it should seek guidance from the approving budget section, as well as the political will to support this exercise in an integrated manner. In the process of developing the plans, coordination is needed with other sectors that develop resilience plans. The institutional set to be clarified comprises the question of who is the lead agency, the establishment of a coordination committee, which budgeting, safeguards and implementation arrangements are in place, and how and who is going to undertake monitoring, testing and evaluation.

To increase disaster resilience, it is important to include the communities in disaster preparedness and response actions. Communities are recognized as the first line of defense after a disaster occurs. Raising their awareness and strengthening their capacity to perform quality control of supply systems is the first step to reduce the impact of disaster events.

'Build-back-better' (BBB) is a principle that also prevails in the planning and design of damaged structures in the medium term. Water and wastewater utilities should start to consider more advanced technology, improved quality, safer locations and higher flood resilience into their planning and budgeting processes when starting to reconstruct their assets.

Strategy for Long-term Recovery and Reconstruction

In the long term, water and sanitation policies should be in line with the government's Strategic National Action Plan (SNAP) on Disaster Risk Reduction 2010–2019. For the water and sanitation sector, this translates into the following steps:

- **Improving disaster resilience through Water Safety Plans.** It is recommended for provinces, local governments and individual water utilities to develop specific Water Safety Plans (WSP) that include disaster resilience as an integral part. These WSP would be based on the disaster resilience plans recommended under the mid-term strategy. Disaster resilience within these WSPs can include increasing possible sources for water supply, such as tapping new or a higher quantity of wells or river intakes to enable utilities to manage their waters in a more flexible, resilient way. In the case of a disaster, this can better ensure safe drinking water provision to their customers. It might further include the upgrade of appropriate technology for specific disaster-related circumstances, such as separating wastewater and storm water in flood-prone areas in order to reduce possible contamination during the flood event.

- **Adjusting to future disaster risk projections.** Depending on scenarios for future disaster projections, Water Safety Plans should be adjusted to future disaster risk projections under the existing climate change scenarios for their individual locations. If floods like the current one are likely to return more frequently, it might be economically reasonable to alter the systems' design capacity to deal with increasing volumes of water in a better way. This may include changing the location of the facilities or increasing the overflow capacity of a canal.

- **Increased monitoring and maintenance is conducted for high-risk areas.** Components of the supply system that are at a higher risk of failing in case of a disaster might need more frequent maintenance to ensure they are functioning in case of a disaster. The Water Safety Plans suggested above should also include a list of system components to be monitored and checked immediately before a disaster occurs, if that is possible.

- **Costing of proposed actions, plans, and strategies needs to be taken into account.** It is important to involve relevant government agencies responsible for authorizing budget allocations from the beginning into the planning and design stage to guarantee realistic implementation within the timeframe proposed.

Table 31: Water and sanitation sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Category	Type	~6 months	6-24 months
Water Supply			
Infrastructure			
	Siphons	49.0	
	Pumping stations	270.1	
	Tail regulator		274.3
	New wells (in rural areas)		1,248.2
	Other damage		49.2
Treatment			
	Water treatment	119.1	
	Cleaning of wells	107.1	
Other services			
	Administration	670.2	
SUBTOTAL		**1,215.6**	**1,571.7**
Sanitation			
	Infrastructure	1,150.5	
	Wastewater Treatment	1.4	
SUBTOTAL		**1,151.9**	
Increased Disaster Resilience			
	Infrastructure resilience (BBB)	629.9	673.6
	Capacity building		390.0
SUBTOTAL		629.9	1,063.6
TOTAL		**2,997.3**	**2,635.3**
			5,632.7

Disaster Resilience in the Water and Sanitation Sector

Policy Recommendations

The fragmentation of the sector makes it very difficult to monitor and assess the level of damage, losses and needs during emergency situations. The sector is naturally better managed at local level, which further complicates monitoring efforts. Establishing a coordination mechanism for basic data collection and dissemination, or building a network amongst governmental and non-governmental agencies, could go a long way in improving the ability to easily assess needs.

It is important to recognize the decentralized nature of water supply and sanitation service provision. In cases where line ministries (MNRE) or authorities (PWA) are responsible for systems in a large part of the country, it is important to strengthen capacities at the local level and decentralize decision-making during emergencies.

Integrating Disaster Resilience into Water and Sanitation Programming

The water and sanitation sector in Thailand has already proven to be quite flood resilient, mostly thanks to barriers built to protect the various water supply and sanitation systems, especially the more sophisticated ones, like Bangkok's Metropolitan Waterworks Authority facilities. The number of floodwalls built in a very short period of time out of sandbags, mud or concrete held well during these disastrous floods, protecting valuable assets. There were few "accidents" in the Bangkok area and the disruption of service was not very significant, despite the gravity of the situation. Rural systems (smaller wells, surface systems) have probably been affected more and closer inspection is needed to review how they can be better protected in the future.

Despite the high preparedness levels, disaster resilience in the water sector can still be improved further. It is recommended that provincial and local governments as well as utilities develop their individual Water Safety Plans. These WSPs should be in line with the Strategic National Action Plan (SNAP) on Disaster Risk Reduction and contain an integral part on improving disaster resilience. Based on these WSPs, all utilities (water and wastewater) should then set up Standard Operating Procedures (SOP) or Business Continuity Plans (BCP), to optimize response speed and effectiveness in emergencies. Where such procedures already exist, they can be enhanced and strengthened with the experience resulting from the current disaster. As part of this preparedness protocol, it is important to protect electrical systems that are vulnerable to water, by perhaps moving them permanently to higher floors or to an elevated platform. Also, organizing drills, improving evacuation planning and offering periodic training are important.

WSPs also include guidance on how securing access to alternative water sources during disasters can also boost resilience of systems. A lot of systems currently rely on one water source only, either groundwater or surface water. Although this is obviously a more cost effective way of producing water, larger utilities and systems should allocate budget to securing access to an alternative source for times of disaster. In the case of Bangkok, MWA is already considering extending the raw intake canal (Khlong Prapa) to collect water from further upstream in the Chao Phraya River, in order to protect against salinity and water pollution, which increases with smaller distance to Bangkok. Rural households that rely on simpler technologies and wells could consider installing rainwater-harvesting systems on rooftops, to secure clean water in both periods of floods and droughts.

The sanitation/wastewater sector also has a high potential for enhancing disaster resilience. Wastewater is a large environmental problem in Thailand, with organic waste being a big part of the total wastewater. Although significant investments have been made for wastewater treatment across Bangkok and other large cities, and households are required to have a wastewater treatment facility, the safe collection, treatment and disposal is not always guaranteed. In many cases, wastewater is still discharged directly into the environment. A higher awareness of the population regarding the public health hazards connected to insufficient wastewater treatment is needed, connected to the

introduction of wastewater service fees. At the same time, a more diligent protection of the environment through untreated wastewater is needed from the government.

Many of the wastewater systems are open lagoons or ponds that may easily become inundated, overflowing contaminated water to neighboring areas, outside of the treatment plant. In Bangkok, storm water from khlongs (canals) is mixed with wastewater which means that the water that reaches the wastewater treatment plants is sometimes too 'clean' for the treatment to work effectively. It is important to think of containment strategies as well as treatment efficacy strategies for these wastewater systems, so that wastewater is kept separate from floodwaters.

Lastly, it is very important to work closely with communities, to ensure better resilience along the various water canals. It becomes the mutual responsibility of the utility and the community to protect the raw water intakes, to ensure uninterrupted service provision as far as possible, and protect the communities from public health risks resulting from pollution through wastewater.

Transport Sector

Summary

Thailand's transport sector is extensive and covers all modes – road, rail, air, and water. Much of the transport infrastructure is located in the central provinces, where most of the country's population and industrial base is concentrated and which was most impacted by the flood, although parts of the northeast were also affected[88].

The total damage and losses for the sector, for the 26 provinces included in the damage assessment, are estimated at THB 23.6 billion and THB 6.9 billion respectively, as shown in Table 32.

Table 32: Total damage, losses and needs in the transport sector in Thai baht, millions

Sub-sector	Disaster Effects			Ownership		Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Total	**23,580.0**	**6,938.4**	**30,476.4**	**30,326.4**	**150.0**	**8,045**	**14,376.0**	**2,295.8**

The cost of damage is calculated on the basis of estimates prepared by the transport sector agencies, based on their standard costs for specific work activities. These estimates reflect preliminary assessments carried out by the agencies as part of their submissions to the government for funding allocations to restore the roads to their pre-flood condition.

The road network in particular – which connects Bangkok to the provinces and includes an extensive network of provincial, rural and local roads – is very dense, and has been severely affected by the flood, principally in the central region but also in the Northeast. Damage to road pavements, from water flow across them and from long periods of inundation during which heavy traffic continued to pass, is extensive. The cost of transport across the network has increased, as traffic diverted to alternative, longer routes when sections of road were inundated, or travelled more slowly over roads that have been damaged. Together these constitute transport-related losses for the road network relative to the pre-flood condition. These losses, particularly those related to road surface condition, will continue until the network has been restored to its pre-flood state. Related to roads, two of the major government-operated truck terminals in Bangkok have experienced some damage.

[88] Refer to a map in the DRM section of the report.

The railway has continued to connect Bangkok with the provinces, with some diversions, and with some connections provided by buses. Damage appears to have been limited to embankments (submerged for long periods, many of which remain submerged as of this writing) signaling systems, and station structures.

For the other transport modes – civil aviation, and inland water transport – there has been relatively little damage, and correspondingly only minor losses. Civil aviation impact has been limited to the flooding of Don Muang airport, and the resulting damage to the airport's facilities. Air traffic was not directly affected, since the few domestic flights that used the airport quickly diverted to Bangkok's main international airport. It is likely that the airport will be out of service for between three and six months. For inland waterways, which mainly provide for movement of bulk agricultural and construction materials, there has been little damage, although riverside loading and unloading facilities were often inaccessible for considerable periods, but a suspension of inland water traffic was put in place for about 33 days at the peak of the flood period.

The estimated damage, losses and needs for the portion of the transport network included in the 26 provinces covered by the needs assessment, are summarized in Table 33 below.

Table 33: Transport sector – Damage, losses and needs in Thai baht, millions

Sub-sector/ Component	Disaster Impacts			Ownership		Recovery and Reconstruction Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Roads	**19,638.0**	**6,263.4**	**25,901.4**	**25,641.4**	**0.0**	**4,666.2**	**12,876.0**	**2,295.8**
Expressways[a]	0.0	450.0	450.0	450.0		0.0	0.0	
DOH[b]	0.0	3,443.7	14,922.7	14,922.7		1,147.9	8,035.3	2,295.8
DRR[c]	4,456.0	1,336.8	5,792.8	5,792.8		1,336.8	3,119.2	
Local[d]	3,443.0	1,032.9	4,475.9	4,475.9		1,721.5	1,721.5	
Truck terminal[e]	260.0	0.0	260.0	260.0		260.0	0.0	
Railways	**3,000.0**	**525.0**	**3,525.0**	**3,525.0**	**0.0**	**1,500.0**	**1,500.0**	**0.0**
Civil Aviation[f]	**900.0**	**150.0**	**1,050.0**	**900.0**	**150.0**	**900.0**	**0.0**	**0.0**
Inland Water[g]	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
TOTAL	**23,538.0**	**6,938.4**	**30,476.4**	**30,326.4**	**150.0**	**6,866.2**	**14,376.0**	**2,295.8**

[a] No damage; losses from toll free operation for 1 month; [b] DOH = Department of Highways: losses 30% of damage; [c] DRR = Department of Rural Roads: losses 30% of damage; [d] Province and local roads: damage 30% of DOH network damage for the province, losses 30% of damage; [e] Damage to two truck terminals and a bus terminal in Bangkok; [f] Don Muang airport, damage estimate based on government statements, losses an estimate of private concessionaire and other losses; [g] Damage primarily siltation and hence reduced draft of navigable waterways, and erosion of river dikes; cost included in water resources section of the assessment.

The government's committee for restoring the transport network, chaired by the Minister for Transport, has proposed budget allocations for the immediate restoration of transport-related infrastructure. It is understood these allocations are: about THB 11 billion for national and provincial roads, THB 4.5 billion for rural roads, THB 900 million for the Don Muang airport, THB 260 million for the truck terminals in Bangkok, and about THB 2.6 billion for the railway. Table 32 reflects these, but with the comment that, for the railway, there is as yet little detailed supporting information.

Sector Context

Transport contributes about 7 percent to Thailand's GDP. More broadly, logistics-related services make up almost 20 percent of GDP. The country's transport sector consists of: (i) roads, about 51,000 km of national and provincial highways, 44,000 km of rural roads, and 84,000 km of local roads; (ii) rail, about 4,100 km of generally single track line; (iii) air, 6 international and 29 domestic airports; and (iv) waterways, about 2,700 km of coastal shipping routes and 1,850 km of inland waterways. Road accounts for about 94 percent of domestic freight transport, with rail and inland water transport providing for 2 percent and 4 percent respectively. For passenger transport, road is also by far the dominant mode.

The road network is relatively new, and largely in good condition, subject to the comments in the following paragraph. The rail network is much older, and provides relatively limited low-cost passenger and bulk freight services along four major corridors, to the north, the northeast, the east, and the south. Inland waterways carry mostly bulk agricultural and construction materials, with the services privately operated.

For the road sector, in particular the national system under the responsibility of the Ministry of Transport's (MOT's) Department of Highways (DOH), the network is in relatively good condition, with an asset value of around USD 40–50 billion. However, neither routine nor periodic maintenance allocations are now adequate. As a result, there is a significant and increasing backlog of critically needed periodic maintenance, a situation that is exacerbated by the shortfall in periodic maintenance funding. If the backlog is not addressed, the asset value, and capacity, of the national road network will decrease rapidly and, as was apparent from the field visits undertaken as part of the needs assessment, the network will be more susceptible to damage from events such as this flood. The combination of increasing traffic loadings and weakened road structures caused by long-term, inadequate periodic maintenance and a flood will rapidly reduce the overall service life of the network, and increase its susceptibility to damage in the event of a similar flood in future. Less information is available for the rural roads component of the network, for which MOT's Department of Rural Roads (DRR) is responsible, but it is likely that the situation is similar in respect of limited funding for essential periodic maintenance, and hence for the long-term sustainability of the network.

From the institutional perspective, DOH and DRR are capable of managing the works required to restore their respective networks to their pre-flood conditions. DOH has in the past received assistance from the World Bank to improve its capacity to manage its network.[89]

There is less certainty that the local road networks can be similarly restored quickly and effectively. These networks, which as noted above are extensive, are the responsibility of the provinces, local municipalities, and other agencies.

[89] Thailand: Highways Management Project, approved in December 2003

Overall, Thailand relies almost entirely on its road sector for the effective operation of its economy. While its existing institutions, with some uncertainty about the local level, are capable of relatively rapidly restoring damaged infrastructure to its pre-flood condition, there remain longer-term concerns about the gradual deterioration of the network due to less than adequate maintenance funding. Should this situation continue, the network would be progressively less able to resist damage from future events such as floods, necessitating higher damage restoration costs than would otherwise be the case.

Damage and Losses

Damage

Table 34 summarizes the damage to the transport sector, by sub-sector, as a consequence of the flood. As mentioned above, the damage is almost entirely to the road sector. For the 26 provinces that are included within this needs assessment, the damage can be broadly broken down as shown on the following page. The estimates of damage cost are based on the respective agencies' preliminary assessments of damage to their networks, converted to costs for each damage site or activity using the agency's standard unit costs for each type of work required.

Roads

For both major areas that the flood has affected, the central and northeast plains, the terrain is generally gently sloping. Rivers are wide and, in normal times, slow flowing. The heavy rain in the mountains to the north resulted in much greater than average inflows into the rivers that feed into the plains from the mountains. This flow exceeded the capacity of the rivers, which resulted in very substantial flows across the land surrounding the rivers, across which the region's road networks have been constructed. In most cases, drainage structures did not have the capacity to quickly pass the water under the roads, and the roads were overtopped. Typical damage, broadly in order of frequency, is described below. The damage types are common for all classes of road, from national highway to local accesses.

- Pavement surface cracking, or otherwise failing, caused typically by traffic continuing to use the road when a long period of inundation had reduced its strength substantially.
- Pavement loss, caused typically by a combination of traffic and rapid shallow flow across the downstream lane of the road surface.
- Embankment erosion, typically on the downstream side of the road, caused by shallow cross flow and, in some areas, wind-induced wave action.
- Damaged cross drainage structures, typically culverts, and adjacent slope protection.
- Incidental damage to traffic control facilities, such as signage, pavement markings, railing, etc.

While the damage is relatively straightforward to repair, it extends over very substantial sections of the network, and so will require the substantial investment indicated in Table 33.

Table 34: Transport – Damage in Thai baht, millions

	Public	Private	Total
Roads	**19,638.0**		**19,638.0**
Expressways	0.0		0.0
DOH	11,479.0		11,479
DRR	4,456.0		4,456
Locala	3,443.0		3,443
Truck terminals in Bangkok	260.0		260.0
Railways	**3,000.0**		**3,000.0**
Railway network	3,000.0		3,000.0
Civil Aviation	**900.0**		**900.0**
Airports	900.0		900.0
Waterways	**0.0**		**0.0**
Inland Waterways	0.0		0.0
TOTAL	**23,538.0**		**23,538.0**

Railways

Based on information provided by the State Railway of Thailand (SRT), there has been some damage to the railway infrastructure. Advice from the SRT indicates that the bulk of this is to embankments and track work, caused by long periods of inundation, with some damage to signaling, stations, and other facilities. The assessment has included the SRT estimate of damage, pending completion of a detailed assessment.

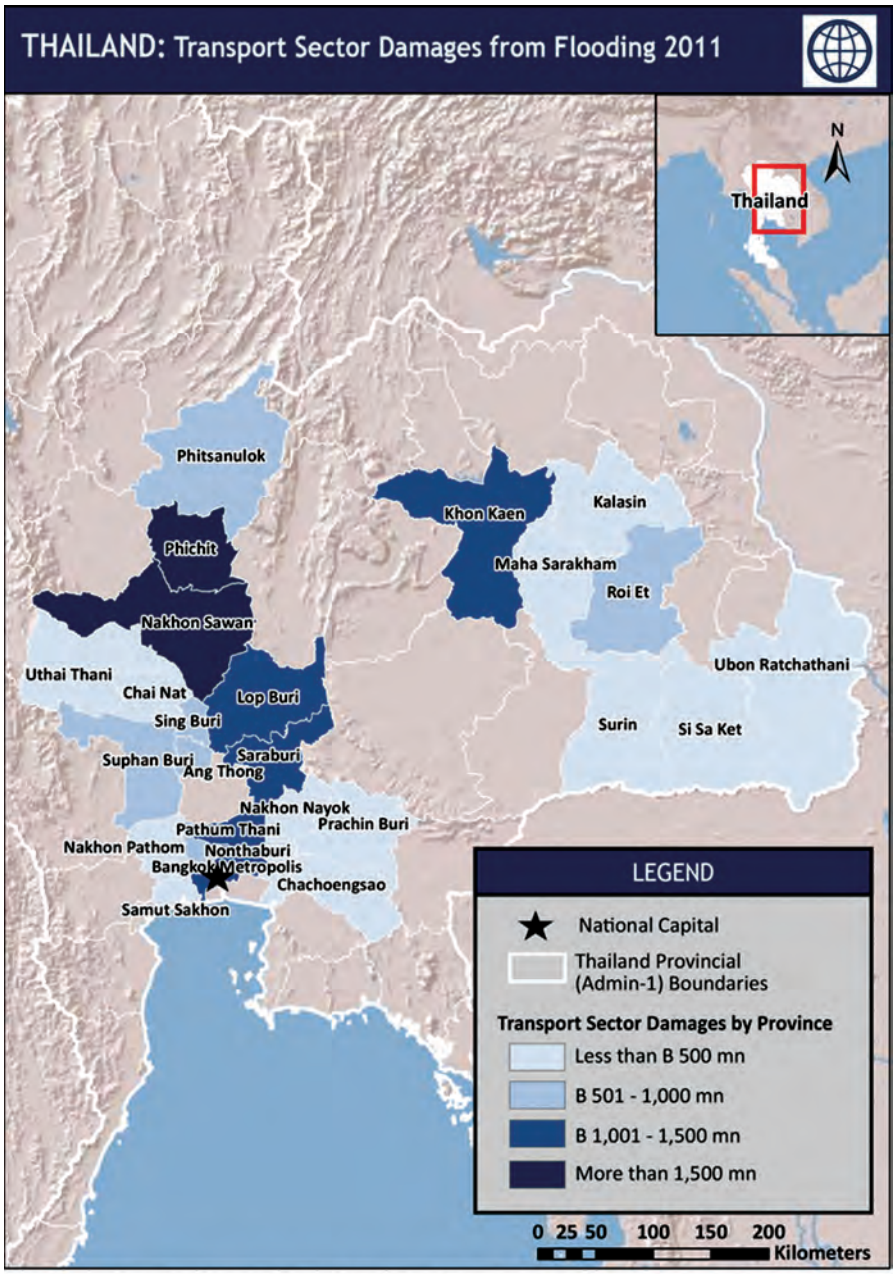
Civil Aviation

Bangkok's second airport at Don Muang was inundated shortly after the flood reached Bangkok, and remained inundated as this report was being prepared. The damage estimate presented in Table 33 above is based on information received from the government, and from the Airports of Thailand (AOT).

Inland Waterways

Based on information provided by the Marine Department, the agency responsible for maintaining the rivers and canals that make up the country's inland waterway network, there has been no significant damage to river ports or other facilities. The department advised, however, that many of the waterways will require dredging and river bank protection will require reconstruction. The cost for this, tentatively estimated at about THB 4.5 billion, has been included in the water resources part of this assessment.

Figure 14: Transport sector – Map of damage from flooding 2011



Layer Sources: Basemap (ESRI), Admin. Boundaries (DIVA-GIS), Transport Sector Damages (Authors). **[Created by GFDRR]**

Disclaimer: The borders and country names used are indicative and do not represent the views of The World Bank Group.

Losses

Based on available information, losses arising from the flood on each of the transport sectors are presented on a province basis in Table 35, which also includes damage by province. The basis for calculating losses is described below.

Table 35: Transport sector – Damage and losses by province in Thai baht, millions

Province	Damage -Total	Losses-Total
Ang Thong	522.9	156.9
Ayuthaya	1,264.1	379.2
Bangkok	1,526.8	788.1
Chachoengsao	99.0	29.7
Chai Nat	424.3	127.3
Kalasin	241.4	72.4
Khon Kaen	1,053.6	316.1
Lop Buri	1,381.2	414.3
Maha Sarakham	146.7	44.0
Nakhon Nayok	72.4	21.7
Nakhon Phatom	487.1	146.1
Nakhon Sawan	2,146.5	644.0
Nonthaburi	839.7	251.9
Pathum Thani	1,370.7	411.2
Phichit	1,835.6	550.7
Phitsanulok	947.8	284.4
Prachinburi	480.1	144.0
Roi Et	887.4	266.2
Samut Sakhon	296.8	89.0
Saraburi	1,301.9	390.6
Singburi	778.5	233.6
Si Sa Ket	465.8	139.7
Suphan Buri	768.5	230.5
Surin	453.7	136.1
Ubon Ratchathani	457.8	137.3
Uthai Thani	289.4	86.8
TOTAL	**20,539.00**	**6,491.9**

Note 1: Includes expressway toll losses (THB 450 million), and civil aviation (Don Muang Airport) damage and losses (THB 900 million and THB 150 million respectively). Railway damage and losses (THB 3 billion and THB 540 million) are not included, since the railway is not province-specific.

Roads

Losses for the expressway network have been assumed as tolls foregone on the expressways for which tolls have been temporarily removed. These expressways, including the elevated tollway to Don Muang airport, have provided access through otherwise flooded areas of Bangkok.

Losses for the national, provincial, rural and local road network within the 26 provinces covered by the assessment have been assumed at 30 percent of the damage to the network in the respective provinces. In this context, losses have been defined as the

increased cost of transport across the road network post-flood compared with pre-flood. The calculation of the losses so defined is based on pre-flood traffic, freight and passenger, in each province, adjusted for the post-flood condition by reducing travel speeds (a proxy for increased pavement roughness), increasing journey distances and times (a proxy for the effect of flood-caused closure of some network links), and making other adjustments as appropriate. The result across the 26 assessment provinces, for a range of assumptions for each variable used in the analysis, indicates that overall the losses have been equivalent to 27–35 percent of the estimated cost of the damage. Further work is being done, based on a whole-of-country network model operated by MOT's Office of Transport and Traffic Policy and Planning (OTP), but for the present purpose the assumed proportion of 30 percent is considered appropriate.

It is to be noted that this approach is relatively crude. The network model covers only the higher level road links (routes with 1 to 4 digit numbers); it does not include the local road network. Some of these lower level roads would have provided alternative routes used by traffic prevented by flooding from using the primary network. Also, inundation and closure periods varied from route to route; assuming a constant closure period across the network is a simplification of the actual situation. Finally, traffic volumes and composition would almost certainly have changed considerably, particularly during the inundation periods. However, since there have been no traffic flow or classification surveys done since the flood commenced, flows have been tested as above, with no change in composition.

Railways

Since the railway continued to operate during the flood period, albeit with diversions for trains travelling to the north, and the use of buses for the initial section of the link to the south, losses resulted from longer journeys and slower speeds, lower passenger and freight volumes, and other factors.

Civil Aviation

As noted above, the impact on the civil aviation sector has been limited to the inundation of Don Muang airport. Since the domestic flights that used the airport prior to the flood have transferred to Bangkok's main airport, there have been no flight-related losses. The losses assumed relate to services that the airport would normally provide when in service, such as food concessions, car parking, etc.

Inland Water

The government suspended operation of the inland waterway network for about 33 days at the peak of the flood, principally because the clearance under bridges crossing flooded waterways was not sufficient to allow barge traffic to move safely. During this period, based on annual freight loading on the network, about 3 million tons of principally agricultural and construction materials would have been transported. Information received indicates that about half of this traffic transferred to other modes, essentially road, and the remainder was held in storage until waterway services resumed. Overall, the loss incurred by the inland water system as a consequence of the floods has been assumed to be negligible.

Recovery and Reconstruction Requirements

The discussion in this section will be limited to the road network. The railway reconstruction works have yet to be defined in detail, and are likely to be relatively straightforward heavy maintenance activities with which the railway workforce is familiar. For civil aviation, restoration requirements will be limited to repairing damage to the Don Muang airport airside, terminal, and maintenance facilities, for which provision has been made in the damage summary presented in Table 34. These works will include providing asphaltic overlays for the two main runways, replacement of runway lighting, repair or replacement of electrical and mechanical systems in the terminal, and similar works. For inland waterways, there has been no damage to transport-related infrastructure. The dredging and river dike repairs that will be required have been included in the damage reported in the water resources part of the assessment.

Roads

The agencies responsible for the several parts of the road network – DOH, DRR, and the provincial and local bodies – have worked quickly and effectively to minimize damage to their networks during the flood, and to restore it to service as the waters receded. Damaged pavements were removed where necessary, pavement failures were repaired by overlays, and drainage structures were restored. From the limited field visits carried out during the assessment, it was apparent that the immediate restoration works have been effective, and traffic is using most of the network, albeit for considerable lengths of road using pavements that are significantly rougher than in the pre-flood condition. In the few locations where roads remain cut, typically due to a culvert washout, alternative routes are available and temporary structures can be constructed without significant cost or difficulty.

Reconstruction will be a much larger and longer-term task. For the DOH and DRR networks alone, the agencies' assessments have indicated that work of varying scope and cost is required at more than 1,000 locations. While there is no similar assessment as yet for rural roads, it can be assumed that the magnitude of the reconstruction task will be similar, although simpler in nature.

DOH and DRR are presently commencing preparation of designs for the reconstruction works. Based on discussions with the agencies, most of the works will involve restoring the roads to their pre-flood condition, with, in some instances, road elevations being raised, additional cross-drainage structures provided, and more extensive protection works being specified for sections of the roads where over-topping is likely in future similar floods.

While reconstruction to pre-flood condition may be appropriate in many of the damaged locations, consideration needs to be given to lessons learned from the impact of this flood on the network. These include a more overall approach to hydraulic design, alternative pavements (since concrete pavements perform much better than asphalt pavements when inundated) and others. These are discussed further below.

Challenges to Recovery and Reconstruction

Implementation

From an implementation perspective, the reconstruction works should present no significant challenges for the various road sector agencies. The works, although large in some instances (although most are estimated to cost THB 30 million or less), are of a standard nature with which the agencies are very familiar. Most of the works will be implemented by private sector contractors (except perhaps for the railway, which may utilize its large workforce). The works will most likely be supervised by a combination of the agencies' own personnel and private sector consultants. While availability of contractors, equipment and materials should not be a constraint, providing sufficient supervision resources to ensure that the works are executed to the required quality standards will require attention. Implementing such a large volume of work over a relatively short period can often result in a lack of attention to quality requirements, with a consequent reduced service life of the investment. To address this potential risk, more use than would normally be the case should be made of domestic private sector consulting resources for construction supervision.

Preparation

The agencies charged with restoring the road network to its pre-flood condition will be under considerable pressure to do this without delay, as soon as funds become available. Since the works are relatively simple, design and procurement documentation work can be completed very quickly. For much of the damaged network this will be the appropriate approach. However, the need for such a large-scale rehabilitation program presents an opportunity to look more closely at the network from a sustainability and disaster risk management perspective. In this context, the following concepts could be considered in developing the rehabilitation program.

Comprehensive and consistent hydraulic information

It seems apparent that each agency developing infrastructure, whether roads, canals, urban installations, and others, undertakes its own hydraulic studies, and bases its designs on these studies, without very much regard for what impact the development might have on other developments in adjacent areas. This can be a dangerous approach in flood plains such as the Chao Phraya River Basin, where small changes in the hydraulic

characteristics in one area can have adverse impacts on other areas a considerable distance away.

To avoid this situation, and also to provide the government with a comprehensive understanding of flood behavior in the basin, there is an urgent need for comprehensive modeling of the entire basin, and of the northern mountain catchments from which the basin's rivers originate. Having such a model available, with real time connections to rainfall levels, river height, dam operations and other critical inputs, would enable all agencies, developers, urban planners, etc, to have access to and share a common hydraulic information source for the entire basin. This would enable the impacts of proposed developments to be assessed for their wide impact, rather than for their very limited impact as presently appears to be the case. This initiative is reported on in more detail in the Flood Control, Drainage and Irrigation section of this report.

Providing for climate change impacts

It is now widely accepted that climate change will result in more such events as the recent flood, and also more periods of dry weather than is the case now. Climate change mitigation needs to become a standard input into the design of infrastructure that interacts with rainfall data and river flows. This should be considered as part of the basin modeling referred to above. Some studies of climate change impacts have been undertaken, and should be referred to.[90]

Develop hazard mapping

In conjunction with the hydraulic model development referred to above, the entire river basin should be mapped from the perspective of hazard vulnerability. Given the nature of the basin, this would focus largely on flood-related hazards, but would also take into account other hazards to which the basin might be subject.

Consider development of strategic road sub-networks

For a flood of this magnitude, perhaps 1 in 50 or 100 years to be determined, it is not always possible to maintain the entire road network in a flood free condition, at an acceptable cost. An alternative is to identify critical links in the network that are to be flood-free, and designed and constructed to be so, and to allow the remainder of the network to be inundated from time to time. This remainder would be designed to withstand inundation more effectively than present designs so, for example by including floodways – depressed sections of road, suitably protected against flow damage – to allow water to dissipate more quickly than is the case at present. Some portions of these less critical roads can be constructed higher than others, so that they can become places of refuge for people, livestock, implements, etc, to allow them to avoid the impact of the flooding on their usual locations.

Consider alternative pavement structures for road sections likely to be inundated

A very substantial portion of the damage to the road network, particularly the national network that carries heavy traffic, is failure of the pavement structure due to inundation-caused

[90] A Master Plan on the Climate Change of Thailand: An Energy and Food Crisis, Chulalongkorn University, 2010

loss of strength, and possibly breakdown of the asphaltic pavement, also due to inundation. The field inspections carried out during the assessment indicated much damage of this nature, and also indicated that concrete pavements performed much better under such conditions. In particular for the DOH national and provincial roads, the design process should consider alternative pavement structures – asphalt and concrete specifically – and apply in the analysis a whole of life cycle comparison, rather than a simple capital cost approach. The analysis would take into account, in addition to capital cost, routine and periodic maintenance costs, deterioration over time, the impact of flooding on the structure, and others as appropriate. It is likely, based on experience elsewhere, that concrete pavements will be more cost effective when the analysis is done in this manner, particularly when there is a high likelihood of flood-induced damage. While it is not possible with the information available to suggest which sections of the network could benefit from adopting concrete pavements, the notional additional capital cost of constructing 100 km of equivalent two-lane highway with a concrete rather than an asphalt pavement would be about THB 1 billion.[91]

Recommendations for Resilient Recovery and Reconstruction

The suggestions presented above, under the heading of preparation, will if adopted result in resilient recovery and reconstruction, and in a network that is better able to resist events of this nature over the medium to long term. The recovery and reconstruction activities can be considered over the following three time frames. Table 36 sets out estimated reconstruction costs for these periods.

Strategy for Short-term Recovery (up to 6 months)

- Continue rapid restoration of roads, the railway, and the Don Muang airport to basic trafficable condition as they emerge from inundation;
- Prepare designs and documentation for a rapid commencement of reconstruction when budget becomes available; and
- Commence the studies, in consultation with other agencies involved in reconstruction activities, which will take the suggestions set out above for improving damage resilience from concepts to implementable activities.

Strategy for Medium-term Recovery and Reconstruction

- Procure contracts and commence reconstruction activities, based on a sensible prioritization of works to ensure the most critical works are done first, within a likely constrained budget situation; and

[91] Based on the estimated costs of concrete and asphalt pavements as THB 15-20 million and THB 8-10 million respectively, as advised by DOH.

- Complete the resilience-related studies, with particular focus on the hydraulic modeling for the river basin – in conjunction with other relevant agencies – and progressively input these into the designs and documentation for the remaining reconstruction works.

Strategy for Long-term Recovery and Reconstruction

- Continue with the reconstruction works, ensuring that supervision and quality control are adequate; and
- Progressively adopt and mainstream the results of the resilience-related studies into all road design and construction activities.

Category	Type	~6 months	6-24 months	>24 months
Roads				
Expressways	No activities required			
National/Provincial Highways	Restore network to pre-flood condition with strengthening and improvements where necessary	1,147.9	8,035.3	2,295.8
Rural Roads		1.336.8	3,119.2	
Local Roads		1,721.5	1,721.5	
Transport Terminals in Bangkok	Restore to pre-flood condition	260.0		
SUBTOTAL		**4,466.2**	**12,876.0**	**2,295.8**
Railways				
Track	Restore to pre-flood condition	1,375	1,375.0	
Systems	Restore/upgrade to current standards	125.0	125.0	
SUBTOTAL		**1,500.0**	**1,500.0**	
Civil Aviation		**900.0**		
Don Muang Airport	Restore to pre-flood condition	900.0		
Inland Water Transport	See Flood Control, Drainage and Irrigation section			
TOTAL		**6,866.2**	**14,376.0**	**2,295.8**

Table 36: Transport sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Disaster Resilience in the Transport Sector

Policy Recommendations

In addition to these largely works specific activities presented in Table 36, the assessment proposes a number of policy-related matters, reflecting the broader issues introduced in the preparation section above. These are summarized in Table 37. The focus is the road sector, but the suggested river basin modeling, climate change mitigation studies, and hazard mapping activities have relevance across all sectors. Developing these would benefit from the availability of substantial technical assistance support. It is understood that Japan is already providing considerable support with some of this work. The government might wish to discuss this further with its other development partners also, for those areas not covered by the assistance from Japan.

Table 37: Transport sector – Policy recommendations

	Recommended Recovery Actions	Responsibility	Intended Outcomes	Responsibility
1	Develop and implement a comprehensive hydraulic model for the Chao Phraya River Basin, including all of its upstream catchment areas, to take into account potential climate change impacts.	Government to appoint a high-level official, with authority and resources, to bring together and direct the agencies responsible for – or involved with – the water sector, including the existing river basin authorities, where they exist.	A functioning and effective model for the behavior of the Chao Phraya River Basin, that (i) acquires, processes, and transmits river basin information; and (ii) is a resource to which all developments in the basin that may have significant impacts on hydraulic behavior are required to refer.	Within 2 years
2	Undertake a hazard mapping program for the .Chao Phraya River Basin, in conjunction with the hydraulic model development.	As for the modeling recommendation above.	In conjunction with and related to, the hydraulic model, a map for the basin, each province, each district, etc, that defines a specific area's susceptibility to a defined hazard.	Within 2 years
3	Develop a strategic road network program.	Ministry of Transport, with road sector agencies (EXAT, DOH, DRR, etc).	For a range of possible events, for example floods of varying frequencies, defined portions of the network that must be maintained blockage free where feasible to do so, and other portions that may be permitted to close. Appropriate technical approaches and standards for each of these two portions of the network.	Within 1 year
4	Adopt more flood resistant road structures – concrete pavements for example.	Ministry of Transport, with road sector agencies (EXAT, DOH, DRR, etc).	Defined sections of the strategic network, and other parts of the network, that could be reconstructed when appropriate with concrete pavements.	Within 1 year for defining locations; over time for implementation

Some recommendations here are similar to those in the DRM chapter and the Flood Control, Drainage and Irrigation chapter and coordination amongst responsible agencies will be necessary to avoid overlap and duplication of efforts.

Integrating Disaster Resilience into Transport Sector Programming

It is always possible to ensure that a road or other network will never be inundated. However, the cost for doing so, for very infrequent events, cannot be justified except for defined routes that serve essential purposes. Once it has been accepted that parts of the network will be inundated, and that inundation becomes reasonably predictable through the modeling referred to above, it is then necessary for the agencies responsible for the road networks to develop plans for managing the predicted, and actual, inundations as they happen. Observations made during the field visits that were undertaking during the preparation of this part of the assessment indicated that the agencies responsible for transport infrastructure reacted to the event very effectively, partly it must be said because the flood advanced at such a slow pace, which gave adequate time to prepare. Had that time been augmented by information about the likely height and extent of the flood – information that could be provided by a basin-wide model – the agencies might have been able to plan their reaction to the pending flood even more effectively. In summary, integrating disaster resilience – in particular for a disaster such as a basin wide flood – requires as much information as possible about how the flood is likely to develop over the entire period of its occurrence. Effective modeling of the basin's behavior is the key to this.

Electricity Sector

Summary

Thailand had one of highest electricity consumption rates per capita (2,177 kWh) in the region in 2011. The country's total installed generating capacity increased 5.85 percent from the previous year to 30,920 MW or 156,125.91 GWh[92] of energy supply. The combined sector net revenue in 2010 (EGAT, PEA and MEA) was recorded at about THB 61.8 billion, though no reports of private power producers' net revenue were available.

Flooding caused major damage to the power generation plant, sub-stations and distribution networks and resulted in severe revenue losses to the sector. Damage was reported in 18 out of 26 assessed provinces. The most severe damage and loss were reported in Ayuthaya province, followed by the Bangkok metropolitan area and Pathum Thani. The combination of abnormal floods, exceptionally high water levels and prolonged flooding was the reason for destructive power supply in the affected provinces. Flooding damaged one private-owned power generation plant and submerged 32 transmission and distribution substations, 18 of which were reported damaged. It cut power supply lines to more than a hundred thousand households and about 80,000 of those consumers have reported to having their meters damaged. The ongoing floods have killed 45[93] people due to electrocution.

Total damage and losses are estimated at about THB 8.9 billion, of which around THB 3.2 billion and THB 5.7 billion were for damage and losses, respectively. Economic losses were mainly due to losses of revenue from un-served electricity demands caused by power cuts.

Table 38: Electricity sector – damage, losses and needs in Thai baht, millions

Sub-sector/ Component	Disaster Impacts			Ownership		Recovery and Reconstruction Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Generation	2,425.07	1,091.76	3,516.83	0.00	3,516.83	0.00	2,425.00	0.00
Transmission	0.00	2,092.42	2,092.42	2,092.42	0.00	37.01	610.18	1,689.00
Distribution	760.69	2,531.42	3,292.10	3,292.10	0.00	861.50	2.00	0.00
TOTAL	**3,185.76**	**5,715.59**	**8,901.35**	**5,384.52**	**3,516.83**	**898.51**	**3,037.18**	**1,689.00**

Recovery and reconstruction needs are estimated at roughly THB 5.6 billion for: Short term (a) inspection of transmission lines, submerged substation and repair, (b) recovery of distribution systems including distribution substations, distribution lines, transformers, meters, Automatic Meter Reading (AMR), (c) re-installation of service stations (123 stations), (d) electricity use safety campaign at corporative and household levels; Medium term (a) recovery of submerged substations and flood protection, (b) review of distribution systems designs integrating disaster resilience and safety, (c) rehabilitation of submerged power plants; Long term (a) upgrading existing transmission substations to be disaster resilient, and (b) flood protection/proofing of substations and distribution networks. With a view to better disaster preparedness in the future, the sector has allocated THB 799 million for disaster resilience measures.

[92] EGAT's annual report 2010, page 21.

[93] The flood situation report of November 23, 2011

Sector Context

The electricity sector of the Kingdom of Thailand is operated largely by state-owned entities, namely (i) the Electricity Generating Authority of Thailand (EGAT), Provincial Electricity Authority (PEA), and (iii) Metropolitan Electricity Authority (MEA), as well as private power producers, who mainly run the generation business. Thailand's electricity consumption per capita in 2010 was 2,177 kWh[94].

EGAT's main operations focus on (i) electricity generation (including purchase from neighboring countries) and transmission business, and (ii) selling bulk electricity to state-owned autonomous distributing authorities PEA and MEA, and some direct customers (medium and large enterprises). EGAT owns and operates various types of power plants located in 39 sites, totaling about 15,000 MW countrywide. Its power generation fleet consists of six combined cycle power plants, three thermal power plants, 21 hydropower plants, eight renewable energy power plants and a diesel power plant.

At the end of 2010, EGAT's transmission network comprised 30,639.75 circuit-kilometers of transmission lines with voltage levels ranging from 500, 300, 230, 132, 115, to 69 kV, and 208 substations with 531 delivery points and a total transformer capacity of 75,505.19 megavolt-amperes (MVA).

In the same period, the country's total installed generating capacity increased 5.85 percent from the previous year to 30,920.02 MW[95] , comprising of (i) EGAT's Power Plants, 14,998.13 MW (48.50 percent), and (ii) Power Purchase of 15,921.89 MW (51.50 percent). The power purchase included 12,151.59 MW (39.30 percent) from domestic independent power producers (IPPs), 2,182.30 MW (7.06 percent) from small power producers (SPPs), and 1,588.00 MW (5.14 percent) imported capacity from neighboring countries.

In 2010, EGAT's electric energy sales volume rose 10.19 percent from the previous year to 156,125.91 million kWh. Its sales included 106,403.53 million kWh of energy (68.15 percent) sold to the Provincial Electricity Authority (PEA), 46,636.29 million kWh (29.87 percent) to the Metropolitan Electricity Authority (MEA), 1,595.07 million kWh (1.02 percent) to a small number of direct customers, 1,314.30 million kWh (0.84 percent) to neighboring utilities, and 176.72 million kWh (0.11 percent) to other minor customers.

Total net income of EGAT in 2010 was recorded at THB 37.4 billion compared to THB 31.2 billion in 2009 or equivalent to 19.62 percent increase.

The Provincial Electricity Authority (PEA) was established as a state enterprise for public utility under the Provincial Electricity Authority Act B.E. 2503 (1960). The main objective of PEA is to generate, obtain, distribute and sell electricity to people, businesses, and industrial sectors in 73 provinces throughout Thailand, with the exception of the Bangkok Metropolitan Administration, Nonthaburi and Samut Prakan provinces. PEA has strong relationships and conducts considerable transactions with EGAT. Most electricity energy sold to customers by PEA was purchased from EGAT.

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94 Team's calculation based on data of electricity sold by EGAT, PEA and MEA in 2010 provided by EPPO, and population data posted at http://www.trueknowledge.com/q/population_of_thailand_2011

95 EGAT's annual report 2010, page 18.

By September 2011, PEA's distribution network consisted of 19,672 circuit-kilometers of 115 kV line, 273,191 circuit-kilometers of 22 & 19 kV line, 459,796 circuit-kilometers of 0.4 kV line, 229,619 distribution transformers with capacity of 80,793 megavolt-amperes (MVA). Total number of households connected to PEA's networks, in September 2011, was recorded as 15,912,540 households equivalent to 99.37 percent of households in PEA service areas, which represents 99.98 percent of villages in PEA areas.

In 2010, PEA's electricity purchase from EGAT we recorded at 106,404 million kWh and from small and very small private power producers (SPPs and VSPPs) 1,256 million kWh and PEA self-generation was accounted at 103 million kWh. In the same year, PEA electricity sales volume rose 11.77 percent from the previous year to 100,750 million kWh[96]. In the year, PEA provided 1,714 million kWh of electricity free-of-charge to poor households.

Total net income of PEA in 2010 was recorded at THB 14.8 billion compared to THB 14 billion in 2009 or equivalent to a 5.45 percent increase. PEA employed 27,847[97] staff in 2009.

The Metropolitan Electricity Authority (MEA) is a state enterprise under the Ministry of Interior. It was established on 1 August, 1958 under the Metropolitan Electricity Authority Act 1958 by combining the Bangkok Electricity Authority (Wat Liab) with Samsen Royal Electricity Authority under the Department of Public Works.

At the beginning of its establishment, the MEA was responsible for generating and retailing electrical power in the metropolitan area, until 1961 when the generation plant was transferred to the Yanhee Electricity Authority, later renamed The Electricity Generating Authority of Thailand (EGAT). Since then the Metropolitan Electricity Authority has only been in charge of the distribution of electrical power to the Bangkok metropolitan area and Nonthaburi and Samut Prakan provinces.

At the end of 2010, MEA's network consists of 1,656.57 circuit-kilometers with voltage levels ranging from 230, 115 and 69kV, including 382.89 circuit-kilometers of underground cable, 149 substations (3 substations of 230kV-115kV, and 146 substations of 115kV-12kV). The low voltage distribution networks consists of 14,868.16 circuit-kilometers with voltage levels of 24kV and 22kV, exclusive of underground cable of 1,936.38 circuit-kilometers, with distribution transformers with capacity of 19,995 megavolt-amperes (MVA). The total number of consumers connected to MEA's networks in 2010 was 3,035,144, which is equivalent to 88.23 percent of those in the service areas. The average monthly sale of energy is 3,667.70 GWh.

In 2010, MEA's electric energy purchase from EGAT we recorded at 46,634 million kWh and from private power producers 5.57 million kWh. Electricity sales volume in 2010 rose 7.97 percent year on year to 45,060 million kWh[98] and MEA's energy loss was accounted for 1,580 million kWh, equivalent to 3.39 percent.

[96] Source: EPPO (Nov 2011)

[97] Source: PEA Annual report 2009

[98] Source: EPPO (Nov 2011)

Total net income of the MEA in 2010 was recorded at THB 8.7 billion compared to THB 7.3 billion in 2009 or equivalent to a 19.46 percent increase.

Damage and Losses

Damage

The assessment team, consisting of officials from EGAT, PEA, EPPO and the World Bank, visited the two affected provinces (Nakhon Sawan and Ayuthaya) on November 13–15, 2011 to assess damage and losses caused by flooding. Data used for the assessment were provided by relevant power utilities (EGAT, PEA, MEA and EPPO). In addition, data and information obtained during the visit to the affected provinces were taken into account. Data was verified with relevant entities.

Table 39: Electricity sector - Damage in Thai baht, millions

	Public	Private	Total
Generation	00.00	2,425.07	2,425.07
Transmission	00.00	00.00	00.00
Distribution	760.69	00.00	760.69
TOTAL	**760.69**	**2,425.07**	**3,185.76**

For the assessed provinces, floods hit Nakhon Sawan on 3 October, 2011 and reached Ayuthaya three days later. Floodwater levels in some areas was reported as deep as 1.5–2.0m. The floodwaters remained at that height for 2–3 weeks in the countryside and about 3–4 weeks in urban areas (case of Rojana Industrial Park).

The recent flood reportedly caused damage to the electricity sector in more than a dozen provinces including the Bangkok metropolitan area. The following sections will assess how seriously the floods impacted the sector in terms of damage and loss. For damage calculation, the official replacement cost (market price), which was approved by relevant utilities,[99] will be used.

Damage to power generation plant

Damage to a power generation plant was reported in Ayuthaya province. The privately owned 280MW combined-cycle power plant in Rojana Industrial Park was flooded in the third week of October and remained flooded at the time of the team's field visit on 15 November, 2011. The power plant was substantially damaged and requires the replacement of some parts of the generator, turbines, main transformers and the re-installation of all Remote Terminal Units (RTU) and communications networks. Based on the visit and discussions with the owner of the power utility, the damage to the Rojana power plant is estimated at THB 2.4 billion. No other damage to state or private facilities was reported during the assessment.

Damage to the transmission system

There were no reports of damage to the transmission lines although 6,240 towers were flooded. No other damage to state or private transmission networks was reported during the assessment.

[99] PEA's Reference Price for Procurement of Goods, Number Six for the Year 2011 dated September 2011.

Damage to distribution networks

Damage to distribution networks was reported in 18 of the 26 assessed provinces including the Bangkok metropolitan area. Eighteen substations were submerged and damaged. These submerged sub-stations are located in the Central Region 1 including Ayuthaya, Saraburi, Ang Thong, Pathum Thani, Prachinburi, Nakhon Nayok and Sa Kaeo provinces. The most severe damage to sub-stations was reported in Ayuthaya, Pathum Thani and Saraburi provinces. Some 80,000 electric meters were reported damaged, of which 72,930 are 1-phase meter with capacity ranging from 5(15)A - 2 wire to 30(100) A - 2 wire, and 3,960 are iii- phases meters, 15(45)A - 4 wire to 30(100)A - 4 wire. Most of the damaged meters were recorded in Ayuthaya (27,247), Nakhon Sawan (17,471), Ang Thong (8,243); and Pathum Thani (6,686) provinces.

In Central Region 1, floods damaged 848 automatic reading meters and 1,885 time-based use meters for low and high voltage connection (TOU - Low voltage - 4 wire and TOU - High voltage - 4 wire). The damage to the distribution networks is estimated about THB 760.69 million. No other damage to distribution networks was reported during the assessment.

Damage to property and assets

Some 155 office vehicles were reported as damaged assets in the metropolitan areas of Bangkok and Nonthaburi provinces. Minor damage to property (e.g. office equipment, materials, and supplies) was reported in PEA branch offices in the affected provinces. These were negligible and were not included in the damage calculation. Damage to office vehicles is estimated about THB 5.42 million. No damage to warehouses and other assets were reported. This damage to property/assets is included in the distribution business.

It was noted that the damaged power plant, substations and distribution networks are located in very low-lying, flood-prone areas. It was assessed that the damage to power plant, substations and distribution networks was caused by extra-ordinary flooding associated with high water levels and prolonged flooding.

Total damage is estimated at about THB 3,185.76 million.

Losses

Losses to generation, transmission and distribution businesses were estimated on the basis of business disruption or the opportunity loss (sale of energy) caused by the flooding. Following sections discuss the losses of subsectors and the methodology of loss calculation.

Loss to generation business

Losses were calculated from the first day the business was interrupted until the business is fully restored and back to operation as of pre-disaster situation. With its resources, the company expects to rehabilitate the damaged power plant in 18 months – including the flooding period. The rehabilitation will start when the floods is completely receded. With the stated characteristics of the power plan, the loss of power generation is estimated at about 2,207.52 GWh.

Due to damage in some parts of the distribution networks, PEA and MEA expect a reduction in power purchase from private producers in 2011 and 2012 by about 5,194.21 GWh, which will result in losses for private companies of roughly 7,401.73 GWh (including the damaged Rojana power plant). With the average (energy) sale tariff of THB 2.99 kWh and average production cost of THB 2.85 kWh, the total loss of generation business is estimated at about THB 1.1 billion.

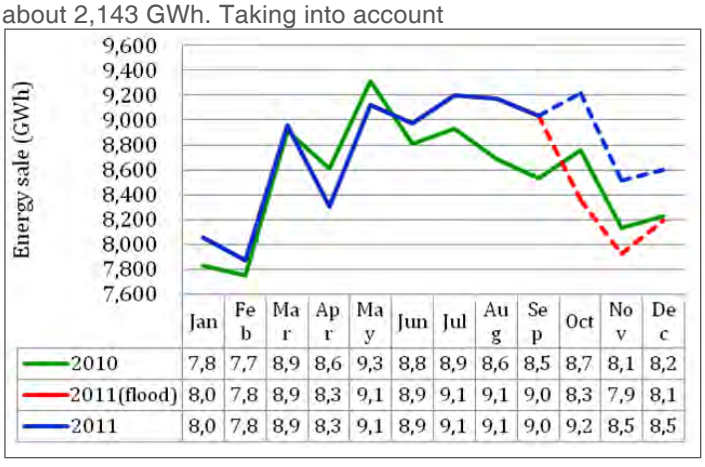
Installed capacity	MW	280
Plant production factor	%	65-60
Estimated energy production	GWh/year	1,472
Recovery period	months	18
Estimated loss of energy production	GWh	2207.52
TOTAL Loss of revenue		**1,091.76**

Table 40: Damage to the Rojana Power Plant in Thai baht, millions

Loss to transmission business

Prior to flooding, EGAT had expected to sell about 157,054 GWh of energy to PEA and MEA in 2011. After, EGAT revised its projected energy sales down to 154.649 GWh. In 2012 EGAT is expecting a loss of energy sales of about 2,143 GWh. Taking into account EGAT's energy production costs and its average purchase tariff[100] of THB 2.11 kWh and average sale tariff of THB 2.48 kWh, the estimated EGAT revenue loss in 2011 and 2012 is THB 1.7 billion. Aside from the loss of revenue, EGAT also paid to protect its stations and equipment from floods, as well as paid for emergency operations and flood relief. These extra operations will cost them about THB 377.37 million.

Figure 15: PEA Energy sales in 2010 and 2011



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	7,8	7,7	8,9	8,6	9,3	8,8	8,9	8,6	8,5	8,7	8,1	8,2
2011(flood)	8,0	7,8	8,9	8,3	9,1	8,9	9,1	9,1	9,0	8,3	7,9	8,1
2011	8,0	7,8	8,9	8,3	9,1	8,9	9,1	9,1	9,0	9,2	8,5	8,5

[100] In addition to its power generation fleet, EGAT purchase power from PPP and from neighboring countries.

PEA is experiencing similar losses. Before flooding, PEA had expected to sell about 102,367 GWh of energy to its consumers in 2011. Due to flooding, this target has been revised down to 101,436 GWh. The target for 2012 has also been revised and scaled down from 115,236 GWh to 113,238 GWh. Revenue loss to PEA is estimated to be about THB 2.3 billion for 2011 and 2012, until its supply system is restored and business returns to pre-flooding conditions.

Figure 15 shows PEA's actual energy sales in 2010 and nine months in 2011 plus the sales forecast for Q4 of 2011, for both before flooding and after-flooding scenarios.

MEA is also experiencing similar losses. Since its network was not severely damaged, the disruption to energy supply was very brief. MEA expects no loss of energy sales in 2012. For 2011, MEA's loss of energy sales is estimated to be about 418.94 GWh only, equivalent to THB 232.19 million. During the floods, MEA used energy to pump water to protect the Bangkok metropolitan area, to the cost of about THB 10.68 million.

Total losses to distribution business are estimated at about THB 2.5 billion (Table 41). Damage and loss totals by province are shown in Table 42

Table 41: Losses to distribution businesses in Thai Baht, millions

Losses by Organization	Losses
MEA's Losses	242.88
PEA's Losses	2,288.54
TOTAL	**2,531.42**

Table 42: Electricity sector – Damage and losses by province in Thai baht, millions

Province	Damage	Losses	Total
Ang Thong	5.51	3.02	8.53
Ayuthaya	2,803.64	3,359.97	6,163.61
Bangkok	2.80	2,262.43	2,265.23
Chai Nat	1.04	0.65	1.69
Lop Buri	4.78	2.73	7.51
Nakhon Nayok	1.11	0.54	1.65
Nakhon Pathom	1.03	0.56	1.59
Nakhon Sawan	11.27	6.24	17.51
Nonthaburi	2.63	72.86	75.48
Pathum Thani	310.79	4.06	314.85
Phitsanulok	0.31	0.21	0.51
Phichit	0.28	0.20	0.47
Prachinburi	0.72	0.45	1.17
Samut Sakhon	0.29	0.16	0.45
Saraburi	37.76	0.17	37.94
Singburi	0.30	0.19	0.49
Suphan Buri	1.31	1.07	2.38
Uthai Thani	0.19	0.13	0.32
TOTAL	**3,185.76**	**5,715.63**	**8,901.39**

Note: Only 18 provinces out of 26 in the assessment area reported damage and interrupted power supply

Recovery and Reconstruction Requirements

Challenges to Recovery and Reconstruction

There is a clear division of tasks in the sector and strong capacity, both human and financial, to cope with disasters. The recent flooding has reminded the power utilities to be prepared for worst-case scenarios. EGAT has committed some THB 799 million to upgrade their existing systems and assets (e.g. transmission lines, towers, sub-stations) to be more flood resilient. These measures were incorporated in the budget at every stage of recovery and reconstruction efforts, which is estimated to be 14.58 percent of the total replacement costs.

A portion of EGAT's post-flooding costs was for financial management costs, caused by late payments from other utilities. These late payments highlight the fact that other utilities companies had not budgeted for disaster response and resilience. In the greater interest of the power business and the sector in general, a cooperation credit (soft loan) should be made available for those power utilities to upgrade their networks to be more resilient to flooding/disasters, as any cut to any of the networks affects the others – of which the current floods has made a case.

Renewable energy supply by solar power could address a bunch of problems but not all of them. It may be counter-productive if dead batteries are not well managed, plus households may end up not using it at all if proper and regular maintenance is not done and time of use is not well managed. Risk of losing human lives by electrocution can be minimized if more disaster resilient specifications of in-house wiring are used with extensive and continuous awareness campaigns on safe electricity usage.

Recommendations for Resilient Recovery and Reconstruction

Strategy for Short-term Recovery (up to 6 months)

- **Providing meters quickly and reestablishing safe connections** as quickly as possible will help both the service providers and users and reduce safety risks. Meters should be replaced above this flood level, where possible. A quick and bulk purchase would help (i) avoid further losses of revenue (ii) mitigate loss of lives, and (iii) reduce the purchase costs of the meters.
- **Inspection of transmission lines.** The submerging of thousands of transmission lines towers triggered line safety concerns. There is an urgent need for the inspection of transmission lines where towers were flooded. Should any sign of line safety be found, immediate reinforcement should be carried out. This strategy should also be applied to ensuring the safety of substations.
- **Rapid restoration of the distribution networks,** where possible: A win-win strategy – it would help power utilities to reduce revenue loses, at the same time helping consumers to restart their businesses.

Strategy for Medium-term Recovery and Reconstruction (6–24 months)

- **Ensure all affected facilities are completely restored with better disaster resilience capacity.** Revisiting the specifications of in-house wiring will help reduce the risks of loss of lives if better water-proof household switches, sockets, breakers and fuses are made available at reasonable prices.
- **Explore lowest-cost options to minimize damage to existing substations in future** floods by considering the relocation of substations in low-lying areas to higher ground, and moving critical equipment above the recent floodwater level.
- **Take action to reduce the number of deaths by electrocution in future floods.** The following measures are recommended for consideration:

  (i) Campaign on safe electricity use. Campaigns ought to be re-activated, especially in the affected and flood-prone areas. This should be done mostly at the community and household level and is especially important for female-headed families and the elderly, children and disabled. It should be a continued campaign through various means. A televised campaign is thought to be a very successful way of disseminating the information.

  (ii) Revisit the safety design standards and specification of in-house wiring net works.

  (iii) Search for waterproof and lowest-cost household switches, sockets, breakers, fuses, etc. that can be recommended for household use in the flood-prone areas. Private companies that are motivated to test new technologies should be engaged for developing safe electrical equipment.

  (iv) Develop plans for emergency response and consider cutting power in the event of flooding, and not restoring it until flooding has completely disappeared.

  (v) Explore alternate energy options (e.g. solar power), especially in flood-prone areas. Should solar power technology be selected, a dead battery management program should also be introduced to avoid exposure of toxicity associated with the change of power source and equipment changes.

Strategy for Long-term Recovery and Reconstruction (beyond 2 years)

As climate change combined with uncoordinated development could make more frequents of flooding. Long-term disaster preparedness measures are needed. Recommendations for reducing risk in the sector include:

- Revise specifications of the power system including but not limited to the founda tion of transmission lines, and the strength of the towers and cross arms should be revisited and more disaster resilient specification/designs should be available for immediate use. These disaster resilient specifications for power systems should be consulted with other stakeholders to avoid creating impacts to the sectors.
- Upgrade main transmission substations in the disaster prone areas to be disaster resilient. Flood protection/proofing of existing substations.

Category	Type	~6 months	6-24 months	>24 months
Generation	1.Rehabilitation of Submerged Power Plant		2,425.00	
SUBTOTAL			2,425.00	
Transmission	1.Inspection of transmission lines (foundation) and repair	31.40		
	2.Inspection of substations	0.32		
	3.Repair of submerged substation	5.29		
	4.Reconstruction of submerged substations and protection		610.18	
	5.Upgrading main transmission substations in the disaster prone areas to be disaster resilient			1,500.00
	6.Flood protection/proofing of existing substations			189.00
SUBTOTAL		37.01	610.18	1,689.00
Distribution	1.Recovery of damaged substations (18 substations)	550.00		
	2.Recovery of distribution systems (distribution lines, transformers, meters, Automatic Meter Reading-AMR)	250.00		
	3.Installation of service stations (123 stations)	61.50		
	4.Review distribution systems designs and in-house wiring specifications integrating the disaster resilience and safety issue.		1.00	
	5.Awareness campaign on electricity use safety		1.00	
SUBTOTAL		861.50	2.00	
Increase Disaster Resilience	(for increasing Disaster Resilience, some **THB 799.18 million** is included in the total cost)			
TOTAL		**898.51**	**3,037.18**	**1,689.00**

Table 43: Electricity sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai Baht, millions

Disaster Resilience in the Electricity Sector

Disaster resilience can be defined as 'the capacity to prevent, mitigate, prepare for, respond to and recover from the impacts of disasters. Building resilience will enhance the utilities' and communities' ability to minimize the effects of future disaster events and to efficiently and effectively cope with their impacts. Resilience is a dynamic quality and is usually developed and strengthened over time. This can be achieved by guiding and supporting a range of resilience strategies in the key areas of built infrastructure, land use planning, emergency management and planning and community education capacity building.

Resilience, in the context of infrastructure, can be defined as the ability of an asset or system assets, to continue to provide essential services when threatened by an unusual event (e.g. a flood or typhoon) as well as its speed of recovery and ability to return to normal operations after the threat has receded. Resilience also involves designing an infrastructure asset, or adapting an asset so that although it comes into contact with threats such as flood waters or high winds during flooding and cyclone events, no permanent damage is caused, structural integrity is maintained and, where operational disruption occurs, normal operation can resume rapidly after the threat has receded.

With the above concept in mind, the integration of disaster resilience into the electricity business may include:

- Reviewing the electricity network to identify and rectify any vulnerabilities following a flooding or typhoon event.
- Designing and locating major electrical infrastructure to withstand (where possible) typhoon strikes.

Telecommunications Sector

Summary

The telecommunications sector includes landline communications, cellular communications, broadcasting (television and radio) and postal services. The telecommunications sector in Thailand is dominated by mobile communications. Most of the major damage was to landline communications in urban areas and industrial estates where services have been disrupted. Over three hundred cellular communications sites, mostly in Bangkok and neighboring provinces, have also been affected. The broadcasting and postal services were also affected, though to a lesser degree.

The losses in the telecommunications and broadcasting sectors accounted for the loss of revenue due to the disruption of services caused by the floods, and the extra expenditures for emergency repair of damaged sites and reconnection of the services. Revenue losses were relatively substantive in all sub-sectors.

The priority needs for recovery and reconstruction are to restore full services within the first six months, building back with immediate risk reduction measures.

The medium-term will put efforts in improving the resiliency of existing terrestrial infrastructures through a number of mitigation measures and a review of policies to achieve the mainstreaming of disaster risk reduction into the telecommunications sector. More studies should be carried out to assess the impacts to the systems and cost the substantive mitigation measures to be put in place during the medium and long term.

In the long-term, the expansion of telecommunications and broadcasting networks should be designed to be more resilient to multi-hazards, and substantial investment for a resilient infrastructure better prepared for multi-hazards should be encouraged.

Table 44: Telecommunications sector - Damage, losses and needs in Thai baht, millions

Sub-sector/ Component	Disaster Impacts			Ownership		Recovery and Reconstruction Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Land-line communications	742.32	1,995.51	1,937.83	865.58	1,072.25	926.37	531.0	180.0
Cellular communications	280.92	699.09	980.01	19.65	960.37	364.92	541.7	270.0
Broadcasting	131.39	488.73	620.12	401.86	218.26	170.20	173.6	360.0
Postal services	135.00	175.00	310.00	310.00	-	177.00	175.0	170.0
TOTAL	**1,289.63**	**2,558.33**	**3,847.97**	**1,597.09**	**2,250.88**	**1,674.49**	**1,421.3**	**980.0**

*Note: *The needs include cost estimates for disaster resilience and build back better. However, more detailed studies should be carried out by service providers to assess the impacts of the systems progressively as the flood recedes and cost the substantive mitigation measures to be put in place during the medium-term and long-term.*

Sector Context

The telecommunications sector in Thailand is dominated by mobile communications. Mobile use has steadily increased, with 75,572,336 subscribers in 2011, while the number of fixed line subscribers in Thailand has seen a decline with 6,884,668 subscribers in 2011. The mobile market in Thailand is dominated by three private operators – AIS, DTAC and TRUE. In the 3rd Quarter of 2011, AIS, DTAC and TRUE are commanding a combined 98 percent market share of 75,572,336 subscribers. According to their 2010 annual reports, the revenue of the mobile market held by AIS (THB 102.5 billion), DTAC (THB 67.9 billion) and True (THB 62.4 billion) added up to nearly THB 232 billion. About 52 percent of the distribution of fixed line subscribers is concentrated in the metropolitan areas, with the rest distributed across rural areas. About 53 percent are also subscribed to broadband internet services in 2011 as compared to 36 percent in 2009 and 46 percent in 2010. True is the largest private Internet Service Provider in Thailand, with a broadband and dial-up subscriber base of 1.9 million subscribers.

Telecom of Thailand (TOT) offers leased line/circuit services with countrywide coverage, in addition to the DSL ports that could be subscribed with its fixed-voice landlines. Its customers consist of private businesses, government agencies, and other telecommunication service providers. CAT operates Thailand's international telecommunications infrastructure and also provides data communications and applications services, including leased circuits, predominantly to businesses, including to the other internet service providers for access to the international networks.

The National Broadcast and Telecommunications Commission (NBTC) is the organization in charge of regulating telecommunications and broadcasting services in Thailand. Television is the most popular medium in Thailand having an estimated household penetration of 98 percent. Up to 8.7 million households receive TV via terrestrial broadcast and 4.8 million households via satellite. The advertisement revenue of non-paid TV in 2010 was THB 61 billion.

Thailand has six terrestrial TV stations based in Bangkok with repeaters across the country. Channel 3, which has 32 relay broadcast stations, has annual revenues of THB 11.9 billion, according to its 2010 annual report, with advertising income representing about 93 percent of the total revenue. Channel 5 had regional networks, with more than 30 stations across the country broadcasting programs from the Bangkok Central station by a satellite system. Channel 7 installed its first ground network station in the provinces and expanded the facility to comprise 35 stations. The Mass Communications Organization of Thailand (MCOT) (Channel 9) broadcasts from the host station in Bangkok to its 36 local network stations nationwide and through 62 radio stations nationwide. MCOT's 2010 annual report indicated revenues of THB 5.6 billion for that year, with about 67 percent coming from television.

Cable and satellite television penetration in Thailand was 48.1 percent in 2010. Almost 2 million households receive TV via TRUE Cable and 3.7 million households via local cable providers. According to their 2010 annual report, the revenue of the True Visions Group of companies was THB 9.4 billion in 2009, and THB 9.5 billion in 2010.

It is estimated that Thailand has about 200 AM radio stations and more than 300 FM stations. The Public Relations Department (PRD) operates the national television (Channel 11) and radio networks, being the biggest national radio operator and owns 144 radio stations, (87 FM and 57 AM) in 60 provinces. The total revenues were THB 478.98 million in 2009, and THB 476.61 million in 2010, with estimates for 2011 at THB 563.85 million. The time rental of radio and TV are the main revenues (67 percent in 2010). Community radio stations operated with low-power transmitters have proliferated in the last few years and it is estimated that around 7,500 unlicensed community radio stations operate in Thailand. The advertisement revenue of licensed radio (excluding community radio) in 2010 was THB 5 billion.

The postal service industry in Thailand is classified into domestic and international services. Thailand Post Co, Ltd. (Thailand Post) covers around 80 percent of domestic postal service activities. For international postal service, DHL (52 percent) and FedEx (28 percent) are the main players. Other postal companies including Thailand Post, UPS and TNT share the remaining 20 percent of international postal service activities.

Thailand Post operates 16 mail centers and six bulk posting centers. The number of post offices has increased gradually to 1,162 offices in 2011. In addition, there are 28 mobile post offices as of 31 August 2011. According to the Universal Postal Union, one permanent office serves approximately 14,000 inhabitants. Thailand Post's revenue from postal service is around THB 13 billion per year. More than three-fourths of revenue of the postal service comes from domestic mail. Revenue from international mail accounts for slightly more than 15 percent and the rest is from postal financial services. The share in revenue of domestic mail has gone up from 76.3 percent in 2008 to nearly 80 percent in 2011. For the international mail and postal financial services segment, the figures have been constantly lower both in sales volume and monetary value.

Damage and Losses

Damage

The main causes of telecommunications disruption due to the extensive flooding in Thailand are physical water damage and electrical power disruptions. The landline communications systems operated by public service providers have been severely affected in urban areas. These include the cables and leased lines connecting the flooded industrial estates in the lower parts of central Thailand. Until the date of this reporting, the leased line sites of these industrial estates, which are still flooded, are still out of function. The service providers estimated between three and six months of service disruption in the industrial estates before the flood recedes and business could resume. Estimated damage to landline communications, which include the leased line data networks and the voice and data line networks, amounted to THB 553.95 million.

The National Broadcast and Telecommunications Commission (NBTC) reported that 398 base stations and cell sites were damaged/cannot be operated as of 1 November 2011, out of which 97 cell sites were due to electricity disruptions. The cell sites were located in Bangkok and the provinces of Pathum Thani, Nonthaburi, Ayuthaya, Nakhon Sawan, Nakhon Phatom, Uthai Thani, Lop Buri, Singburi and Saraburi. More than 80 percent of the

damaged cell sites were in the provinces of Pathum Thani, Nonthaburi, Ayuthaya and in Bangkok. The sites were either impacted directly by the floodwater or could not operate due to temporary power cuts. With the limited information at hand, the assessment assumed that half of the base stations that were not operational as of 1 November 2011 were flood damaged, and the other half were not operational because of cuts to electricity supplies due to the floods, and that the damaged cell sites are split equally between 2G cell sites and 3G cell sites. The estimated damage to cellular communications, which include the damaged cell sites, amounted to THB 280.92 million.

Table 45: Telecommunications sector – Damage in Thai baht, millions

Sub-sector / Component	Public	Private	Total
Land-based communications			
Leased line data network	125.19	41.98	167.17
Voice data landline	188.37	386.78	575.15
Cellular communications			
Transmission systems		280.92	280.92
Broadcasting			
TV and radio broadcasting	57.97	24.75	82.72
Community radio broadcasting	-	48.67	48.67
Postal services			
Postal installations	135.00	-	135.00
TOTAL	**506.53**	**783.10**	**1,289.63**

It should be noted that figures of damage and losses provided in this assessment were based on information provided by the public (CAT, TOT) and private (TRUE) telecommunications service providers. It is important to also note that the information on damage and losses of other major private mobile operators (AIS, DTAC) was not available at the time of the assessment and that many provinces, including the densely populated ones neighboring Bangkok, are still flooded. Extrapolations were made based on the market share information (AIS, DTAC, and TRUE: 43.5, 30.51 and 24 percent respectively) and information provided by the NBTC to estimate total damage in the telecommunications sector in the 26 flood-affected provinces.

The estimated damage to the broadcasting sub-sector, which includes television and radio broadcasting, as well as community radio, amounted to THB 131.39 million. The figures of damage and losses in the broadcasting sub-sector were based on information provided by public service providers (TV Channel 9, Channel 11). The floods inflicted damage to buildings, recording and broadcasting and other electrical equipment as well as transmission systems. The information on damage to other major private broadcasting operators was not available at the time of the assessment. The information collected in Nakhon Sawan, where one third of community radio stations were affected by floods and ceased operations for two months on average, was used as reference to estimate damage to community radio in the 26 flood-affected provinces.

Postal services were also affected by the floods. Thailand Post reported that damage was concentrated in eight severely flooded provinces (Bangkok, Lop Buri, Pathum Thani, Nonthaburi, Nakhon Sawan, Ayuthaya, Nakhon Phatom and Samut Sakhon) with a total of 77 post offices damaged. Estimated damage to the postal services sub-sector, which include mainly damage incurred to buildings, counter service sets and equipment of Thailand Post, amounted to THB 135 million.

Losses

The losses in the telecommunications and broadcasting sector were accounted for by calculating the loss of revenue due to the disruption of services caused by the floods, and extra expenditures for emergency repair of damaged sites and reconnection of services. The estimation of losses of revenues for public service providers for services disrupted in the leased line and voice and data line is substantive, amounting to THB 543 million over an estimated disruption period of three months. Based on the information provided by a service provider and extrapolation based on the market share, the estimated loss of revenues in cellular communications amounted to THB 636 million. Loss of revenues in the television and radio broadcasting sub-sectors reported by public service providers and community radio stations amounts to over THB 391 million. Thailand Post reported losses of revenues of THB 5 million daily due to the impact of floods to its overall postal operations and the closure of 36 post offices, amounting to a total loss of revenue of THB 125 million as of 18 November 2011.

The losses also include expenses incurred by public and private service providers in emergency services such as the provision of power generation at cell sites that have lost power, higher operational costs as well as preventive flood protection actions (sand bags, dikes). They also include the extra services such as fee waivers provided by some telecommunications service providers to subscribers for one month and free phone calls in the affected areas, as well as financial support and compensation to flood-affected staff. The temporary relocation of severely affected post offices to mail centers and/or bulk posting centers and extra boat mailing service, etc. incurred an additional cost of THB 50 million.

Recovery and Reconstruction Requirements

The highest priority for the telecommunications sector within the next six months is the full recovery of all services by all public and private service providers. In this respect, the estimated needs for recovery and reconstruction were focused to cover for the next six months.

Public and private service providers in Thailand have been proactive in re-establishing services in areas where floodwaters have receded. Flood-damaged equipment has been progressively replaced with new equipment and placed at higher locations, either on power poles or higher raised platforms. The height is raised based on the historical depth of floods.

Challenges to Recovery and Reconstruction

The flood situation in Thailand is not yet over at the time of this reporting. The needs for substantive mitigation measures to be put in place during the medium term and into the long term provided in this report are rough estimates. Telecommunications service providers are preparing to carry out detailed studies to assess the impacts of their systems once the flood is over and will provide information on future mitigation measures and costing when available.

Another challenge in building back better in the telecommunications sector is the tradeoff between the market-driven expansion of services and the need to critically review the vulnerability of the networks in high-risk areas.

Recommendations for Resilient Recovery and Reconstruction

Strategy for Short-term Recovery (up to 6 months)

Expediting the rapid and full recovery of all services should be the highest priority for the telecommunications sector over the next six months. All damaged components of telecommunications hardware should be replaced and repaired as soon as floodwaters recede. The restoration of telecommunications in flooded industrial estates is of particular importance in order to allow the impacted industrial plants to resume business as early as possible.

Improving the resiliency of telecommunications and broadcasting systems should be done whilst restoring and repairing systems, based on information from the current disaster. Such measures include building back with immediate risk reduction measures, such as mounting containers on platforms that are higher than historical flood depths, and essential equipment including back-up power generators in better positions (higher levels).

Building redundancies into the network to avoid single points of failure can ensure high availability of services. Efficiencies could also be gained by using adaptive capacity so that the redundant equipment could be automatically deployed if additional capacities are needed. Damaged equipment and/or systems which are becoming obsolete should be replaced with new technologies to achieve more diversity and efficiency.

Strategy for Medium-term Recovery and Reconstruction

The vulnerabilities of existing telecommunications and broadcasting infrastructure should be assessed. Necessary measures should be put in place to enhance the resilience of telecommunications and broadcasting infrastructure, which is regarded as critical to prevent future loss of services.

Establishing higher construction standards, establishing higher power backup capacities, and improving scalability to meet the sudden increase of traffic during emergency disaster responses could significantly increase the resiliency of existing terrestrial infrastructures including mobile base stations and wireless transmission towers in high risk areas. The network resilience may be enhanced through an increase of network redundancy.

A multi-systems disaster communications infrastructure with terrestrial communications networks, public address systems and satellite-based communications networks should be considered in the resilient infrastructure design. The telecommunications resilience could be achieved through multiple diverse systems providing back up should one system fail. Reliance on a single communication system may become overloaded or inoperable after a disaster. With Thailand's satellite communications capacities, the use of satellite communications as a backup means to enhance the resilience of communications infrastructure should be examined. Unlike terrestrial wireless communications infrastructure, satellite-based communications infrastructure is much less affected by disasters and can be rapidly and easily deployed or redeployed.

Alternative power supplies for critical telecommunications infrastructure that are vulnerable in 'cascade' events should be planned for. Telecommunications infrastructure is heavily dependent and reliant on the continuing availability of electricity. Current mobile and fixed network distribution and exchange points, including cell sites have only limited

time of battery backup making them vulnerable in 'cascade' events (e.g. flooding could affect power supply thus making mobile networks vulnerable, affecting broadcasting). Alternative power supplies would include the provisioning of portable power generators and sufficient supply of fuel could be planned for cell sites. Green alternatives such as solar or wind power could break the dependence of the cell sites from the power grid, especially at hard to reach locations.

The continuation of broadcasting to all communities before, during and after disasters should be ensured. In this respect, it is suggested that communication from the national early warning center to broadcasters be improved and engage broadcasts around disaster risk reduction. Community radio stations could provide information in disaster preparedness, disaster response and relief and post-disaster communications in accordance with their community needs. It is important that broadcasters have the knowledge and skills to communicate information on disaster risk reduction that will help communities cope with disasters.

Guidelines for business continuity plans that include disaster risk management, including response plan for rapid restoration of damage, should be developed. A primary disaster emergency communications capacity is the standby capacity for the rapid deployment of communications equipment during a disaster. Disaster recovery plans should be periodically reviewed, updated and practiced.

Increasing information system reliability through the use of cloud computing should be considered. It is critical that networks and information systems are reliable. Cloud computing enables people to remotely access information systems though telecommunications networks. At the same time, cloud computing empowers organizations to distribute information systems across different geographical locations to reduce the risk that critical information systems are affected by a single hazard. Organizations may increase their resiliency and capacity to recover from disasters if they incorporate cloud-based information systems to their business continuity and disaster recovery strategies.

A review of the policy and regulatory framework to ensure disaster risk reduction measures are mainstreamed into the telecommunications and broadcasting sector is recommended. In this respect, the Government of Thailand could consider initiating studies towards a national emergency telecommunication strategy that addresses risk reduction measures. The studies will require extensive consultations with the service providers and be well extended into the long-term recovery period.

Strategy for Long-term Recovery and Reconstruction

The future expansion of telecommunications and broadcasting networks should be designed to be more resilient to multi-hazards.

Relocation of critical telecommunications and broadcasting infrastructure in high-risk areas should be undertaken.

Substantial investment by service providers to make their infrastructure more resilient and better prepared for multi-hazards should be encouraged. The telecommunication authorities should carry out studies on supporting policies for a telecommunications regulatory environment conducive to investment, in line with the national disaster risk reduction and disaster management strategies and plans.

Table 46: Telecommunications sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Category	Type	~6 months	6-24 months	>24 months
Land-based communications				
	Replacement of damaged leased-line communications equipment (nodes with equipment, co-axial cables, air conditioner, generator, modem equipment, inter-change fiber cabling, etc.) to ensure post recovery services.	167.22	66.0	0
	Replacement of damaged voice and data communications equipment (primary cables and other relevant equipment such as DSLAMs, MSANs, pay phones, etc.) to ensure post recovery services	575.15	345.0	0
	Estimates for retrofitting to increase resilience and ensure mitigation of future disasters, including civil works.	220.0	120.0	180.0
SUBTOTAL		926.37	531.0	180.0
Cellular communications				
	Replacement of damaged telecom system equipment, equipment for 2G and 3G cell sites, battery, cooling systems, etc., to ensure post recovery services.	280.92	238.70	0
	Estimates for retrofitting to increase resilience of cell sites and to ensure mitigation of future disasters.	84.0	303.0	270.0
SUBTOTAL		364.92	541.70	270.0
Broadcasting				
	Repair of buildings, offices, facilities, and roads in flooded stations.	22.52		
	Replacement of damaged equipment (transmission equipment, satellite dish/base, TV and digital cameras, repair of three DSNG vehicles and equipment, TV set top boxes), repair of vehicles and equipment.	59.19	3.6	
	Repair of community radio room and replacement of equipment.	48.60		
	Reconstruction of 10 broadcasting stations with higher buildings.			190
	Estimates for retrofitting to increase resilience and ensure mitigation of future disasters, civil works.	40.0	170.0	170.0
SUBTOTAL		170.20	173.6	360.0
Postal services				
	Reconstruction/repair of damaged post offices(77).	130.0		
	Reconstruction/repair of counter service sets (50).	2.0		
	Replacement of damaged computers, printers, electricity system, etc. in 30 affected post offices.	3.0		
	Estimates for retrofitting to increase resilience and ensure mitigation of future disasters, civil works.	42.0	175.0	170.0
SUBTOTAL		177.0	175.0	170.0
TOTAL		**1,674.49**	**1,421.3**	**980.0**

Notes: Substantive mitigation measures for implementation in the medium and long term should be further defined with details through an assessment of the affected systems to be carried out once the flooding situation permits.

Disaster Resilience in the Telecommunications Sector

Policy Recommendations

Telecommunications must be regarded as critical facilities that support essential services in the event of disasters. It is recommended vulnerabilities be assessed and the resilience of existing telecommunications and broadcasting infrastructure enhanced as a major disaster preparedness measure, and appropriate measures be taken to prevent future loss of services.

Telecommunications infrastructure and services need to be designed, taking into consideration the multi-hazard risks that Thailand face, such as floods and related hazards that include landslides.

Besides providing critical channels for early warning messages, communications must remain operational during disasters when contact with the communities will be critical for liaising and coordination of help and support resources.

Similar standards of resilience are required across the infrastructure network. To address common vulnerabilities, regulators of different aspects should work together on achieving a balanced tradeoff between design criteria for disaster events and market driven uses.

Integrating Disaster Resilience into Telecommunications Sector Programming

As mentioned in the strategy for recovery and reconstruction, a review of the policy and regulatory framework to achieve mainstreaming disaster risk reduction into the telecommunications and broadcasting sector should be carried out. This would pave the way towards the development of a national emergency telecommunications strategy that addresses risk reduction measures, responsibilities and arrangements to ensure that the critical infrastructure is protected from disasters to ensure service continuity before, during and after the disaster event.

Building an effective emergency communications capacity requires national coordination and the formulation of relevant policies with the participation of disaster management and telecommunications and broadcasting authorities.

The telecommunications and broadcasting authorities and service providers should jointly assess the collective vulnerability and develop a cooperative emergency response plan to ensure that some systems will remain in service even under extreme circumstances, and collaborate to increase their collective geographic diversity and establish redundant interconnections capable of supporting emergency operations.

2.6 Social Sectors

Health Sector

Summary

The 2011 floods impacted Thailand's health sector more profoundly than annual floods do, and resulted in loss of life and injury for many. At the time of writing[101] , the flood has caused 652 deaths, with drowning being the top cause of mortality. Roughly 600 public sector health facilities, provincial health offices, and district health offices were interrupted or damaged by the floods. An even higher number of private health facilities, including private hospitals, medical and dental clinics, were damaged, as large urban areas in central Thailand and the Greater Bangkok area were inundated. The cost of damage is estimated at THB 1.6 billion.

Apart from damage, Thailand's health sector also sees losses in economic flows arising from the increased workload imposed by the disaster, from setting up temporary hospitals and mobile health units, as well as from temporary decline in health sector revenues due to closed health facilities and a possible decrease in the number of patients, arising from the interruption of transport services. The cost of losses is estimated at THB 2.1 billion. The recovery and reconstruction needs, which include the cost of repairing damaged facilities, incorporating the "build-back-better" concept, and replacement of damaged furniture, medical equipment and supplies, is estimated at THB 2.3 billion.

Table 47: Health sector - Damage, losses and needs in Thai baht, millions

Sub-sector/ Component	Disaster Impacts			Ownership		Recovery and Reconstruction Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Hospital	946.8	884.4	1,831.2	1,248.5	582.7	620.3	476.8	231.9
Health Center/Private Medical/Dental Clinic	717.5	1,044.3	1,761.7	154.7	1,607.0	332.5	388.1	82.2
Provincial/District Health Office (Administrative)	19.7	204.4	224.1	224.1	0.0	175.4	5.3	5.2
TOTAL	**1,684.0**	**2,133.0**	**3,817.1**	**1,627.4**	**2,189.7**	**1,128.1**	**870.3**	**319.3**

Sector Context

Thailand's achievements in the health sector are widely recognized. Thailand has seen significant improvements in health outcomes over recent decades, reflecting sustained public investment in both infrastructure and human resources. Thailand has also succeeded in expanding coverage of health protection schemes, culminating in the introduction of the Universal Coverage Scheme in 2001. These efforts have eased access to health services, contributed to increased and more equitable patterns of utilization, and helped reduce the financial burden and the risk of impoverishment associated with healthcare expenses.

[101] 30 November 2011

Public sector health facilities play a crucial role in the health service system as they provide health services to the people in all localities with good accessibility and coverage, particularly in remote areas, while private sector health facilities play a significant role in urban areas. The Ministry of Public Health (MOPH) is the most important healthcare provider in the public sector. MOPH's provincial hospitals achieved national coverage as early as the 1950s, followed by the achievement of "a district hospital in every district" coverage by the 1980s, and "health centers/health promotion hospitals in every sub-district (tambon)" coverage by the 1990s. In addition, MOPH owns and operates 25 large regional hospitals for advanced tertiary care, and 47 specialized hospitals. Complementing MOPH health facilities, there are a number of health facilities operated by other public agencies, including university hospitals, Ministry of Defense hospitals, Bangkok Metropolitan Administration facilities, as well as those provided by other local administrative organizations. There are over 800 public hospitals and 9,000 health centers/health promotion hospitals in the country. Private health facilities also play a significant role in providing health services in urban areas throughout the country, particularly in areas with good economic status. There are over 16,800 private clinics without in-patient beds and 340 private hospitals nationwide. Private hospitals provide around 20 percent of hospital beds in the country.

Achieving almost universal health coverage through three public mandatory insurance arrangements in 2002 is one of the most significant achievements in the development of Thailand's health service system. The Universal Health Coverage (UC) scheme, the Social Security Scheme (SSS), and the Civil Servant Medical Benefit Scheme (CSMBS) now cover an estimated 98 percent of the population, with the UC scheme alone covering 75 percent. The cost of the UC and CSMBS is borne by the national budget, while SSS (for formal sector labor force) is financed by tripartite contributions from employers, employees and the government. Overall, the universal health coverage policy not only provides equal opportunities for women and men to receive healthcare services, but it has been very effective in improving access to health services for the poor. Incidences of catastrophic out-of-pocket health expenditures declined from 5.4 percent in the pre-UC era to 3.3 percent thereafter. The impact of out-of-pocket expenditures for health on increasing the poverty headcount has declined from 2.1 percent to 0.8 percent.[102] Overall, utilization of health centers and district hospital services has doubled after the introduction of the UC scheme.

Thailand has achieved a lot with relatively low levels of spending on health per GDP, though the government's share of health spending is constantly rising. Total health spending (financed from public and private sources) in Thailand was estimated to amount to around 4 percent of GDP in 2008. This is lower than many regional and middle-income peers that have made less progress toward universal coverage. Nevertheless, unlike many other middle-income countries, a high and rising share of total health spending is financed by the government. In 1995, government financing accounted for 47 percent of total health spending; by 2008, this had increased to 75 percent. As a result, government health spending as a share of GDP has nearly doubled, from around 1.5 percent in 1995 to almost 3 percent in 2008. The upside of this trend is the reduced reliance on out-of-pocket financing, and the benefits that come with that in terms of financial protection and equity in access. However, these benefits imply a growing fiscal burden. In a context of

[102] Limwattananon et al (2005) Presentation to the International Conference on Social Health Insurance in Developing Countries, December 5-7, 2005, Berlin, Germany.

limited buoyancy of government revenues, the share of the government budget allocated to health has increased from around 10 percent in 1995 to just over 14 percent in 2008. The share of the government budget dedicated to health is hence relatively high compared to regional and middle-income peers.

Rapid demographic and epidemiological transition and the rise of expensive chronic diseases will put strains on the Thai health service system in the future. Life expectancy at birth of the Thai people increased from 54 years in 1960 to 69 in 2008, and is projected to increase further to 76.8 years in 2025 and 79.1 years in 2050.[103] Along with the demographic transition, Thailand's challenge of the fast-moving epidemiological transition to non-communicable diseases (NCDs) is formidable: over the past 12 years, prevalence of diabetes has tripled – from 2.4 to 6.8 percent; prevalence of hypertension has quadrupled – from 5.4 to 22.1 percent; prevalence of overweight and obesity has been tripled in Thai males – from 1.5 to 4.8 percent, and nearly doubled in Thai females – from 5.6 to 9 percent[104]. Given the high costs and long-term nature of care associated with old age, NCDs and NCD-related disabilities, cost and service pressures are likely to build up in the health system. Nonetheless, communicable diseases, particularly AIDS, tuberculosis, and other emerging diseases, cannot be neglected. As many as half a million people in Thailand are infected with HIV, and most of them are entitled to free AIDS treatment. Thus, Thailand needs to deal with additional health system challenges that are the results of the demographic transition to an aging society and the increase in the prevalence of chronic illnesses now and in the coming years.

Damage and Losses [105]

Damage

In 2011, Thailand's health sector experienced its worst floods in decades. Around 600 public sector health facilities, provincial health offices and district health offices were interrupted or damaged by the floods. Even higher numbers of private health facilities, including private hospitals, and medical and dental clinics, were damaged, as key urban areas in central Thailand and the Greater Bangkok area were inundated by the floods. Damage was mainly caused by floodwater, water currents, high humidity, and mud. The extent of damage to health facilities tends to be more severe in neighborhoods where the floods came rapidly due to broken water dams, e.g. Pathum Thani, Ayuthaya, and Nakhon Sawan provinces.

Total damage is estimated at THB 1.68 billion with an approximate 57 – 43 percent split between the private and public sectors respectively. The government identified 26 provinces in central, eastern, and northeastern Thailand as those most affected by the floods.

[103] United Nations, World Population Ageing, 1950-2050.
[104] Source of information is from Bureau of Policy and Strategy, Ministry of Public Health.
[105] It should be noted that, under the DALA methodology used in this exercise, damage and losses are largely estimated under an economic lens and due to time and data availability constraints the team has to rely significantly on assumptions and extrapolation. The lower productivity of injured persons is normally addressed in each sector where the injured persons work, where it will translate into lower production. Some aspects of losses, e.g. psychological complications (including post-traumatic stress disorders, etc.), are not addressed by the study. People in non-flooded areas were also found to have increased stress and lower economic productivity, and this has not been accounted for in this study.

However, the cost of damage to health facilities varies greatly from one region to the next. All of the highly affected health facilities are located in the low-lying, flood-prone plains of central Thailand. The estimated cost of damage to health facilities in five key provinces in central Thailand alone – Ayuthaya, Bangkok, Nakhon Sawan, Nonthaburi, and Pathum Thani – accounts for around 90 percent of the total cost of damage. On the contrary, the cost of damage to health facilities in the northeast is estimated at THB 10.7 million, which is only 0.64 percent of total damage costs.

In the public sector, regional and provincial hospitals bear the highest cost of damage. Sixteen regional and provincial hospitals were reportedly damaged, and the extent of damage is greatest at Ayuthaya Regional Hospital. The second highest costs in damage occurred in the health centers/health promotion hospitals sector, with as many as 468 facilities reportedly damaged. Many health centers/health promotion hospitals are located below the roads and streets in front of the facilities, and thus floodwater inundated the facilities even before the flood reached street level. In addition, 77 district hospitals were reportedly damaged. Apart from health service delivery facilities, three provincial health offices (PHOs) and 29 district health offices (DHOs), which perform administrative and supervision roles at the provincial and district level, were also reportedly damaged.

In addition to MOPH facilities, a university hospital in Pathum Thani – Thammasat Chalermprakiat Hospital – was severely damaged. At the time of the mission, the floodwater had not fully receded. Many areas on the ground floor and all basement areas were still flooded at the time of writing, making it difficult to calculate accurate damage estimates. An initial estimate of THB 139 million was made by the hospital management team, but the team believes that number will rise once the full extent of damage is shown after waters recede fully.

Private sector health facilities, which are mainly located in urban areas, were affected considerably by the floods. Although floods are relatively common in the central plains, major urban areas had largely been well protected from flood destruction in recent years, due to a number of flood prevention measures organized by local authorities and the central government. However, the extent of the 2011 flooding is significantly more severe, and existing flood prevention mechanisms were overwhelmed, resulting in broken water dams and severe flooding in the majority of urban areas in central Thailand. Over 73 percent of Ayuthaya's and Pathum Thani's urban areas have been severely flooded for over two months. Nearly 40 percent of Nonthaburi's urban areas have been flooded for over two months, while another 30 percent have been flooded for one month. In Bangkok, over 35 percent of its urban areas have been flooded for one month, while an additional 10 percent flooded for two months.[106]

The extent of the flooding in urban areas in central Thailand, particularly in the Greater Bangkok area (which include Pathum Thani and Nonthaburi), which have the highest concentration of private health facilities, have severely affected many private hospitals and a great number of large and small private medical and dental clinics, causing a large amount of damage. The cost of damage to private health facilities is estimated at THB 954 million based on satellite data on flooded areas, but the real cost of damage will not be known until floodwaters have fully receded.

Table 48 summarizes the cost of damage by four categories – structural, furniture, medical equipment and medical supplies. The value of damage is estimated based on the cost to rebuild or repair facilities that were totally or partially destroyed, as well as the replacement value for the furniture, medical equipment, and medical supplies that were destroyed, assuming that they are being replaced with the same capacity and quality prior to the flood.

Table 48: Health sector – Damage in Thai baht, millions

Damage Category	Health Sector Damage (Millions THB)		
	Public	Private	Total
Structural	515.7	282.6	798.3
Furniture	144.3	402.0	546.3
Medical Equipment	66.6	268.9	335.5
Medical Supplies	2.2	1.1	3.3
TOTAL	**728.8**	**954.6**	**1,683.5**

Most of the damage to public sector health facilities is structural, as many public health facilities straddle across large, spread-out areas and received full exposure to floodwater currents, though no health facilities were fully destroyed by the floods. The structural damage caused by flood currents tend to be more severe in district hospitals and health centers/health promotion hospitals which are located in semi-urban and rural areas, where the water currents were stronger as they were not obstructed by buildings.

[106] Flood Data from Satellite Image (1 August - 16 November 2011).

Most private sector health facilities are located in urban areas, where floodwater currents were weaker, which helped mitigate structural damage. However, the total cost of damage to furniture is significant, due to the high number of large and small private medical and dental clinics located across flooded urban areas. The flood not only ruined furniture directly exposed to water. Most of the furniture kept above the water level in nearby areas was also damaged through exposure to high humidity brought by the floodwater, as well as by fungi which grow rapidly in high humidity environments. Moldy furniture is commonplace in flooded hospitals and clinics.

A number of pieces of expensive medical equipment, including MRI and CT scanners, X-ray machines, and laboratory equipment in public and private hospitals were also damaged. The damaged equipment was located on the first floor and basement of the hospitals, and was directly exposed to floodwater. The fact that the cost of damage to medical equipment in private health facilities is higher than those in public health facilities does not mean that medical equipment in public hospitals was less damaged than those in private hospitals. However, a number of public hospitals, which were flooded, have outsourced the operations of expensive medical equipment to private companies. The equipment is owned by private companies, and those public hospitals give the companies the rights to operate the equipment in public hospital compounds, as part of an integrated hospital service. Thus, the cost of damage to this equipment is not borne by the public hospitals, but by private companies.

As well as private hospitals, large and small private dental clinics are believed to have incurred significant damage to dental equipment. Unlike private medical clinics, which do not need expensive medical equipment, large and small dental clinics need to be equipped with expensive dental equipment. One set of dental equipment costs around THB 200,000 per unit. Each unit is heavy and immobile. Given the high number of dental clinics in the flooded areas of Greater Bangkok (including Pathum Thani and Nonthaburi), the damage to dental equipment in the private sector is expected to be high.

The damage to drugs and other medical supplies is minimal, as floodwater in affected areas rose gradually and hospital/clinic staff had sufficient time to move medical supplies

to upper floors. However, some medical supplies were still damaged by the floods. In a district hospital that the team visited in Nakhon Sawan, most of the hospital buildings are one-story high, except for a small second floor, administrative area. During the floods, which lasted for 3 months, the hospital used the small space on the second floor to store expensive equipment, but there was not enough space to store all medical supplies. Part of the medical supplies was left on high shelves in a one-story drug storage building. Although the high shelves helped keep the medical supplies above the water level, all supplies stored there were damaged due to high the humidity.

Losses

Losses included higher costs of medical and healthcare services above normal use and related opportunity costs. They included costs incurred for: above-normal overtime payment to staff; above-normal use of medical supplies; above-normal treatment and care cost; transport of patients to other hospitals/health centers; temporary health facilities or mobile health units cost; disease prevention; monitoring of morbidity increases; public awareness campaigns; control of possible outbreaks; flood prevention; and revenue losses. The total amount of losses is estimated at THB 2.1 billion. Losses in the public sector are estimated at THB 893 million, while losses in the private sector are estimated at THB 1.2 billion. Table 49 outlines estimated losses by categories.

The cost of disease prevention, monitoring of morbidity increases, public awareness campaigns, and control of possible outbreak costs is traditionally borne by the public sector. Nevertheless, due to the universal health coverage policy starting in 2001, around 98 percent of the Thai population is provided with relatively comprehensive health insurance coverage by three schemes, and the amount of out-of-pocket health spending has declined in recent years. Thus, the costs of the majority of the loss categories, including overtime payment to staff, above normal use of medical supplies, above normal treatment cost, temporary health facilities, and transport of patients to unaffected hospitals, are largely absorbed by the public sector.

Table 49: Health sector – Damage in Thai baht, millions

Loss Category	Health Sector Losses (millions THB)		
	Public	Private	Total
Overtime payment to staff	115.6	0.1	**115.7**
Above normal use of medical supplies	52.1	0.0	**52.1**
Above normal treatment and care cost	15.4	0.0	**15.4**
Transport of patients to other hospitals/health centers	4.7	0.0	**4.7**
Temporary health facilities cost	21.5	0.0	**21.5**
Disease prevention, monitoring of morbidity increases, public awareness campaigns, control of possible outbreak costs	114.8	0.0	**114.8**
Revenue losses in hospitals/health centers	435.1	1,232.5	**1,667.6**
Flood prevention	133.9	2.3	**136.2**
TOTAL	**893.2**	**1,234.9**	**2,128.1**

It should also be noted that hospitals that escaped flooding may also incur losses, particularly for referral hospitals to where patients were transferred from flooded facilities. For example, Buddhachinnarat Regional Hospital in Phitsanulok was not directly affected by the floods, as Phitsanulok City Municipality and partners were able to prevent water from overflowing from the Nan River into the municipality, and the municipality stayed dry throughout the monsoon season. However, as Phitsanulok's neighboring provinces in central Thailand were severely flooded, several other hospitals were put into emergency

situations, and Sawanpracharak Regional Hospital in Nakhon Sawan province was closed altogether. As a result, a number of patients were transported from those affected provinces to Buddhachinnarat Regional Hospital, increasing the workload of Buddhachinnarat hospital staff enormously. The hospital management team has shared that during the peak of the flood crisis, the staff workload was so high that the cost of overtime payment to staff rose to nearly THB 1 million per day.

The greatest losses were in terms of revenue losses, incurred as a result of hospital closures due to floods, or the possible decrease in number of patients due to interruption of transport services and access. It should be noted that the provider payment mechanisms of two public health insurance schemes in Thailand helped reduce the amount of revenue losses. The UC scheme, which covers 75 percent of the Thai population, provides capitation payment for outpatient treatment, while the smaller Social Security Scheme (SSS) provides capitation payment for both outpatient (OP) and inpatient (IP) treatment. This means that the hospitals in the schemes still receive capitation payment throughout the duration that the hospitals were closed during the floods. Theoretically, some of the hospitals that joined the UC scheme and were closed due to floods may be in a position of "revenue gain", because there are significantly less expenditures during hospital closure, while the capitation payment for OP remains the same. As the UC scheme mainly contracts public hospitals, the potential "revenue loss" is reduced significantly among these hospitals, particularly for hospitals that rely on OP treatment. Nevertheless, UC does not provide capitation for IP treatment, and part of this potential income is classified as revenue losses. It should also be noted that CSMBS scheme payment accounts for a large proportion of revenue of many tertiary-level public hospitals. As the CSMBS provider payment method is fee-for-service for OP services and reimbursement per episode by diagnosis related groups (DRGs) for IP services, the hospital does not receive any payment while it is closed, and thus there are potential revenue losses.

Although the SSS contracts a number of private hospitals as providers, the majority of private hospitals rely more on patients' out-of-pocket payment and private health insurance reimbursement for income. Thus, the total revenue losses among private hospitals as well as private medical and dental clinics are higher than those of the public sector. In addition, medical tourism accounts for a significant amount of profit among a number of private hospitals in the Greater Bangkok area. Even though major medical tourism-oriented private hospitals in central Bangkok were not flooded, there is undoubtedly a reduction in the number of medical tourists to Bangkok in the past few months, as central Bangkok was still at risk of flooding, and the medical tourists had the choice of travelling elsewhere for treatment.

Generally, losses in the health sector also include costs of clearing and cleaning operations before health facilities can resume service delivery. However, following the discussion with PHOs as well as public and private hospital directors, it was explained that the cleaning of post-flood hospitals and health centers is generally done by hospital and health center staff voluntarily, and not by hiring private companies or individuals. Thus, this was not considered as an additional cost. Another area of potential loss worth mentioning is the shortage of drugs and rising price of some medicines/medical consumables due to supply shortage. This happens as some factories were flooded or faced a shortage of production materials (e.g. storage/containers), but the effect is likely to be transient and the magnitude may not be high.

Table 50 outlines an estimated amount of damage and losses by province. The five provinces with the highest amount of damage and losses are Bangkok, Pathum Thani, Nonthaburi, Ayuthaya, and Nakhon Sawan. It should be noted that the floodwater level is still high in Pathum Thani, Nonthaburi, and parts of Bangkok during the mission, and the actual cost of damage and losses could be different from the estimated number, depending on how rapidly the floodwater will be fully receded.

Table 50: Health sector – Damage and losses by province in Thai baht, millions

Province	Health Sector Damage and Losses in Thai Baht, millions		
	Damage	Losses	Total
Ang Thong	30.9	122.7	**153.6**
Ayuthaya	283.3	198.9	**482.3**
Bangkok	353.5	550.6	**904.1**
Chachoengsao	11.0	74.7	**85.8**
Chai Nat	1.8	41.2	**43.0**
Kalasin	0.5	3.5	**4.1**
Khon Kaen	3.3	0.0	**3.3**
Lop Buri	15.1	73.8	**89.0**
Maha Sarakham	3.7	1.8	**5.5**
Nakhon Nayok	3.7	23.9	**27.6**
Nakhon Phatom	9.2	28.2	**37.3**
Nakhon Sawan	109.9	123.4	**233.4**
Nonthaburi	320.1	373.4	**693.5**
Pathum Thani	425.7	325.9	**751.6**
Phitsanulok	24.7	8.5	**33.1**
Phichit	6.3	10.1	**16.4**
Prachinburi	1.8	7.1	**8.9**
Roi Et	0.0	0.0	**0.0**
Samut Sakhon	3.8	15.3	**19.1**
Saraburi	35.3	17.6	**53.0**
Singburi	20.3	53.3	**73.6**
Si Sa Ket	0.0	0.0	**0.0**
Suphan Buri	10.6	30.4	**41.0**
Surin	0.8	1.1	**2.0**
Ubon Ratchathani	1.8	40.0	**41.8**
Uthai Thani	6.7	7.4	**14.1**
TOTAL	**1,684.0**	**2,133.0**	**3,817.1**

Recovery and Reconstruction Requirements

The total recovery and reconstruction needs of the health sector are estimated at around THB 2.3 billion. Needs for the public sector is estimated at around THB 1.26 billion, while those of the private sector is estimated at THB 1.04 billion. Recovery and reconstruction needs are divided into short-term needs (less than 6 months), medium-term needs (6–24 months), and long-term needs (over 24 months), as categorized in Table 51. The cost of short-term recovery efforts, which include above-normal treatment costs, temporary health units, overtime payment to staff, monitoring of morbidity increases, public awareness campaigns, and control of possible outbreak costs, is estimated at THB 324.2 million, and will be completed within 6 months. Reconstruction cost in the short-term, medium-term,

and long-term is estimated at THB 603.9 million, THB 760.3 million, and THB 319.3 million respectively. The reconstruction needs also take into account the increase in disaster resilience, which add THB 200 million in the short term (before the next monsoon season) and THB 110 million in the medium term.

Table 51: Health sector – Recovery and reconstruction needs in Thai baht, millions

Health Sector Recovery and Reconstruction Needs	Ownership		Recovery and Reconstruction Needs		
	Public	Private	~6 mths	6-24 mths	> 24 mths
Total	**1,268**	**1,049**	**1,128**	**870**	**319**

The Ministry of Public Health has put remarkable efforts in recovery and coping with healthcare needs, through provincial health offices (PHOs), hospitals, and health centers/ health promotion hospitals. Several PHOs, including Nakhon Sawan PHO, have demonstrated strong leadership and effective management to ensure that health service delivery continues uninterrupted during and following the flood disasters. Temporary health units and mobile health clinics were set up in place of health facilities that were closed due to the high level of floodwater. Hospital Directors in the flood-affected areas instructed their staff to work seven days a week to cope with the higher workload. Many public hospitals in unaffected areas initiated mobile health clinics and sent their own medical personnel to the flood-affected facilities to help relieve the high workload. In Nakhon Sawan, while the regional hospital needed to be closed as the electrical closet was damaged by the floods, efforts were made to upgrade temporarily two secondary care-level district hospitals in the province to tertiary care-level general hospitals, with quick mobilization of health professionals from the areas which were not affected by floods.

MOPH also increased surveillance activities to closely monitor the health situation and produce timely information for appropriate response to disease outbreaks, including providing available and timely public health information campaigns to communicate essential health risks to the population.

The government, through the MOPH, related ministries and Bureau of Budget, has also made available concrete plans for reconstruction and rehabilitation. MOPH has launched a survey with ten indicators to public health facilities in the flood-affected provinces to measure the reconstruction and rehabilitation needs.

The “Bangrakam model” has been promoted by the government as the best practice in flood disaster response. Bangrakam is the name of a district in Phitsanulok province. The district has been flooded for about two months in every monsoon season. However, this year the flood came earlier, stayed longer, and had a higher water volume. Despite being flooded for over three months this year, the floods appear to cause fewer problems for the population of Bangrakam than other areas. The main hospital building was not flooded and all health centers/health promotion hospitals (some were flooded) were open throughout the monsoon season, and there were no disease outbreaks during the flood. Bangrakam District attributed its success in health outcomes during the disaster to the “2R 2P” method. The first “P” is preparation (before the flood), which includes public information campaigns, disease surveillance, preparation of medical equipment and supplies, and staff

capacity building. The first “R” is response (during the flood), which includes mobile health units, outreach teams, mental health assessment, and one-stop service call center (which provide health-related as well as other services). The second “R” is recovery (immediately after the flood), which includes damage surveys, repairing health facilities, mental health assessment, and improving the quality of drinking water and tap water. The second “P” is prevention (long-term), which includes assessing lessons learned and surveying health facilities which are at a high risk of flooding, and make necessary structural preventions.

It should also be noted that the UC system significantly increases the resilience of Thailand’s health system to disaster situations. The system contributed to continuity of care in many cases because patients are allowed to move or are referred easily, and budget follows the patients. The UC’s provider payment mechanism also helped reduce the amount of revenue losses in public sector health facilities.

Some hospitals that were directly affected by severe floods benefited from having hospital disaster response plans in place, such as fire evacuation plans. This helped their responses in the time of electrical shutdown and increased the effectiveness of patient triage and transfers when actual evacuation was needed. However, these hospitals also raised the issue that the existing disaster response plans generally underestimate the actual difficulty faced in times of crisis, as logistics and basic infrastructure could be severely damaged in major disasters such as the current flood.

Recommendations for Resilient Recovery and Reconstruction

Thailand’s health sector has shown considerable resilience during the flood disaster this year. This is evident in its successful efforts to deliver uninterrupted health services seven days a week, timely ambulance and emergency transport services (including the use of helicopters to transport patients in critical conditions), timely establishment of temporary health and mobile health units, hotline number and one-stop service call center, during and following the flood disaster. However, some areas are more resilient than others, and there is still room for many local areas to increase resilience, and to follow some of the good practices. A valid example is the “Bangrakam model” in Phitsanulok. This local initiative of “2R 2P” to respond to flood disaster has been hailed by the government as an example of best practice, and other provinces in the flood-prone areas were encouraged to follow suit.

Outlined below are additional strategies for short-term, medium-term, and long-term recovery and reconstruction, applying the concept of “build-back-better”. Some of the strategies may have already been applied by some local areas, but they are worthwhile to be documented and used as public good.

Strategy for Short-term Recovery (up to 6 months)

- Restore affected health facilities to ensure people's access to healthcare services
- Focus should shift from general emergency distribution to targeted services aligned with specific needs of different population groups. Particular attention should be given to the following groups:
    - o Pregnant women, lactating mothers, newborns, children under five, immuno-depressed persons;
    - o Patients with chronic diseases, including the disabled and the elderly, whose pre-existing conditions are further aggravated (or whose drug adherence was compromised) by the lack of access to drugs and health services during the floods; and
    - o Patients who are under anti-retroviral therapy and DOTS (TB), particularly for those whose drug adherence was compromised by the lack of access to health services during the floods
- Review location of expensive medical equipment on the first or basement floors, and consider the possibility to move such equipment to upper floors, where possible.
    - o Each hospital in flood-prone areas should prepare an emergency plan for moving expensive medical equipment during floods; and
    - o It should be noted that some heavy medical equipment, including X-ray machines and laboratory equipment, may still be needed on the first floor, e.g. to serve accident-related patients in the emergency ward. As skilled technicians (not hospital staff) are needed to mobilize X-ray machines, and these skilled technicians may not be available during the critical days before the flood, hospitals in flood-prone areas should consider preparing appropriate

permanent flood barriers for small, specific areas to protect these machines and heavy medical equipment on the first floor from potential flooding.

- Public campaigns highlighting practical guidelines to prevent injuries, drowning, electrocution, and other accidents should be made available widely.
- Services to address psychological complications (including post-traumatic stress disorders, etc.) due to the flood should be provided.
- Sanitary conditions and public health concerns would be a major priority as flood waters will have overwhelmed drinking and wastewater management systems. Wastewater includes storm water, floodwater, domestic wastewater and waste water from medical facilities, but does not include water that contains excreta. Draining wastewaters properly is important to avoid a number of scenarios that can lead to increased health risks. Poor drainage can lead to the following: increased number of breeding sites for water-related vectors (e.g. mosquitoes); erosion of shelters; wastewater filling pit latrines and solid waste pits; pollution of surface or ground water; and limiting access to shelters. As waters recede, bacterial and chemical contaminant concentrations are also likely to rise due to the concentration of waste in reduced volumes of stagnant water. Response and recovery planning should take these issues into account
- The government may initiate a multi-sectoral discussion of food security and nutrition risks and issues. Food-insecure, marginal populations faced with floods are much more vulnerable to food and nutrition emergencies. Therefore, once the immediate food and nutritional needs of the target population have been addressed, all emergency efforts should include plans for protecting and reestablishing the food security and livelihoods of the affected population through agricultural, economic and health and nutrition policies to reduce poverty and vulnerability to famine.

Strategy for Medium-term Recovery and Reconstruction

- Review hospitals in flood-prone areas and make structural adjustments to make health facilities more resilient to disasters.
    - o Electrical closets, power generators, clean water storage, hospital waste storage should be located in areas that floodwater cannot reach. A hospital which is flooded can remain functional as long as its electrical closets, power generators, and clean water storage are intact; and
    - o Protect at least the service area by permanent flood barriers, which are high and strong enough to prevent floods;
        - If it is not possible to protect the service area due to any reason, at least the main service building and drug storage building of each hospital in the flood-prone areas should be higher than one story, to ensure that health services can be delivered even if the water has flooded the first floor.
    - o Adequate and “flood-free” accommodation for healthcare personnel should be prepared to ensure continuous operation of health facilities during floods; and

    - Transportation from “flood-free” main road either by car or by boat must be prepared to ensure patients’ access to health facilities.
- Health sector personnel – both male and female – in flood-prone areas should be trained on flood risk management, and on how to operate hospitals and health centers during flood disasters.
- Drowning was the top cause of mortality during the 2011 flood disaster in Thailand. Public campaigns to emphasize the necessity of swimming skills are needed. Basic swimming modules should be integrated in curriculum for all schools, to ensure that the future generation of Thais can swim. To address adults and other residents who are outside of the school system, the government should set up free or inexpensive swimming courses targeting these population groups throughout the Kingdom. To ensure that both women and men enroll in the swimming courses, separate courses for women and men, and girls and boys, may also be needed.
- Research should also be conducted to identify the causes of electrocution during floods and revise strategy or procedure for electricity cutout that will balance the need for electricity use and potential casualties.
- Dental clinics located in flood-prone areas should be prepared for the possibility of having to move large dental equipment units during floods.
- Appropriate technical supervision is needed to ensure that building codes and other safety measures are followed, both in future health facility construction, and in the rehabilitation of damaged health facility buildings. “Build-back-better” concept should be enforced.

Strategy for Long-term Recovery and Reconstruction

- Thailand should take this opportunity to review and assess the health system’s response to emergencies and disasters, and identify system-wide and cross-sectoral improvements
- National, regional and provincial disaster risk management and disaster response plans should be developed. Prevention, mitigation and coping measures must be integrated into this plan. The longer-term objective should focus on improving the referral network of health providers and functionality of the health system during disaster emergencies, focusing on the interconnectedness of personal medical records, pharmaceuticals, blood and other supplies, improved health information systems, adequate staffing supply and capabilities, health financing, functional referral systems among public and private facilities, as well as strong participation of village health volunteers and civil society. Role and functions of local and central government agencies should be clarified in this plan.
- A chronic disease management system for patients with non-communicable diseases and communicable diseases (including TB and HIV/AIDS) should be made. Drug adherence can be interrupted by flood disasters (e.g. facility is closed, patients cannot travel to facility due to the lack of transport, etc.). Failures to adhere to drugs may lead to even more expensive treatment (or fatality), which will put additional strains on the health financing system. The following efforts could be made to mitigate the risks:

- Patient medical records, including patients' contact telephone numbers and addresses, must be kept in a safe place and be easy to reproduce or distribute to referral health facilities or mobile teams. Currently, medical records are partly kept in an electronic database in almost public health facilities and private hospitals. It is crucially important to establish standard data interchange of essential data of patients e.g. drug allergy, clinical history, treatments, drugs and important laboratory results. A backup system for these medical records in well secure sites outside healthcare facilities is recommended;
- Health literacy of chronic disease patients should be promoted. People who live with chronic diseases have to understand appropriate self-care for their chronic disease status, treatment plan, current treatments including drugs, as well as make plans for potential disaster events. Healthcare staff should also actively arrange consultations with chronic disease patients prior to potential floods to discuss options of drug supplies and consultation with medical personnel during the floods; and
- Health facilities should actively make plans on how to deliver needed services during disaster events. It is possible for a health center to map the locations of their own chronic disease patients, to ensure that health center staff or village health volunteers can distribute drugs and visit patients in case the patients cannot travel to the health center during the floods.

- Public and private hospitals in nearby areas should constitute a network and be able to provide cross-support to each other in emergency situations.
- Safe location elements should be incorporated into new hospital and health center construction and renovation. In flood-prone areas, hospitals and health centers should be located on higher ground, and in cities/towns, should particularly be higher than the street/roads in front of the hospitals and health centers.
    - Health centers and clinics which are currently located below the street/road level should be elevated to the street level or higher; and
    - For hospitals that are located beside flood-prone rivers or canals, strong, dam-like fencing could be built around the hospital to prevent flooding.
- Utilization of community-driven development mechanisms can be considered. The types of damage can vary considerably between areas. Adopting a community-based approach can help match funding to diverse community needs and can increase community ownership. If block grants are given to villages for reconstruction, they can decide whether they should be used for repairing schools, revitalizing farmland, or rebuilding a local health clinic. Community-based approaches can also help ensure transparency of fund distribution, which is particularly important when allocating contested private goods.

Table 52: Health sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Recovery	Type	~6 months	6-24 months	>24 months
	Overtime payment to staff	115.7	0.0	0.0
	Above normal use of medical supplies	52.1	0.0	0.0
	Above normal treatment and care cost	15.4	0.0	0.0
	Transport of patients to other hospitals/health centers	4.7	0.0	0.0
	Temporary health facilities cost	21.5	0.0	0.0
	Monitoring of morbidity increases, public awareness campaigns, control of possible outbreak costs	114.8	0.0	0.0
	SUBTOTAL	**324.2**	**0.0**	**0.0**
Reconstruction	**Type**			
	Structural	159.7	319.3	319.3
	Furniture	273.2	273.2	0.0
	Medical equipment	167.8	167.8	0.0
	Medical supplies	3.3	0.0	0.0
	SUBTOTAL	**603.9**	**760.3**	**319.3**
Increase Disaster Resilience	**Type**			
	Moving of electrical closets, power generators, water storage, and hospital waste storage to safer places	60.0	0.0	0.0
	Adding a second floor to the originally one-floor main service building and drug storage building in flood-prone areas	60.0	60.0	0.0
	Hydro pump	50.0	0.0	0.0
	Elevating health centers/clinics in low lying areas to the road level or higher	30.0	50.0	
	SUBTOTAL	**200.0**	**110.0**	**0.0**
Recovery and Reconstruction	**GRAND TOTAL**	**1,128.1**	**870.3**	**319.3**

Housing Sector

Summary

The 2011 flooding brought impacts beyond anyone's anticipation, both in quantity as well as in timing. While for agriculture this meant total loss of harvests, in the area of housing the relatively slow rise of the water gave most families time to move their valuables to a safer place.

Damage was mainly to household goods, estimated at about THB 38 billion worth, and less to structures, which amounted to about THB 7.8 billion. In addition, losses grew to large proportions due to the long period of evacuation – in some cases over three months – amounting to almost THB 36 billion, borne primarily by host families, government agencies, private sector entities and other donors; aside from these, the education sector contributed another THB 1.7 billion for this (see Education section). Cleaning of properties and goods cost roughly THB 1.97 billion, but at the same time may have provided about THB 0.99 billion in paid labor (approximately 60 percent of labor was voluntary).

Most people were more concerned about their livelihoods (especially in rural and industrial park areas) and household goods. There was not much damage found among the house buildings themselves. However, while not much repair can be done, the quality of timber structures will have depreciated significantly.

Damage and Losses

It is to be noted that the damage and loss assessment is a rough estimate, using a series of assumptions that are extrapolated over the focus area, for the purpose of developing policies and programs that will cover the relevant sectors, and allocating budgets. The actual figures on damage and losses should come from field inspections and reports that can be verified by the public.

Process of Assessment

The Rapid Assessment team benefitted from great collaboration with national and local agencies, including the translation of many references. However, as assessments were ongoing at provincial level, a large part of the data was not yet available that could have been used for cross-checking.

The extent of damage was estimated from the number of houses that likely became inundated, established by an analysis of flood maps. To arrive at a more representative figure of the cost of damage to buildings – rather than applying an across-the-board generalization – the costing was disaggregated by types of housing, construction materials used, and number of floors that are typical to different income brackets. For lack of data, this exercise uses the same proportion of building types across the provinces, although some parts are rural and others are more urban. Using secondary data and interview results, estimates were done on the approximate value of household goods. Preliminary local data of the visited provinces were used to verify the damage and losses estimates, which were then extrapolated into total provincial figures. Annex 14 provides a list of assumptions used

throughout the assessment. Among the most critical is the assumption that the percentage of inundated built-up areas in the province is the same with the percentage of damaged houses. In reality the built-up areas may be of various densities and land uses other than residential[107].

For housing, the provinces of Nakhon Sawan and Phitsanulok were selected as sample regions to verify the preliminary damage and loss data, and discuss the viability of reconstruction approaches with counterparts. In both provinces, the Rapid Assessment team carried out field visits to observe damage to house structures, utilities and household assets, and supported by interviews with individuals and community groups.

Result of the Estimates

Overall, the Rapid Assessment team found significant damage at the household level, especially concerning household property. Relatively less damage was seen concerning the physical structure of the houses. This was quite consistent with people's statements about their loss of furniture and appliances, while there was less concern about the houses themselves. After damage to household goods, losses related to evacuation became the second largest cost in the housing sector (as can be seen in Table 53 below), due to the prolonged period of evacuation[108].

Damage

It is estimated that 1.96 million houses were affected, about 19,000 of which were totally damaged. In most of the areas, especially in the rural areas in the focus regions, annual flooding appears to be a familiar phenomenon to which the people have well adapted themselves. For two generations the people have developed the ability to evacuate things quickly upstairs and the knowledge of certain locations/areas that will stay dry. The wide areas of rice fields served by ample irrigation have benefitted from the streams, and throughout the years, farmers have also adapted the timing of their crops to the flood cycle. However, this time it was beyond anticipation and experience. In most areas of Bangkok, flooding has not been an issue for a long time, during which many developments occurred (industries, waterfront restaurants, housing). Part of the downtown area of urban Nakhon Sawan was also protected by dikes, while other areas in urban Nakhon Sawan (among others parts of the Choosing district) were flooded up to about 1.5 meters.

Much of development has not followed building codes or official plans, which has put many functions in vulnerable areas – including housing – and thereby greatly added to the severity of impacts from this disaster. Local government agencies stated their desire to rectify these conditions not only by dikes but also by possible resettlement. However, local agencies are hesitant about relocation of these settlements and want to avoid eviction, especially because many communities have been there for generations. Resettlement may be reconsidered, if adequate alternative sites are available for resettlement.

[107] The percentage of inundated built-up areas was calculated from satellite photos made over four months. In case the percentage of inundated areas in the built-up areas is predominantly residential instead of other land uses (for instance industrial) then the percentage of flooded areas will be too low for the number of flooded houses. If mostly other land uses are under water instead of housing, then this number is too high for housing. Also, the analysis cannot yet specifically pick out buildings from other non-vegetation or paved areas, neither the depth of water.

[108] During evacuation many families were also out of work, meaning most were dependent on subsistence support (among others with service from public kitchens and survival bags). Household goods do not include working capital; these are covered by the Livelihoods and Employment sector.

Table 53: Damage and losses in housing, by province

PROVINCE	HOUSING DAMAGE		HOUSEHOLD GOODS DAMAGE	LOSSES		TOTAL
	Number of damaged houses	Estimate of cost (Thb)		Temporary shelter & utilities including stay in house	Debris cleaning (also cleaning of goods)	
1 Phitsanulok	10,946	44,233,906	212,321,607	148,331,015	10,973,113	415,870,586
2 Phichit	14,826	62,511,270	287,934,620	205,633,421	14,863,045	570,957,182
3 Nakhon Sawan	51,411	36,007,505	1,005,446,475	757,030,699	51,539,236	2,210,075,327
4 Uthai Thani	4,440	22,748,651	86,128,026	43,212,333	4,451,231	156,544,681
5 Kalasin	4,951	7,886,264	96,035,816	60,781,746	4,963,281	169,672,058
6 Khon Kaen	8,600	4,460,783	116,811,351	101,418,740	8,621,072	281,320,545
7 Maha Sarakham	6,802	11,229,093	131,949,613	89,384,399	6,819,362	239,389,269
8 Roi Et	8,290	19,251,251	160,803,432	111,139,682	8,310,573	299,513,228
9 Si Sa Ket	2,025	7,056,625	39,281,579	18,726,302	2,030,133	67,096,665
10 Surin	786	1,532,403	15,251,955	8,847,503	788,245	26,420,893
11 Ubon Ratchathani	1,171	2,218,793	22,721,005	995,815	1,174,257	27,111,042
12 Chai Nat	20,088	106,147,303	389,659,610	307,313,926	20,138,218	823,279,145
13 Singburi	21,078	91,156,043	408,865,300	349,356,254	21,130,798	870,529,473
14 Ang Thong	50,579	263,596,605	981,101,020	1,014,706,272	50,704,836	2,310,159,312
15 Ayuthaya	196,929	1,294,170,947	3,835,439,603	4,552,823,011	198,221,520	9,880,852,010
16 Lop Buri	33,280	173,079,512	645,544,641	498,277,196	33,362,757	1,350,297,386
17 Saraburi	23,459	192,143,896	455,055,168	345,421,798	23,517,963	1,016,162,285
18 Suphan Buri	84,841	418,463,976	1,645,707,059	1,506,432,468	85,052,716	3,655,741,060
19 Nakhon Phatom	89,571	358,681,824	1,737,944,848	1,556,109,343	89,819,709	3,742,645,295
20 Pathum Thani	237,394	1,116,013729	4,616,898,235	5,228,136,293	238,608,525	11,199,894,175
21 Nonthaburi	201,920	654,200,726	3,974,928,829	3,928,319,660	205,430,541	8,763,084,676
22 Samut Sakhon	19,378	30,860,681	378,261,881	228,622,666	19,549,166	717,313,771
23 Chachoengsao	61,780	326,727,732	1,198,379,785	1,072,425,632	61,934,142	2,659,529,071
24 Nakhon Nayok	19,942	199,611,144	386,834,426	313,347,540	19,992,208	919,805,262
25 Bangkok	761,725	1,954,019,947	14,843,185,266	13,159,573,053	767,119,039	30,724,659,030
26 Prachinburi	761,725	90,338,776	336,854,416	259,578,883	17,409,163	704,198,604
		7,848,349,383	38,059,345,564	35,925,945,652	1,966,524,852	
	1,956,578					83,800,165,452

Note: Shelter costs paid by schools that served as shelters were counted in the education sector loss calculations.

Condition of House Structure and Components

As the flooding was a slow-onset disaster, most of the housing did not suffer severe damage. More damage was observed on household goods. There were exceptions where dams were breached or in one case observed, a combination of weak structure, water current and wind brought the collapse of a house. In field visits, respondents reported significant damage to household goods but almost no damage to houses. There were few complaints by affected families concerning their houses, except that the floors were not high enough – this time. In several locations also the second floor was under water. Observed damage include:

- Foundations – no case of settlement, movement, cracks.
- Little damage to timber components, except doors and window frames expanded; some fungi around columns and lower parts of cabinets was reported, on ceilings of some ground floors.
- Locks and hinges had started to corrode.
- Electrical wiring was intact in all places, though careful inspection will have to be done, by skilled personnel. Fuse boxes have been quickly removed or moved to higher spots. In places visited, people reported that the electrical company had shut down the power network and only turned it on again after it was completely dry and all panels had been checked.
- Water supply installation was intact in all places, and meters were all running normally even where the house has totally collapsed. Taps in those houses were working well, and water was clear and odorless.
- All septic tanks were inundated, although part of the toilet units were placed upstairs. Concerning this, no health issues were found in the field visits like chikungunya and diarrhea. One case of rash on a baby was reported in Bangkok. Thorough draining and drying of soil around houses and in high density areas will be required, in addition to spraying of disinfectants and repellents against of mosquito breeding.
- Aside from the DDPM, the National Housing Authority (NHA) provided some information on multistory housing (flats), although it was limited to government-built housing within the last five years. It is expected that this information can be extrapolated to multistory housing in general. Although necessary to provide indications of losses due to non-performing loans (in the Financial sector), the team has not yet succeeded in getting information related to housing loans.

Damage to Household Goods

This is the area that incurred the most damage. Most families saved their TV set, and other electrical appliances. Larger items like cupboards were lost. Some items were damaged during transport.

Survey respondents stressed primarily the loss of household assets. A large amount of discarded household goods is now disposed along roads, becoming a considerable task for the solid waste management agency.

Estimations on household goods damage were based on the number of families whose houses were flooded.

Losses

The largest loss was related to shelter costs. A relatively small number of affected people evacuated to temporary evacuation camps, schools, temples or public office buildings used as shelters. The Department of Disaster Risk Management (DDRM) of the Ministry of Interior (MOI) has been recording the internally displaced persons (IDPs) and the evacuation centers, as well as the logistical support to affected families, which is an important part of the losses afflicted; this was based on reports from the provinces on the number of inundated houses as well as affected households. However, as the process was still ongoing, the figures are not final yet.

An estimate of overall needs – as a result of the damage and losses – for housing reconstruction is provided in Annex 15.

Recovery and Reconstruction Requirements

Opportunities

Community resilience and initiatives: Although relatively hardest hit by the disaster, rural communities responded quickly, and showed their capacity to deal with the situation effectively. Putting communities in the driver's seat with adequate facilitation by professionals and government agencies is an opportunity to release community potential, and at the same time an opportunity to have civil society, the private sector as well as the academic society engaged and 'on call', to respond to community-defined needs and programs.

Spontaneous settlements and unofficial development: Presently, coping with community housing on riverbanks is a sensitive issue that is difficult to handle for local governments. Much of urban development has not followed building codes or official spatial plans, not only by the lower income groups but also by the private sector. The present flooding disaster provides an opportunity to analyze risks to the livelihoods of communities and businesses along the river as well as the environmental and economic potentials of the riverfront. Engaging interrelated sectors and institutions, medium-term policies may be agreed upon, that allow for interim solutions while longer-term policies, environmental regulations and building codes are being developed. As human settlements have always been oriented towards the waterways, waterfront development and mitigation systems of flooding risks are two sides of the same coin.

Government partnership with CODI: The Community Organizations Development Institute (CODI) has a decade of experience in facilitating low-income communities to rebuild their environment. A semi-government institution, CODI receives core budgetary support from the government. CODI and their partners can be mobilized 1) to help communities assess and articulate their housing and settlements needs, determine priorities in costing and targeting, and assist communities in managing rehabilitation and reconstruction of their neighborhood; and 2) to assist communities in assessing the causes of damage and find solutions for them, among others by revisiting indigenous coping mechanisms in housing and environmental design, and where appropriate, including options of resettlement. The processes may build on the Baan Mankong modality of delivery of actions on the ground.[109]

As has been shown by the Baan Mankong program, communities are capable of managing the rebuilding of their own housing at a relatively large scale, if given the chance and responsibility, and adequate assistance. Cooperatives have been a strong element in the processes, and can provide economic resilience to communities (for instance coping with arrears) while managing community projects. It also showed that actively involving women from the start in decision making and planning provides a much higher level of transparency and accountability of the activities, and strong relevance to actual family needs.

No high-pressure timeframe: People do not need to be in a hurry to repair their home, except for repairs on doors and windows, and painting. Unlike in post-tsunami or post-earthquake situations, over half of the affected families could stay in their inundated houses, while the other half evacuated but could return to their homes as soon as the house was cleaned and dry. Of the estimated 1.96 million affected families, “only” 1 percent (19,000 families) is estimated to have been forced to live elsewhere because of total damage of their house. On the other hand, care needs to be taken if grants are handed out to beneficiaries in a region at once, which will trigger high levels of activity and demand intensity of assistance by facilitators and close guidance by government agencies in the use of the grants. For this reason, community preparedness (in terms of organization and action plans) will become the prerequisite for launching every activity.

Facilitation

CODI itself has relied on community activists to do all the deliberation and organization, and has been able to develop community networks that are actively interacting with a small number of personnel in the field covering a large region. This is an ideal setup that keeps initiative in the hands of people. However in post-flooding reconstruction, some input may need to be provided simultaneously to the process, which means a higher need for personnel capable of dealing with communities and conveying the right messages. Aside of training of key community organizers, local forums (including all parties) may need to be

[109] The Baan Mankong program has provided improvement of 80,000 houses in slum areas between 2003 and 2009, or serving 13,300 families per year; this was done with government funds. The Rapid Assessment team considers this approach very suitable for post-disaster reconstruction, as proven effective in various community-driven post disaster reconstruction programs in other countries, among others the reconstruction of over 250,000 houses by community groups in post-earthquake Yogyakarta & Central Java in less than 2 years.

maintained to keep transparency, agree codes of conduct, mutual learning and develop responsiveness to community initiatives. The collaboration that develops from this disaster response may grow into an effective network in the long run.

Disbursement of Grants for Family and Community Activities

It is important to devise channels for disbursement of grants that are as direct as possible, as has already been done with the THB 5,000 emergency response grants. Grants may be transferred directly from government banks to people's accounts, either group-wise or through cooperatives. For community infrastructure, some community grants will be needed, especially when micro-infrastructure needs to be improved or groups of families decide to relocate.

Rehabilitation of Housing and Building Back Better

In particular situations 'building back better' may be a necessary policy. This may not only be related to better construction of the houses themselves, but may also include correction of the existing land uses. This is mainly for the safety of family assets, and for environmental and health safety reasons (water quality, sanitation); in certain parts it may be for hydrological reasons (to free waterways, reduce obstruction). The government will be expected to respond to people's aspirations to find better locations for their homes. Non-structural actions in this context may need to start earlier than structural actions, as communities need to decide on investment in better buildings as well on resettlement, by their own analysis. Facilitation to communities will include information and technical backup to develop building and settlement designs. Relevant local government agencies will be required to provide appropriate inputs. Local community organizations may develop roles related to risk prevention and mitigation (see section on Disaster Risk Management).

Recommendations for Reconstruction

General

Community-led: Lessons from previous experience (e.g. Indonesia earthquake, Pakistan floods, Cyclone Nargis etc.) have taught us that placing affected people and communities at the center of decisions and actions during the recovery and reconstruction phases will achieve sustainable and successful results. Community commitments may become the basis for government support to improved quality of settlements, rather than disbursement of funds for rebuilding conditions as they were before.

Focus on vulnerable groups: It is likely that the families which have been inundated for longer periods are also those who are more affected.

Special efforts to induce transparency of information and decision-making will make a big difference in performance of all programs. Criteria need to be announced in written form, and consistent among the regions. This is to avoid differences in interpretation and distribution of supports, and reduce tendencies to deviate from rules. Communities need to be involved in the assessment of damage, preparation of action plans, and management of activities. It is expected that in such an environment mutual trust and effective collaboration between government, people and civil society will grow.

Collaboration between government, private sector, civil and academic society. Work with NGOs and academic personnel to act as facilitators to communities (female and male facilitators, to be able to communicate well with all). As in most countries, NGOs are critical and put pressure on government policies. However, in this condition where the scale of services delivery is far beyond the capacity of regular government apparatus, collaboration is the only choice. Inclusive approach to the many parties will even develop mutual understanding and become a practice that is beneficial in the long run. There are always irregularities and sometimes tendencies to "use" or coerce villagers. This needs to be controlled by:

- **Entrusting responsibilities to communities:** Let communities make the decisions, and allowing their representatives deal with the government through the regular tambon–amphor mechanism; the community planning & programming processes should provide ample opportunity for every social group to contribute solutions, including the vulnerable and poorer families, men as well as women. It is part of the tasks of facilitating organizations to ensure that this process happens[110].

- **Strengthening local governance through effective coordination and facilitation:** Maintaining a forum at each local government level among facilitators (NGOs, university staff and students, private sector CSR units), led by an intermediary institution like CODI. Ideally at amphor as well as tambon level.

Short-term

- Identification of damage should actively involve the communities. Careful reporting of the house-by-house damage cannot depend on small, appointed teams only. On the other hand, the number of significantly damaged houses will be relatively low, although initially many individual owners of intact houses have reported theirs as "heavily destroyed" and applied for the THB 20,000. The amount of funds needed to support "totally damaged" houses is estimated at about THB 1 billion for not more than 19,000 units, while the majority of funds may be used by medium damaged houses – about THB 2.6 billion. The real needs in the field after assessments may be much less, as estimates were based on the satellite map calculation of flood coverage areas.

- Clear instructions regarding criteria of handing out of compensation grants (THB 10–20,000, or 30,000[111]), and dissemination of the information. If possible in printed form, posters etc.

- The grants themselves should be part of a specific program to be decided by the government, where recipients (especially owners of the totally damaged houses) are given the choice to change the basic structure of their houses, or even find a better place to settle. In the latter case, loans may be considered (CODI for low incomes, NHA for medium-high incomes).

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[110] Special women's, youth, and also special interest groups of farmers or renters meetings to be explicitly scheduled.

[111] As THB 30,000 will not be sufficient to rebuild a house from scratch, an amount of THB 50,000 is proposed (Annex 15). There will be only a small number of houses that are really totally damaged (= needing to be rebuilt from zero or from the foundation up); as for all grants, the selection of recipients need to be transparent and verified by a third party (probably the community facilitators), and announced in written form.

- Suggestions for such a program are provided in Annex 15. This needs to be urgently decided in the short term, although its implementation may occur in the medium term (grants for facilitated house repair of medium damaged houses and reconstruction of totally damaged houses), or even in the long term (loans for neighborhood redevelopment and/or resettlement).
- A sum of around THB 1.3 billion is anticipated to provide very soft loans to groups of low-income families, and about 1 billion commercial loans to middle-high income families to rebuild their houses with improved construction.

- The criteria of the grants should be clear to the public: what is “light”, “medium” and “total damage”; it is recommended to not allocate the funds for purchase of household goods, but instead only for construction. As there is not so much damage to the building itself compared to livelihoods and goods, the grants should be kept at a minimum to finance essentials.

- Good practices in administering the funds: training to communities by local government staff from relevant agencies or trained facilitators; communities build in groups and have to report progress and finances; funds in installments following progress.

- Promotion of appropriate technologies for construction and maintenance of housing and utilities, environmental management.

- The above outreach and capacity building activities will need specific allocation of budgets (estimated at THB 120 million for the relevant government agencies and THB 152 million for civil society and academic institutions).

- Interim regulations on rebuilding, if regulations are still to be coordinated with other technical or administrative agencies. Among others:

  - Temporary permits and land tenure.
  - For high-risk locations, when families or family-groups are planning house or cluster reconstruction, consider in situ relocation or resettlement to new locations. These will need temporary construction which is easy to demount and move to other locations. Assistance to these settlements should be followed-up in the medium term.

- Management: As may be suggested in general for the other sectors, a powerful Reconstruction Commission with full, delegated authority for procurement and financial management will be essential. A multi-year budget needs to be allocated for this authority. Ideally this commission reports to the public and has regular meetings with representatives of the public.

- Info-com strategy: Government may enhance transparency and collaboration by actively involving the various parties (community-NGOs-private sector-government) and maintain an open grievance-response units at the district level that reports all of the cases on a website. A regular forum would be instrumental for communication, sharing problems & solutions and making commitments, especially at

local level (amphor–tambon–community); these forums should be maintained by organizations that are acceptable to both government agencies as well as to civil society. This is expected to provide a strong basis for the medium- and long-term programs as well.

Medium-term

- In cases where the existing configuration cannot ensure an adequate environment for the residents, reconstruction may require redevelopment. This will again require sufficient guidance.
    - o Assess vulnerability of existing houses including indigenous techniques, toward various disaster risks (not only flooding). Prepare technical information and assistance for improvement of housing structure; if possible, government guidance and quality standards for components (like reinforced concrete columns: on material quality, sound connections, dimensions, foundations)[112].
    - o To guide village reconstruction plans, government facilitation to communities (together with NGOs and/or universities) on building back better and DRM. Spatial plans that combine macro guidelines with bottom-up planning by communities. Government may provide significant contributions to community planning and management of reconstruction, like base maps, environmental standards.
- Preparation for long-term implementation: Consolidation among government agencies related to:
    - o Land use planning.
    - o Coordination of irrigation and drainage between villages and tambons.
    - o Building codes for complex issues like waterfront development.
    - o A consensus among government agencies on pending regional and village plans, collaboration among local government agencies to send staff to villages to facilitate village planning. This is to provide clear and consistent policy background to communities who want to initiate improvement in their spatial configuration, including prospects of (voluntary/self-initiated).

Long-term

- Continuation of the spatial planning activities that are ongoing at local government level. Revision of existing land-uses by identifying vulnerable areas, involving the communities. This is supplemented with land use regulations that prohibit construction of buildings in risky areas.
- Redevelopment in slum areas. Although it is a difficult issue to cope with slums (especially with Bangkok's squatter communities on government land), these communities are also part of the local economy. The government has already developed good collaboration with CODI to take care of the poorer villages, including riverside slums. This practice may be replicated in other regions.
- Implementation of building codes.

[112] Changing timber columns into concrete columns were in many cases not accompanied with good connections to the foundation as well as the 1st floor frame. The community and local skilled laborers may be trained in securing the quality of footings, and making either (a) rigid connections, or (b) 'hinge' connections with bracing or additional walls.

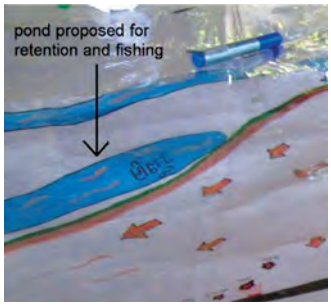
Needs	Provider	~6 months	6-24 months	>24 months
Grants to medium damaged houses	RTG	2,600		
Grants for heavily / totally damaged houses	RTG	970		
Loans for low income families (public banks)	Public banks	1,270		
Loans for med-high income families	Commercial banks	970		
Outreach, capacity building for low-income families (from public sector to relevant local agencies and civil society organizations).	From public sector to relevant local agencies and civil society organization		270	
Various expenditures on housing repair and household good replacement*	Families themselves	9,180	12,240	24,480
TOTAL		**14,990**	**12,510**	**24,480**

Table 54: Housing sector – Recovery and reconstruction needs in Thai baht, millions

** Note: This amount is in addition to the THB 5,000 that it is assumed the government has provided. Loans and grants are prepared in the first six months, to be disbursed in tranches over the following year.*

Communities have ideas about the future of their neighborhood.

Annual floods are familiar to the rural community in Watkao, Phitsanulok, but this time it came too fast and too high, destroying the rice that was just about to be harvested. After four or five days, the water entered the housing area and drowned 149 houses. The community responded quickly, as they urgently needed to secure their livelihood. As soon as the water started to recede from the fields, they started to plant again their three-month crops like beans, cabbage and sweet potatoes. The community considered doing some fishery in a small lake but needed to bargain on this with the neighboring village. An NGO helped the villagers prepare a simple map (not to scale yet) and evaluate impacts of the recent flooding. It was concluded that the pond would also have a retention function. The NGO also helped the village get good quality seeds of short-term crops, which were loaned to farmers who would later return the seeds to the community organization to be used by the next round of farmers. The villagers did not yet develop alternatives for safer locations for housing. But schemes like better quality house construction or land readjustment might be considered by the community.



Education Sector

Summary

At a time when the frequency and magnitude of extreme climate events is rising, a growing number of the world's students are increasingly exposed to earthquakes, floods, cyclones, wild fires and other natural disasters. The 2011 flood in Thailand had a significant impact on the education sector in all 26 provinces[113] of northern, northeastern, eastern and central Thailand.

An estimated 2,934 educational institutions were fully or partially damaged by the flood (2,698 under the Ministry of Education (MOE) and 236 under other agencies involved in education provision). Around 1,435,378 students were affected (1,253,503 students under the MOE and 181,875 students under other agencies). Total financial damage caused to the education sector is estimated at THB 13.0 billion (USD 430.5 million) and total losses are estimated at THB 1.79 billion (USD 59.3 million).

Table 55: Total damage, losses and needs in the education sector in Thai baht, millions

	Disaster Effects			Ownership		Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Total in THB	**13,051**	**1,798**	**14,849**	**10,614**	**4,235**	**8,045**	**5,298**	**-**

The cost of damage is calculated on the basis of pre-flood value of construction materials for damaged parts of school buildings and school equipment and goods such as books, desks, benches, blackboards, windows, doors, school compounds, computers, science lab equipment, office chairs, school roofs, etc.

The total resources needed for both recovery and reconstruction within the education sector are estimated at THB 13.34 billion (USD 440 million).

[113] The total number of affected provinces is higher but for the purpose of this assessment, the NESDB and the MOF requested the team to focus on only 26 provinces severely affected by the flood.

MOE Commissions	Disaster Impacts			Ownership		Recovery and Reconstruction Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Basic Education	1,163	922	2,085	2,085	0	884	393	-
Private Education	215	74	289	0	289	153	75	-
Non Formal Education	61	84	145	145	0	44	22	-
Higher Education	9,402	170	9,572	5,626	3,946	5,508	3,996	-
Vocational Education	519	364	883	883	0	304	221	-
Non-MOE Agencies *	1,690	185	1,875	1,875	0	1,153	592	-
TOTAL	**13,051**	**1,798**	**14,849**	**10,614**	**4,235**	**8,045**	**5,298**	**-**

**Note: Ministry of Interior: Metropolitan Administration, Border Petrol Police Schools and National Office of Buddhism; Ministry of Tourism: Institute of Physical Education, and Ministry Of Culture: Banditpatanasilpa.*

Table 56: Education sector – Damage, losses and needs in Thai baht, millions

Sector Context

Education is a significant component of human capital development whose benefits – as evidence in policy literature firmly establishes – extend to economic development and growth. However, the success or failure of education in terms of increasing productivity and growth depends crucially on access and quality.

Thailand has done a remarkable job in expanding education opportunities at all levels. Structural adjustment and decentralization brought the establishment of a single agency responsible for education standards, quality assessments and the implementation of a radical curriculum reform that took direct aim at the rote learning system that was long a mainstay of public education in Thailand. All this was the result of goals set by the government to achieve universal lower secondary education by 2006 and universal upper secondary education by 2015. Thailand increased the gross enrollment rates[114] (GER) in primary (from 96 percent to 99.4 percent), secondary (from 30 to 83 percent), and higher education (from 19 to 43 percent) between 1985 and 2010. Gender disparities in education are low (Gender Parity Index: primary level = 0.98 percent, secondary level = 1.09 percent and tertiary level 1.24 percent).

Despite these achievements, many challenges remain. In basic education, substantial effort has been placed on improving access but provision of quality education needs urgent attention. In higher education, the GER for population age 18–24 is 35.8 percent in 2011, which is comparable to other East Asian Economies. The graduation rate is higher for females than males. The GER indicates that a significant proportion of the young adult population are unprepared for, do not have access to, are otherwise unable to participate in higher education, or are opting out of the system for employment opportunities. There are also access inequalities due to geographical location, and income – generally access is lower for students from rural areas, and from low-income households. Thailand

[114] The GER is the number of pupils enrolled in a given level of education regardless of the age expressed as a percentage of the population in the theoretical age group for that level of education.

also lags behind its neighbors in terms of enrollment of students in fields that promote research and development such as science and engineering.

Public education expenditure accounts for 4 percent of GDP in Thailand and household education expenditures account for 1 percent of GDP. Appropriations for education consistently account for 20–22 percent of all government expenditures in the past few years. The private sector plays a small role in primary and secondary education but its role is more prominent in higher education, enrolling about 20 percent of the total tertiary students in 2009. Through the years, substantial investment has been made in building quality education facilities at all levels. Before the 2011 flood, 16,855 institutions under the MOE enrolled 5.9 million students in the 26 flood affected provinces.

Damage and Losses

Damage

Institutions of learning ranging from primary schools through higher education institutions were affected by the 2011 flood in the 26 provinces, with many experiencing considerable of damage.[115] Substantial amount of reconstruction/repair/replacement to school infrastructure and leaning materials will be needed. Most highly affected education institutions are located in flood prone areas and lowland. Over 17,000 education institutions in the 26 provinces, 2,934 were fully or partially damaged by the flood (2,694 under the MOE and 240 under other agencies involved in education provision) and 2,508 are public and 426 are private institutions. Of the 6.1 million students enrolled in the 26 provinces, 1,435,378 were affected (1,253,503 students under the MOE and 181,875 students under other agencies). Of the total number of students affected, 1,042,255 students were enrolled in public institutions and 393,123 in private ones. As gender equality in enrollment is broadly on par in Thailand, both male and female students are largely equally impacted by the recent disaster.

[115] Although early recovery could begin now in the provinces where the flood situation has started to improve, the assessment is constrained by the difficult access to information and target groups as the overall attention remains on the immediate relief effort in Bangkok and Greater Bangkok areas.

Under the MOE, an initial assessment of damage to infrastructure and learning equipment of 1,999 public primary and secondary schools is estimated at THB 1.16 billion. This figure is expected to increase once all affected schools submit their estimated flood damage costs. In addition, 192 non-formal education centers in 26 provinces are reported damaged at an estimated cost of about THB 61.5 million; 400 affected private schools at an estimated cost of THB 215.05 million; 56 vocational institutes at a cost of about THB 519.0 million; and 47 universities at a cost of THB 9.4 billion[116] . In total, 2,694 education institutes under the MOE are reported damaged and the current estimated a total cost is about THB 11.36 billion.

	Public	Private	Total
BASIC EDUCATION			
Renovation/reconstruction	722	-	722
Equipment/furniture	20	-	20
Education materials	421	-	421
PRIVATE EDUCATION			
Renovation/reconstruction	-	129	129
Equipment/furniture	-	22	22
Education materials	-	65	65
NON-FORMAL EDUCATION			
Renovation/reconstruction	37	-	37
Equipment/furniture	6	-	6
Education materials	18	-	18
HIGHER EDUCATION			
Renovation/reconstruction	2,465	1,766	4,231
Equipment/furniture	2,190	1,570	3,760
Education materials	822	589	1,411
VOCATIONAL EDUCATION			
Renovation/reconstruction	272	-	272
Equipment/furniture	169	-	169
Education materials	78		78
NON-MOE AGENCIES			
Renovation/reconstruction	1,014	-	1,014
Equipment/furniture	169	-	169
Education materials	507	-	507
TOTAL	**8,911**	**4,140**	**13,051**

Table 57: Education sector – Damage in Thai baht, millions

In addition, 240 education institutions under other agencies outside of the MOE are also affected at an estimated cost of THB 1.69 billion.

The cost of damage is calculated on the basis of pre-flood value of construction materials for damaged parts of education institutes (buildings, roads, dikes, dormitories, stadiums, etc.) and equipment and goods such as books, desks, benches, blackboards, windows, doors, school compounds, computers, science lab equipment, office furniture, etc.

A total cost of damage to the education sector is estimated at THB 13.05 billion (USD 430.5 million).

Most schools were operational at the time of writing, having done major clean up and repair of water damage. However, for some higher-level educational institutions such as Nakhon Sawan Agricultural College, Thammasat University (Rangsit), Kasetsart University and a few others institutions in Ayuthaya and Bangkok, a substantial amount of clean up and repairs will be required after the flood.

Losses

Shelter is critical in providing basic security and personal safety from elements and resistance to diseases, as well as for sustaining the dignity and structure of families and communities. Since major flooding came during the school holiday, an immediate priority of the MOE – through its key commissions/offices – including: Basic Education Commission, Vocational Education Commission, Higher Education Commission, Private Education

[116] Some of the universities have insurance coverage and there is a need for the MOE to obtain necessary data from each institution.

Commission and the Office of Non-Formal and Informal Education – was to urgently convert 890 education institutions in 26 affected provinces into shelters for flood victims. Other agencies involved in education provision, such as the Bangkok Metropolitan Administration, have also been also been active in providing immediate support to flood victims in turning their 190 facilities into shelters. Substantial funding from the MOE and individual institutions has been reallocated to provide emergency support to the operational needs of these shelters, resulting in major losses in the education sector. The total losses are estimated at THB 1.798 million.

The capacity to host flood victims varies among shelters, ranging from 10–4,000 people. Provisions in the shelters include: food, accommodation, basic needs, latrines, medical care, short-term skill training, transport and security. Some shelters provide separate quarters for female flood victims and specific female hygienic items are also included in the survival kits distributed. Most of the users of these shelters had no other alternatives and the shelters are their temporary solution. Since major flooding came during the school holiday, disruptions to classes were minimal. For those institutions not used as shelters, efforts are focusing on moving forward to clean, repair and restore once the water recedes. In many cases, institutional cleanup efforts are being carried out by administrators, teachers, students, and parents on a voluntary basis. Other than running the shelters and debris removal/cleaning, the sector did not incur other losses such as temporary rental of premises, payment of overtime to teachers, or loss of revenues in private sector schools. The academic year for both public and private education institutions at all levels will be adjusted and prolonged to make up for the delay in school opening.

Table 58: Education sector – Damage and losses by province in Thai baht, millions

Province	Damage	Losses	Total
Ang Thong	16.8	31.5	48.3
Ayuthaya	932.2	66.0	998.2
Bangkok	4,686.1	603.4	5,289.5
Chachoengsao	59.6	23.2	82.8
Chai Nat	34.3	22.1	56.4
Kalasin	46.4	14.4	60.8
Khon Kaen	38.2	29.2	67.5
Lop Buri	121.5	45.5	167.0
Maha Sarakham	39.4	14.2	53.6
Nakhon Nayok	48.4	26.1	74.5
Nakhon Pathom	234.2	40.3	274.4
Nakhon Sawan	583.2	73.2	656.4
Nonthaburi	155.8	257.8	413.6
Pathum Thani	5,480.0	310.8	5,790.9
Phitsanulok	87.2	20.0	107.2
Phichit	141.5	26.6	168.1
Prachinburi	87.3	23.7	111.0
Roi Et	5.6	15.1	20.7
Samut Sakhon	69.5	20.0	89.5
Saraburi	34.8	33.8	68.6
Singburi	25.5	19.7	45.2
Si Sa Ket	5.2	11.9	17.1
Suphan Buri	52.6	21.6	74.2
Surin	0.04	3.03	3.07
Ubon Ratchathani	34.8	19.7	54.5
Uthai Thani	30.8	25.1	55.9
Total	13,051.0	1,797.9	14,849.0

	Public	Private	Total
BASIC EDUCATION			
Shelters (food, accommodation, basic needs, latrines, medical care, short-term skill trainings, utilities, transport and securities)	852	-	852
Debris removal and site cleaning	70	-	70
PRIVATE EDUCATION			
Shelters	-	61	61
Debris removal and site cleaning	-	13	13
NON-FORMAL EDUCATION			
Shelters	80	-	80
Debris removal and site cleaning	4	-	4
HIGHER EDUCATION			
Shelters	40	29	69
Debris removal and site cleaning	59	42	101
VOCATIONAL EDUCATION			
Shelters	359	-	359
Debris removal and site cleaning	5	-	5
NON-MOE AGENCIES			
Shelters	131	-	131
Debris removal and site cleaning	54	-	54
TOTAL	**1,654**	**144**	**1,798**

Table 59: Education sector – Losses in Thai baht, millions

Recovery and Reconstruction Requirements

The MOE has placed priority on the timely reopening of schools and remarkable effort is being made to achieve this objective. The new academic year was initially scheduled to start on November 1, 2011. However, with the flood, the opening date was postponed to December 6 and the academic calendar has been adjusted to make up lost days due to the flood. At the school level, classes have resumed, an extra hour is being added to the normal daily schedule, and schools are now open on Saturdays. The school year will be extended into the summer months to ensure complete coverage of the full curriculum.

Major flood-affected universities were scheduled to open on January 9, 2012. Similar to the strategy taken at the school level, universities will also extend their academic year into the summer months to make up instructional time.

Effective measures are already being undertaken by the MOE to recover from this flood. Many schools provided children with supplemental learning materials for home use during the flood. Learning activities also took place in shelters run by the MOE. In order to resume classes swiftly, debris removal and major cleaning efforts are taking place in many institutions. Many technical colleges have been

turned into “fix-it centers” to provide free equipment repair services to local communities. Farmers and community members are encouraged to use the services offered by these centers. It is noteworthy to mention that the MOE, under its various commissions, provided extensive support to flood victims beyond the provision of shelters, food and water. Other items distributed include floating toilets, rafts, boats, and water purification systems.

Overall need for both recovery and reconstruction within the education sector is estimated at THB 13.34 billion. Assuming that the rehabilitation of the education facilities follows building safety standards, the estimates for rehabilitation costs will be higher than damage estimates. Under the assumption that the reconstruction of education facilities will take about two years, total reconstruction costs are THB 10.55 billion.

Recommendations for Resilient Recovery and Reconstruction

It may take up to two years until the education system in the 26 flood-affected provinces is back to normal and all education facilities have been reconstructed and rehabilitated. The MOE was successful in setting up temporary shelters, adjusting academic calendars and ensuring that students returned to class as quickly as possible, with students at all levels back at the latest by January 9, 2012. Despite the large number of affected students, attendance rates are expected to remain the same for girls and boys.

Strategy for Short-term Recovery (up to 6 months)

- Immediate and streamlined budget processing steps to restore affected education institutions.
- Higher education institutions should consider flexible measures to admit high school graduates from flood-impacted areas whose academic calendar would be different in the coming year. In addition, HEIs not affected by the flood should provide financial assistance or fee waivers to disadvantaged students from affected areas.
- Review building usage to ensure that the first floor is used as meeting rooms or classrooms rather than laboratories. For single-story buildings, doors/widows and furniture should be replaced with water resistant materials.
- Flexibility should be built into the academic calendar so schools can use their own discretion regarding the starting date of the coming academic year. Those that are ready should be allowed to open and those less ready should be allowed sufficient time to recover. This is already being done to some extent.
- Appropriate technical supervision is needed to ensure that building codes and other safety measures are followed, both in future school construction, and in the rehabilitation of damaged school buildings.
- Establishing the principle of “build-back-better” (BBB) will improve the resiliency of reconstructed infrastructure.

Strategy for Medium-term Recovery and Reconstruction

- Internal Quality Assurance conducted by all educational institutions should include a natural disaster awareness program as one of its key measurement indicators.
- Education institutions can act as a community educator for community DRM awareness and facilitate programs to better train the public to cope with disasters

of all types, especially targeting programs for girls, boys, women and men. Disaster related curriculum should also be integrated into standard educational programming, such as teaching swimming as a part of the physical education program. This flood demonstrated the importance of this – of the 610 deaths, 535 were caused by drowning.

- Mental health support should be provided to students and their families. Such public awareness programs need to target the particular needs of different stakeholders, including girls and boys, women and men, the elderly etc. There is an urgent need for the MOE to put in place and for schools to implement a concrete education institutions contingency and emergency plan, with specific evacuation centers officially assigned. Designated emergency response teams should also be established and mobilized in all institutions. Evacuation plans should be developed and yearly emergency drills should take place at all educational institutions. Schools with capacity should be assigned as shelters and be provided with sufficient budget to effectively operate as shelters. These designated schools should store emergency medicine and relief materials to be ready to respond. Guidelines for ensuring safe conditions for disaster victims in shelters should be taken into consideration.[117]
- All education institutions (especially HEIs) should prepare action plans related to space management for the short, medium and longer term. Building codes for all education institutions should be reviewed, taking into account safety standards – all buildings should be disaster resilient and flood resistant. For HEIs severely affected by the flood, a study to review campus area usage, to include flood ways, should be conducted.

Strategy for Long-term Recovery and Reconstruction

- All new education institutions and those under repair in flood-prone areas need to adhere to proper building standards to avoid future damage and losses, and should consider the BBB principle.
- For those needing new locations (especially Non-Formal Education centers), the MOE should discuss with communities to ensure that these centers are moved to higher grounds where access is easy.
- Incorporation of safe building codes into school construction and construction of safer schools as emergency shelters will prevent future damage in the education sector.

[117] Rigorous registration process to keep track of victims, sufficient food and water supply; ensure appropriate, adequate and un-crowded shelter; discuss sanitation with victims; protect the water supply from pollution and ensuring steady electrical supply; assess health issues in shelters; plan for message dissemination on health and hygiene among victims and make available various modes of communication.

Table 60: Education sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Recovery and Reconstruction Needs	< 6 mths	6 - 2 4 mths	> 24mths
Recovery and Reconstruction			
Renovation/reconstruction of school buildings	3,203	3,203	-
Equipment and furniture replacement	2,073	2,073	-
Education materials	2,499	-	-
Debris removal and site cleaning	247	-	-
Disaster prevention and awareness materials	22	22	-
SUBTOTAL	8,045	5,298	-
Increase Disaster Resilience			
Dikes/floodwalls for severely affected higher education institutes	-	94	-
			-
Hydraulic pumps	-	56	-
New schools with higher elevation	-	343	-
SUBTOTAL	-	493	-
TOTAL	**8,045**	**5,791**	**-**

Disaster Resilience in the Education Sector

Policy Recommendations

Policies & Legislation

- Strict observation of quality standards, guidelines and proper land use planning for the construction of all new education institutions. Geographic Information Systems can be a very effective tool for locating and designing new schools and disaster shelters. Linkages with any risk mapping (recommendations in the overall DRM section) should be made.
- Education institutions have disaster management plans. The following are useful websites:

  School Disaster Management Manual (Japanese): http://www.center.gsn.ed.jp/curriculm/data/siryoupagepdf/saigaitaioumanyuaru/gakkousaigaitaioumanyuaru.pdf

  Role of Schools as Shelters under Disaster Condition (Japanese): http://www.hyogo-c.ed.jp/~somu-bo/bousaimanual/05-3shou.pdf

Disaster Advocacy & Awareness

- Advocacy and awareness materials for all levels of education. Materials are already available for use at primary and secondary levels. There is a need to provide such advocacy and awareness manuals for administrators in universities. The awareness materials and the way they are disseminated, should take into account the particular needs and constraints of different stakeholders, including women and men.
- Publicity materials and pamphlets for general public advocacy regarding safety in education institutions.

Coordination & Capacity Development

- MOE to build closer coordination with other key agencies dealing with disaster management. This coordination should be at both central and local levels.

- Education and training on disaster risk management and waste management for administrators, teachers, and students.
- Schools conduct disaster preparedness programs (e.g. mock drills, first aid, search and rescue, swimming and crowd management training).
- All teachers – especially those in risk prone areas – should be trained to start educational activities immediately after a disaster, which is critical for helping students recover from the disaster through engaging in their studies and providing a sense of normalcy. It is essential that both male and female teachers are trained; and that such training also take into account the different risks facing boys and girls respectively.

Risk-proofing & Monitoring

- Education institution safety norms are followed in construction of safe institutions.
- Risk assessment done in site-selection and building new education institutions.
- Retrofitting of existing education institutions. Considerations should be taken to build permanent dikes and floodwalls, as well as to the installation of hydraulic pumps.

Engagement of Local Authorities & Communities

- Training of local authorities on auditing of school buildings and on dissemination of disaster awareness and advocacy messages that take into account different needs of women and men.

Cultural Heritage Sector

Summary

The 2011 floods have affected a large number of cultural heritage assets including theatres, museums, temples, historic shrines, archaeological sites, cultural landscapes, and historic landmarks. Assessing damage and losses to cultural heritage assets is a site-specific exercise: their diversity requires site-by-site assessments. In addition to these tangible cultural heritage assets, intangible cultural heritage, such as cultural events, festivals and other gatherings around the country, have also been greatly affected. Overall, Thailand's heritage plays a significant role in the country's identity and is important to preserve.

Across the 26 assessed provinces[118], more than a thousand sites were identified as being under the responsibility of the Fine Arts Department, a body of the Ministry of Culture; of those, damage was reported for more than 300 of them (as of November 2, 2011). However, these assets correspond only to a portion of all cultural heritage structures in the affected zones, as other sites are either under other ministries' responsibility or are simply private assets. Provinces reported damage to 1,532 community temples, which are owned by local religious organizations. Furthermore, at the time of reporting, it is known that a number of assets were damaged that were not included in the report.

Total damage and losses to the cultural heritage sector was estimated to be THB 7.5 billion (USD244.15 million[119]) (Table 61). Beyond the estimate of damage to sites and artifacts, the assessment took into account income loss from ticket sales resulting from the decline in attendance of festivals, and the losses incurred from the implementation of emergency measures to prevent damage during the occurrence of the floods. The duration of the recovery period will greatly impact the scale of losses.

The needs for recovery and reconstruction are estimated at THB 10.15 billion (USD 330.30 million) (Table 61), which includes (i) immediate needs (such as emergency rescue and temporary storage of artifacts in alternative locations); and (ii) complete restoration costs of the flood-affected assets. These will result in a reduction of their vulnerability through retrofitting measures and improvements in their preparedness (e.g. construction of dikes and waterworks when required, relocation of artifacts to safer locations in case of flood warning, training activities in flood preparedness, etc.). Given the current capacity of local government, it could be estimated that the complete reconstruction period will require at least two years, assuming the financial and technical resources are made available.

[118] The total number of affected provinces is higher but for the purpose of this assessment, the NESDB and the MOF has requested the team to focus on only 26 provinces severely affected by the flood.

[119] The conversion rate used is USD 1 = THB 30.74, as of Nov 13, 2011.

Sub-sector / Component	Disaster Impacts			Ownership		Recovery and Reconstruction Needs	
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths
Heritage Structures and Sites	4,331.60	609.98	4,941.58	2,931.95	2,008.00	6,182.74	3,970.75
Repository of Heritage	97.19	4.42	101.61	93.11	8.50		
Natural Heritage	0	16.34	16.34	16.34	0		
Intangible Heritage	0	2,445.74	2,445.74	0	2,446.74		
TOTAL	**4,428.79**	**3,076.48**	**7,505.27**	**3,037.84**	**4,463.24**	**6,182.74**	**3,970.75**

Table 61: Heritage sector – Damage, losses and needs in Thai baht, millions

The Heritage Sector in Thailand

Cultural heritage is defined as tangible and intangible heritage. They are inseparable and in order to maintain full benefits, should be preserved together. Tangible heritage is also classified as immobile and mobile, immobile including monuments and sites, while mobile cultural heritage consists mainly of museum and archival collections, which may cover many thousands of years of human history and achievements. It is fragile, vulnerable, subject to destruction, and of great commercial and artistic value, which translates to a high-risk factor for preservation and protection.

For the purpose of this report, the cultural heritage sector includes the following four sub-sectors:

I. Heritage Structures and Sites (monuments, temples, historic constructions, traditional or vernacular buildings[120]);
II. Repository of Heritage (museums, archives, libraries, culture-related buildings, etc);
III. Natural Heritage (wildlife preservation areas and national parks); and
IV. Intangible Heritage (festivals, recurring events, etc).

Tangible Heritage

With more than a thousand years of history, Thailand displays an enormous number of sites and artifacts of various historical and cultural importance. Religion remains of great importance in Thai daily life and this fact is expressed in the numerous temples, shrines and celebrations throughout the country. For example, the National Office of Buddhism reports having more than 37,000 temples under its authority, while Bangkok itself has more than 400 Buddhist temples alone. While we divided the sector between Repository of Heritage and Heritage Structures and Sites, it is clear that with a strong religious culture, Thailand's artistic repository remains mainly in temples. However, the country possesses a great number and variety of museum, such as the Chao Sam Phraya National Museum in Ayuthaya that holds what is left of the gold treasures, salvaged from the ransacking of the

[120] Vernacular buildings are designed by an amateur without any training in design, guided by a series of conventions built up in his locality, paying little attention to what may be fashionable.

ancient capital 244 years ago. Others house collections of ancient artifacts or traditional objects. Under the Ministry of Culture, the Fine Arts Department (FAD) has under its responsibility a number of National Museums, National Libraries and National Archives, while the International Committee of Museums (ICOM) has a national committee representing all museums in Thailand.

The FAD is also responsible for numerous historical sites throughout the country, which account for more than 1,100 in the assessed provinces. Temples, stupas, buddhas and other religious symbols are either distinguished as “living temples” or “deserted temples”, differentiating those in religious use or not, and might include archeological ruins. Beyond these temples, the National Office of Buddhism oversees more than 15,000 temples and religious facilities over the 26 assessed, flood-affected provinces. Ten Historical Parks are also managed by the FAD, which are essentially a regrouping of historical sites within a given area. Two of them, Sukothai and Ayuthaya, are listed on UNESCO’s World Heritage List, but only Ayuthaya is within the assessed regions. The former capital of the Siamese empire, Ayuthaya still bears witness to the period of development of a true national Thai art, and was granted registration on the UNESCO list in 1991. Since the increased international awareness of Thailand’s cultural assets, foreign and local tourist traffic has risen. This has resulted in an associated increase in revenue and a growing understanding of the value of the heritage sector to the Thai national economy.

The country also possess a long tradition of vernacular “water architecture”; until recently people settled near the water were adequately equipped to face floods, with housing either on stilts or on rafts, living in symbiosis with the land not only through housing typologies but also with a lifestyle that integrated annual flooding as a matter of course. Today, these various vernacular structures are disappearing, threatened by a change of land use and the desire to “modernize”. This often leaves dwellers more vulnerable to floods, as they build closer to the ground, while remaining in the same flood-prone areas. At the same time, some communities along canals, as well as some traditional floating markets, are regularly visited by foreign tourists in search of an “authentic” experience of Thailand.

Of equal importance to the country is its natural heritage. With 15 percent of the country’s land and sea designated as parks and sanctuary, Thailand has one of the highest percentages of protected space in Asia. Two of Thailand’s national parks are listed as UNESCO World Heritage sites: Khao Yai National Park and Thung Yai and Huai Kha Khaeng wildlife sanctuaries. Within the 26 assessed provinces there are six wildlife preservation sanctuaries and 15 national parks. This protected natural area represents more than 7,100 km2 of land, representing 5.26 percent of the province’s area. While some present unique landscape features and others hold archeological ruins and historical temples, the most infamous one is the Khao Phra Viharn National Park, which holds on its grounds the contentious Preah Vihar Temple on the border of Thailand and Cambodia; its ownership has been the source of major diplomatic and sometimes military dispute between the neighboring countries.

Intangible Heritage

Religious holidays are an integral part of Thailand’s culture, involving communities in various traditions and festivals, either through Thailand’s own festivals (such as Loy Krathong or Yi Peng festivals) or international festivals marked around the world (Chinese

New Year for example), which are celebrated in succession throughout the year. Handicrafts, dance, puppet making, massage and food are all expressions of the diversity and vibrancy of activities related to this sub-sector.

The cultural heritage sector cross-cuts the creative industries.[121] It is estimated that the sector accounted for about 7.72 percent [122] of GDP in 2009. If and when linked to tourism, which accounted for about 10.14 percent of GDP in 2009, it is of prime importance. However, the sector's significance cannot be attributed to its economic contribution alone, as it is a source of pride to the average Thai citizen that is difficult to quantify.

Damage and Losses

Damage refers to the direct impact, i.e. total or partial destruction of physical assets existing in the affected area. Damage occurs during and immediately after the disaster and is measured in physical units. For the heritage sector, the destruction of heritage buildings or irreplaceable assets that have survived for centuries cannot be measured purely in monetary terms. Under this framework, damage estimates will provide an initial indicator of reconstruction requirements.

Losses refer to the indirect impacts, calculated as changes in economic flows arising from the disaster, such as in the case of lower revenues due to declines in ticket sales and donations, temporary closing of culture-related facilities, cancellation of scheduled exhibitions and activities, the loss of revenue associated with any annual or recurring cultural event – such as carnivals, music festivals, fairs and cultural festivals. Equally included are the cost of provisions of temporary safety measures to prevent damage or aggravation thereof, and the cost of storage or relocation of moveable goods and objects of cultural value, including the costs of providing adequate conservation/protection systems. Losses occur until full economic recovery and reconstruction is achieved, in some cases lasting for several years, and they are expressed in pre-flood values.

Methodology: Due to the unique nature of tangible heritage assets, overall generalizations about damage and losses are difficult to make. As such, damage (and related economic losses) should ideally be estimated for each individual structure, asset, site or group of buildings due to the highly heterogeneous nature of heritage elements. However, considering the overwhelming number of structures and assets damaged or lost by the floods, and the very short timeframe for this assessment, the Rapid Assessment adopts, in general, gross estimates and a sample approach to estimated damage and losses.

Keeping in mind that the results of this exercise aim to provide an estimate at the country level, we established a methodological approach to enable the estimation of the overall cost of damage and losses for the sector in each province. In order to assess the heritage structures and sites, limited information was available, especially regarding privately owned assets. This information, combined with provincial reports enabled us to calculate a gross estimate that should be treated with caution and should not be used to determine an estimate per site/structure.

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[121] Creative industries in Thailand are comprised of the following elements: Arts, media, functional creation and heritage. Heritage is dealing with crafts, cultural and heritage tourism, traditional medicine, and food. Arts are divided between performing arts and visual arts, while media deals with publishing, broadcasting, film and video, and music. Functional creations deal with design, fashion, advertising, architecture and software.

[122] NESDB and TCDC, Preliminary Report : The Creative Economy, May 2009

Table 62: Heritage structure and sites – Number of affected sites by province[123]

Province	Registered FAD Assets	FAD sites affected by flood (per GIS+ reported to FAD)	Private assets (community temples)	Total
Ang Thong	11	10	161	171
Bangkok Metropolis	192	55	0	55
Chachoengsao	15	9	0	9
Chai Nat	14	4	0	4
Kalasin	14	0	13	13
Khon Kaen	29	2	0	2
Lop Buri	50	26	180	206
Maha Sarakham	17	1	0	1
Nakhon Nayok	5	4	0	4
Nakhon Pathom	17	4	0	4
Nakhon Sawan	15	5	190	195
Nonthaburi	23	19	0	19
Pathum Thani	10	11	0	11
Phichit	30	3	0	3
Phitsanulok	17	4	88	92
Ayuthaya	391	396	663	1,059
Prachinburi	32	4	78	82
Roi Et	48	6	0	6
Samut Sakhon	8	2	0	2
Saraburi	37	6	116	122
Si Sa Ket	21	0	12	12
Singburi	12	16	0	16
Suphan Buri	55	29	0	29
Surin	37	4	2	6
Ubon Ratchathani	33	1	0	1
Uthai Thani	6	3	29	32
Total	**1,139**	**624**	**1,532**	**2,156**

The team first turned its attention to the FAD's assets. The FAD had produced damage and restoration estimates for 313 of their damaged sites at country level, estimating the total cost of repairs and restoration work to be in the range of THB 1.5 billion, with almost half of the cost in Ayuthaya. The validity of the numbers presented by FAD was confirmed by comparing them with the actual repair expenditures incurred after the 2006 floods, which restored and retrofitted the sites damaged.

In 2006, Ayuthaya was severely flooded and the entire historical park was affected, with several assets in dire need of repair and restoration work. The FAD recorded spending THB 116.531 million in the following year and half to complete this work. These numbers were used as a reference for providing accurate restoration estimates for identical assets.

From the FAD's list of assets, we established that over one thousands sites are located in the assessed provinces. The FAD already established a GIS record of all its assets, including those that are of historical or archeological relevance not yet under its ownership.

[123] FAD reported damage in Ayuthaya not only for its registered sites but also for a few service-related facilities (historical park offices, for example). They were included in our calculations

By using GIS mapping to determine the extent of the floods, with an overlay of the location of all the FAD's assets, the team was able to clarify which FAD-administered heritage sites were located in the flooded areas (Table 62). It was assumed that all of the 554 sites would have been affected, to some extent, since water would be present either in their compounds or in their vicinity.

Damage

Of the 26 assessed provinces, a large number of cultural heritage sites were affected. More than 500 historical sites under the responsibility of the FAD would have experienced a certain degree of damage. Religious authorities and communities reported damage to about 1,532 of their temples and support buildings. In terms of repository of heritage, the International Committee of Museums (ICOM) reported damage to 28 museums, both public and private. The FAD also reported damage to one national archive and several libraries and museums. At the time of reporting, a number of assets, both of historical importance or culture-related, were affected.

In the private sector, a large number of settlements presenting vernacular and/or historical features, which are often tourist destinations, have also been greatly affected (see Annex 19). However for this assessment, it was not possible to gather enough information to enable the calculation of damage and losses.

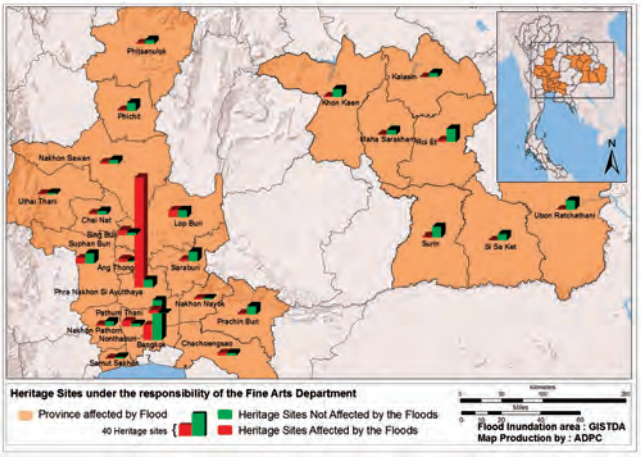


Figure 16: Heritage structure and sites – Map showing location of FAD assets, by province

The map presented in Figure 16 confirms what was already apparent from the estimates provided by the FAD: most of the affected sites were in the vicinity of the city of Ayuthaya. In fact, in Ayuthaya, almost all historical sites under the supervision of the FAD were affected. In some cases, major damage was caused by water infiltration and humidity, and efflorescence, and resulted in varying degrees of structural damage due to the extended time under water. Technical and heritage experts are concerned about the extent of damage and the impact it will have on the structural stability of some sites. Ayuthaya holds a total of 391 sites listed by the FAD, of which only 130 reported damage at the time of writing. A further 663 private temples[124] also reported damage.

[124] A private temple is defined here as a temple or religious structure that is not under the supervision of the state, but could be under the responsibility of a local religious authority, or a community group.

For a number of provinces, the team was able to gather further information about flood-affected temples through the regional offices of the Ministry of Culture and ONAB. Differing from those listed by the FAD, these private temples consist of more recent structures, and most are for community use. It was not possible to get detailed information about these structures, but there was significant variability in these self-reported estimates, which made extrapolation difficult.

In order to complete the determination of damage and losses for the affected provinces, some extrapolation is required. Ayuthaya Historical Park possesses a wide range of different asset types, from which a number of sites were identified. We defined a representative group incorporating a variety of conditions (type of asset, size of compound, type of construction technology, type and scale of damage, etc.) illustrative of the affected sites. Calculations were based on this sample (detailed presentation appears in Annex 17). We selected sites like Wat Pra Sri San Petch that are highly frequented and need extensive restoration measures in the long term, as well as sites that are less known, like Wat Singharam collapsed entirely) and Wat Panancheong, which avoided significant damage (established very important water protection measures). Sites were selected both on the Ayuthaya island and in its vicinity,[125] again trying to capture a variety of situations that are representative at a larger scale. In all 16 different locations a representative sample was selected.

A value per square meter of damage for landscaped areas and for constructions was derived from the sample group, enabling the extrapolation of costs to other provinces and FAD sites, while keeping in mind that most of the affected sites are in Ayuthaya. For most, with the use of digital mapping and GIS information, rough estimates of the size of the affected sites, differentiating their open compound and built areas, were derived. Given the short timeframe of the mission and the unique character of each site we understand that a large margin of error exists given such crude calculations. We assume that the validity of the exercise is at a province- or country-level scale, rather than as an estimate of work for each site. Nevertheless, the team was able to determine that, at a conservative level, the figures roughly correspond to the FAD's estimations.

[125] Temples and other constructions built outside of the island possess a different type of construction than those built in Koeg Mong area, on the island.

Province Name	Heritage Sites and Structures	Repository of Heritage	Natural Heritage	Intangible Heritage
Ang Thong	94.43	-	-	n/a
Bangkok Metropolis	2,770.93	53.40	-	n/a
Chachoengsao	373.04	-	-	n/a
Chai Nat	58.80	-	-	n/a
Kalasin	7.11	-	-	n/a
Khon Kaen	3	-	-	n/a
Lop Buri	2.8	-	-	n/a
Maha Sarakham	312.43	-	-	n/a
Nakhon Nayok	1.10	-	-	n/a
Nakhon Pathom	26	0.20	-	n/a
Nakhon Sawan	6.72	-	-	n/a
Nonthaburi	119.71	-	-	n/a
Pathum Thani	91.73	26	-	n/a
Phichit	21.46	-	-	n/a
Phitsanulok	5.47	-	-	n/a
Ayuthaya	42.27	22.01	-	n/a
Prachinburi	56.42	-	-	n/a
Roi Et	25.76	-	-	n/a
Samut Sakhon	15.75	-	-	n/a
Saraburi	5.84	-	-	n/a
Si Sa Ket	62.14	-	-	n/a
Singburi	-	-	-	n/a
Suphan Buri	123.05	-	-	n/a
Surin	21.55	-	-	n/a
Ubon Ratchathani	1.40	-	-	n/a
Uthai Thani	81.05	-	-	n/a
Total	**2,485,88**	**75.85**		

Table 63: Heritage sector – Summary of damage by province and subsector in Thai baht, millions

Damage in Repository of Heritage

With regard to tangible heritage that falls under the category of cultural-related facilities, we were able to gather information both from the FAD and ICOM, with ICOM presenting information both for public and private museums from 26 of its members, estimating the damage to four of these to be THB 41.1 million. Comparatively, the FAD presented specific data for four national museums, one national archive and one national library. At the country level, only one national archive and one national library were affected. Damage calculations were simply derived by computing the data provided. Using the information gathered at Chantharakasem National Museum as a baseline, and assuming that it is representative of an "average" situation where most elements of the collections did not sustain damage but the equipment and premises did (as reported by other National Museums), a value per m2 was determined, and could be used to extrapolate to the five other National Museums. However, this method of extrapolation could not be further extended since the information provided by the private museums was incomplete and the museums types were different (refer to Annex 19).

Damage for Natural Heritage Sub-Sector

Information about the various national parks in the affected provinces, all under the Ministry of Natural Resources and Environment, was provided directly and collected through the ministry's website. Six wild life reserves and 15 national parks in the affected areas are located in the assessed provinces. These parks are about 200m above sea level, which ensured their preservation from the floods. In one instance, flash floods affected small infrastructure (small bridges over streams). These are the only affected structures related to natural heritage.

Losses

Estimated Losses for Tangible Heritage[126]

The loss estimates for FAD assets are divided into two different categories. One deals with losses directly linked with the structures, emergency prevention and protection measures, costs incurred by the management to deal with the situation, as well as costs related to relocation of goods and objects of cultural value within the buildings, including the costs of providing adequate conservation or protection systems. These are qualified as "structural losses". The second type deals with losses of income due to temporary closing, cancellation of scheduled exhibitions and activities, or loss of income due to the reduced number of visitors. The duration of the restoration and reconstruction period greatly impacts the scale of losses.

The calculation of the structural losses was produced in a similar manner to that of the damage, except that it did not seem appropriate to determine a separate value per m2 for compounds and constructions, due to the nature of the structures' losses. Instead a value for the overall size of the compound was estimated. Structural losses for heritage structures and sites are mainly the cost of prevention measures, water control measures, dikes and sand bags, pumps and other equipment, as well as other costs associated with the floods themselves. For several of its assets, the FAD included some management fees for the restoration of its assets, assuming these would not have been incurred without the occurrence of the event.

Losses stemming from visits were estimated for Ayuthaya's Historical Park, using a baseline of more than 300,000 visitors a year (detailed between local and foreign, and visitation numbers per months over a three year period[127]), with tickets selling at THB 220 for foreigners and THB 40 for locals. Estimates were made upon the assumption that during the flood period, only 5 percent of the usual visitors for this yearly quarter are visiting the sites,[128] and that recovery would be made over a year, with a slower pace for local visitors, as they themselves might be affected for a longer period by the current situation.[129] It is important to note that while Ayuthaya experienced significant damage

[126] Cross-references were checked with the Tourism sector to avoid double accounting.
[127] Information provided by FAD
[128] Assumption made with Tourism Sector.
[129] The team made this assumption based on the speed of recovery following the various recent events (red-shirt protests in May 2010, airport closure in Dec 2009, avian flu in Jan 2005) that were relatively short (World Bank, Thailand Economic Monitor, April 2011), where the recovery period of the tourism sector would be longer when media coverage was extensive (airport closure), considering for this instance the extensive international media coverage of the floods. Furthermore we assume that local visitors would be returning in slower numbers as the level of their disposable income has been impacted by the floods.

and losses, other sites with little or no damage will also experience high losses due to a reduced number of tourists. For example, Sukothai Historical Park received almost no tourists even if the region was not really affected by floods (Annex 21).

Several festivals will most likely experience losses and/or might be cancelled. The floods' effects on other culture-related activities (craft and artisans livelihoods, local events and markets) is much more difficult to quantify, yet a negative impact has definitely been noted. A number of assumptions have been made based on information provided by the Tourism Authority of Thailand (TAT).

Losses Estimates for Intangible Heritage[130]

In terms of losses, the team was able to gather information about foreign and local investments losses, as well as losses for 2011 and 2012. In addition, since the National Parks documentation did not provide the proportion of Thai and foreign visitors, TAT documentation was used to assume the proportion of foreign to Thai visitors to the park as a function of the proportion of foreign to Thai visitors per province.

Visitor figures are based on the fact that parks in Thailand are mostly visited by locals.[131] Table 64 summarizes the total losses as roughly 2.4 and 0.68 billion in 2011 and 2012, respectively.

	2011	2012
Heritage Assets	571.46	38.52
Repository of Heritage	3.13	1.30
Natural Heritage	10.69	5.65
Intangible Heritage	1,810.78	634.96
TOTAL	**2,396.06**	**680.42**

Table 64: Heritage sector – Summary of yearly losses per subsector in Thai baht, millions

Source: Wikipedia

*Note: dates July 11, 2011 and October 23, 2011

Figure 17: Ayuthaya before and during the floods

[130] Cross-references were checked with the Tourism and Environment sectors to avoid double accounting.

[131] See Thavarasukha (1995) states that most Thai parks are visited by 95 percent local tourists, while Lindberg and al. (1997) refers to the increasing number of foreigners visiting the parks, leaving up to 85 percent to the local market. We have used that proportion.

Recovery and Reconstruction Requirements

Assigning a monetary value to certain aspects of Thai cultural heritage is not straightforward, but the inclusion of the cultural heritage sector in the Rapid Assessment process can contribute to the improvement of the foundations upon which the recovery efforts will take place, making them more sustainable and more effective.

In the provinces in which water had receded, recovery and reconstruction had already begun at the time of writing. The population is making an effort to clean up and repair the damage and the cultural heritage sector is expected to be a part of this drive. Nevertheless, it is important that the reconstruction effort follows some rules and guidelines to ensure its effectiveness. Recommendations for reconstruction are divided into shor t-, medium-, and long-term efforts.

Recommendations for Resilient Recovery and Reconstruction

Strategy for Short-term Recovery (up to 6 months)

All subsectors

The need for **information and promotion campaigns** to promote the return of tourists should also be undertaken in the coming weeks and months. Done in conjunction with tourism, these national and international campaigns will contribute to speed the recovery, and benefit sites that did not sustain damage but saw a decline in visitors.

Tangible Heritage (Historical Sites and Structures, Repository of Heritage, Natural Heritage)

Providing temporary rescue measures for all heritage assets that are at risk of further damage is the most urgent need estimated by the mission. These include temporary shoring, relocation of moveable assets to safer areas, and even micro-filming. This will prevent further damage to the assets and ensure their preservation.

Reactivate interrupted services and ensure access to cultural institutions, libraries, archives, museums, as well as to cultural and natural sites, ensuring the proper temporary rescue measures are in place.

Tourist management should also be a priority, especially since some sites are more vulnerable as a result of the floods. Limiting access to some zones, prohibiting people from climbing onto structures, and providing appropriate signage and surveillance will prevent further aggravation of damage. As part of an integrated approach of a long-term heritage preservation strategy, it will contribute to the proper protection of heritage assets.

Carry out an in-depth assessment to each of the affected sites to determine the details of damage and required solutions for restoration work, including structural, architectural, landscaping, utility systems and overall site integrity. Use this as the basis of **an overall comprehensive restoration** plan, prioritizing the most visited and the most fragile assets and sites would limit losses.

Restoration and repairs of damaged structures, including replacement of equipment and signage, will be ongoing for a period longer than six months. The measures should take into account techniques and approaches to ensure the increased resilience of the affected heritage assets.

Through technical assistance and financial support, assist communities and religious organizations undertaking work on their community temple or cultural infrastructure. The private sector should receive special attention to ensure that appropriate techniques and measure are used, in order to avoid further degradation as a result of improper technical solutions.

Provide training to staff and volunteers involved in restorations activities, including mapping, inspection and operating procedures. Raising awareness at the community level will contribute to the preservation of the built heritage of the community, whether it is private or public.

Provide both technical and financial support to the reconstruction of traditional settlements and villages, to ensure the preservation of their traditional and vernacular features that have proven to be flood resilient as well as a source of economic income when linked to tourism. These measures are intended to ensure support for the short-term recovery of communities that might otherwise turn to alternative and less sustainable forms of building and land use, while keeping alive techniques and traditions that are disappearing. The implementation of these measures will require further analysis to determine communities at risk, in terms of vernacular or historic character.

Reconstruction efforts **could include soft-term credit lines** for reconstruction of privately-owned assets, **concessional credit or government-subsidized schemes** for asset reconstruction under disaster-resilient standards, relocation of assets to safer areas (if dealing with movable tangible heritage assets), retrofitting and mitigation measures to reduce disaster vulnerability, and training of specialized labor on disaster-resistant reconstruction.

Ayuthaya Historical Park and Ayuthaya province

The specific situation of Ayuthaya, with its extensive damage and loss to the city and vicinity, requires a special attention:

The creation of a special non-political commission to review and prepare a new Master Plan for the city of Ayuthaya, to ensure the development of a comprehensive approach to restore the heritage sites in the aftermath of the devastating flood in conjunction with a comprehensive flood control plan (which should be national as well as local), as well as an urban development plan, transportation plan, and tourism master plan. Historically, the city walls and an integrated network of canals were efficient flood management measures. Now, however, only through restoration and reconstruction of some, using a concerted and integrated approach, will Ayuthaya city and its invaluable heritage be well preserved for the future. This commission is to be formed urgently, and would provide recommendations in the medium term, and start implementing these recommendations within the next 18 months.

Additionally, short-term recovery should take into account measures that would reduce vulnerability against, and increased resilience to future possible floods within the next six months. This may include building flood protection for some of the sites, and storing equipment and artifacts on elevated ground, or using appropriate technologies to add resilience to the existing structures, as necessary.

Post-Earthquake Conservation in a World Heritage City
1996 Lijiang Earthquake, Yunnan, China

The 1996 earthquake in Yunnan, China, killed 200 people and injured 14,000 more. Approximately 186,000 houses collapsed and 300,000 people were forced out of their damaged homes. There was widespread destruction of dwellings, businesses, schools, hospitals and water, power and transportation systems. There was also significant damage to the Old City of Lijiang's historic homes, bridges, paving, and infrastructure (the city was later designated a UNESCO World Heritage site). Here, the traditional construction technique of loosely attaching mud-brick walls to timber frames allowed the frames to shake without collapsing. However, the walls collapsed. Residents' low income levels and dislocation made rebuilding a daunting task.

Using a loan from the World Bank, the Lijiang Country Construction Bureau (CCB) provided grants for home repair and guidelines on reconstruction techniques that emphasized earthquake-resilient materials and techniques. Within a few weeks of the earthquake, CCB issued the "Design and Construction Technical Requirements for Houses in Lijiang Prefecture." These guidelines explained the materials and reinforcing techniques that should be used, which included vertical and horizontal reinforcement poles, netting walls, and fired, hollow cement brick instead of sun-dried mud-brick. In support of existing historic preservation regulations, residents were also advised against using nontraditional materials or visibly contemporary building techniques. A village committee appraised the damage to each house and households received grant funds for purchase of materials – USD 95, USD 120, or USD 300, depending on the degree of damage.

In addition to the grant program, residents used a mutual self-help approach in which families organized to repair one house before moving on to the next. CCB staff reported that the amount of private money put into the housing reconstruction was often 5–10 times the amount of the grant.

Source: Geoffrey Read and Katrinka Ebbe, 2001, "Post-Earthquake Reconstruction and Urban Heritage Conservation in Lijiang," in Historic Cities and Sacred Sites: Cultural Roots for Urban Futures, Ismail Serageldin, Ephim Shluger, and Joan Martin-Brown, eds. (Washington, DC: World Bank)

Intangible Heritage Subsector

Targeted festivals/events (CSR and groups) to improve Thai "traveler confidence" and restore "Thai" psyche. The 2011 floods affected the Thai population on an unexpected scale, mainly due to the prolonged duration of the disaster. Events that boost the morale of the population, and could even mark the end of the floods or the beginning of the recovery period, could encourage the population to engage in cultural activities, despite the hardships they have endured.

Develop schemes to reactivate cultural activities that were interrupted or affected by the floods (festivals, shows, events). These events are an important part of the Thai culture and are a great portion of the losses sustained by this sector. These events, mostly private, will need support to ensure a fast recovery.

Provide support to the private and informal sector to restart their heritage-related activities (crafts, tours, etc.). The losses sustained by SMEs and the informal sector has left these groups in a precarious situation, since most of their assets are uninsured. For those who sustained the greatest losses, without funds they are unable to restart their

activities. For those with partial losses, the slow return of tourists makes it extremely difficult to return to normal business levels. The sector is particularly fragile; schemes should be developed to encourage the recovery of this informal sector, which is important to the heritage industry.

Strategy for Medium-term Recovery and Reconstruction (6–24 months)

Tangible Heritage (Historical Sites and Structures, Repository of Heritage, Natural Heritage)

In the medium term, it is recommended for local government agencies and departments to **develop local disaster-resilience plans** by revising their existing ones. The revisions should take into account the location and vulnerability of cultural heritage assets, providing a range of adaptation and mitigation measures. These measures should be based on the: (i) vulnerability of the site and likelihood of a similar future event taking place; and (ii) its relative importance in terms of cultural heritage. A prioritized list of cultural heritage assets would be developed within 12 months with the help of experts (local and international). An investment plan based on detailed engineering assessments of the damage incurred would be developed, and the implementation of this plan should be made a priority.

Subsequently, in the medium term, the government should explore ways for the heritage sector to **put together credit enhancement measures** (e.g. guarantee fund) that would entice banks to lend at lower interest rates and/or with lower collateral requirements to private organizations owning heritage or culture-related buildings (being museums, theaters, libraries, private collections, etc.)

Engage in more regular monitoring of historical assets to ensure possible problems and risks are identified before damage to an historical asset is irremediable. **Engage in a more regular maintenance cycle.** Currently, the FAD has a 25-year maintenance cycle for its assets. This is insufficient for the asset stock; the cycle should be shorter.

Training of staff on disaster preparedness and in post-disaster protocols. Prepare advocacy about the importance of Thai heritage, and specifically train specific groups of the population (government officials, institutions, civil society members).

Provide incentives for the relocation to families that are encroaching on historical sites, as well as land use that is conflicting with the historical characters of the sites. In some instances, communities have settled on the edge of or on portions of registered sites, contributing to the deterioration of the historical sites. Further analysis is necessary to determine beneficiaries and ensure a proper management of the relocation process.

Conflicting land uses adjacent to historical sites deserves appropriate attention and should be analyzed for the development of a strategy that would relocate or address these conflicts in order to determine a proper long-term historical preservation strategy for the country.

Support the improvement of livelihood opportunities linked to recovery of the cultural heritage sector) and supporting local businesses in this sector through tax incentives, subsidies, etc.

Natural Heritage Subsector

Beyond short-term promotion campaigns, **promote ecotourism at local levels** in particular to encourage the return of activities to unaffected park areas. Provide support to SMEs (tour guides and tour operators, hospitality industry, etc.) to enable a viable environment to support market opportunities for the development of such businesses, including the integration of appropriate flood protection measures.

Summary of Needs

The table below provides an overview of recommended activities in the short-, medium-, and long-term. It serves as a framework and requires further detailed investigation. It serves only as an indicative estimate of the work required and is to be completed over the coming weeks.

Table 65: Heritage sector – Summary of needs

Sub-Sector	Needs Recommendations	~6 months	6-24 months	Public	Private
	Information campaigns to promote the return of tourists, both local and foreign	provided by Tourism		x	
SUBTOTAL					
Heritage Sites and Structures and Repository of Heritage					
	Urgent contention measures of damaged heritage assets, whether it is temporary shoring, relocation of moveable assets, or micro-filming	1,214.29		1,214.29	
	Provide appropriate tourist management on sites	5.06		5.06	
	Carry out an in-depth assessment to establish of an overall restoration plan	404.76		269.84	134.92
	Restoration and repairs of damaged structures, including replacement of equipment and signage	3,642.86	2 023.81	3,777.78	1,888.89
	Provide both technical and economical support to the reconstruction of traditional settlements and villages, to ensure the preservation of their traditional and vernacular features	further studies need to be engaged to determine beneficiaries			x
	Provide incentive to relocate for the families that are encroaching historical sites	further studies need to be engaged to determine beneficiaries			x
	Support communities to repair/reconstruct the community temple	910.72			910.72
SUBTOTAL		**6,177.68**	**2,023.81**	**5,266.97**	**2,934.53**
Ayuthaya City and Ayuthaya Historical Park					
	All points made above plus:			x	
	Creation of a special non-political commission to review and prepare a new Master Plan for the city.				
	Ensure that the development of a comprehensive approach to restore the heritage sites in the aftermath of the flood in conjunction with a comprehensive flood control plan – which has to be local as well as national – as well as the urban development plan, transportation plan, and tourism master plan.	to the commission to perform estimates of needs			
SUBTOTAL					

Sub-Sector Needs Recommendations	~6 months	6-24 months	Public	Private
Natural Heritage				
All points made above plus:	Tourism			
Promote ecotourism at local levels in particular to encourage return of activities to unaffected park areas			x	x
SUBTOTAL				
Intangible Heritage				
Targeted festivals/events (CSR and groups) to improve Thai "traveler confidence" and restore "Thai" psyche	Tourism			x
Develop schemes to reactivate cultural activities interrupted/affected by the floods (festivals, shows, events)	Social			
Provide support to the private and informal sector to restart their heritage-related activities (crafts, tours, etc.)	Social			x
SUBTOTAL				
Disaster Resilience				
Training of staff on disaster preparedness and in post-disaster protocols	5.06		3.37	1.69
Restoration of structures to provide adequate resilience for future floods		1,216.84	811.23	405.61
Engage a shorter cycle of maintenance and restoration		730.10	730.10	
Improved access to finance for culture-related SMEs to improve their flood protection measures	Social			x
SUBTOTAL	5.06	1,946.94	1,544.70	407.30
TOTAL	**6,182.74**	**3,970.75**	**6,811.67**	**3,341.83**

2.7 Environment Sector

Summary

Unsustainable land use changes in residential, forestry/agriculture, and industrial sectors as well as supporting infrastructure may have contributed to the current flood which was amplified by an extreme weather event, i.e., sustained heavy rainfall. From 1980–2008, agricultural and other areas have increased by 25 percent at the expense of forested areas. Therefore, many important environmental functions, such as carbon sequestration, soil coverage, water regulation, biodiversity protection, and recreation provided by the forests have substantially declined. There have been numerous adverse impacts to this degradation of forests. A recent incident blamed on deforestation was that of a severe land slide at Nam Pad District, Uttaradit Province, on 9 September 2011, which served as a warning of what was to come as the floods continued to move south. The results of the climate change down scaling exercise also suggest that extreme weather events will become more frequent with potentially more significant adverse impacts.

In this report, the focus is on possible hotspots and issues which have significant cumulative environmental impacts. A flood of this magnitude has considerable and widespread environmental impacts; some of them may seem insignificant but will have significant secondary impacts on interlinked ecosystem and other impacts will have high cumulative consequences on other sectors.

Table 66: Total damage, losses and needs in the environment sector in Thai baht, millions[132]

Sub-sector/ Component	Disaster Effects			Ownership		Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Total	375	176	551	212	339	6,034	3,866	2,919

Damage and losses in the environment sector are related to impacts on municipal solid waste management facilities, biodiversity, forests and protected areas, lakes, rivers, mangrove forests, and bays, and industrial waste management facilities.[133] Flood impacts on saltwater/freshwater aquaculture due to low salinity water quality, and perennial trees such as 5,000 rai of pamelo tree in Nakhon Chaisri district, Nakhon Pathom province are captured in the Agricultural chapter.

[132] Please see a separate assumptions and methodology note for the Environment sector for more details.
[133] Damage and Losses for municipal wastewater treatment facilities are included in the Water and Sanitation chapter.

The resources needed for building-back-better recovery and reconstruction within the environment sector is estimated at THB 8.18 billion (USD 273 million). This includes resources needed to properly manage, treat, and dispose of disaster waste such as unusable furniture and appliances, debris from damaged structure, and dismantled flood protections. Recycling and reuse of disaster waste could be one possible option to minimize the impacts on the capacity of existing disposal sites. Afforestation of mangrove forests in the affected area as well as increasing capacity of water quality monitoring are critical to the recovery effort. Modernizing waste treatment facilities at the municipalities and industrial installations are needed to complete the build back better recovery for the environment sector.

Table 67: Environment sector – Damage, losses and needs in Thai baht, millions

Sub-sector	Disaster Impacts			Ownership		Recovery and Reconstruction Needs		
	Damage	Losses	Total	Public	Private	~6 mths	6-24 mths	> 24 mths
Municipal Solid Waste	34	101	135	135		2,404	77	2,233
Biodiversity	13	64	77	77		927	200	340
Industrial Waste	328	11	339		339	393	1,342	268
TOTAL	**375**	**176**	**551**	**212**	**339**	**3,724**	**1,619**	**2,841**

Sector Context

The 2011 flood has significantly affected Thailand's natural assets, namely, biodiversity resources, forest resources and coastal ecology, as well as both private and public waste management facilities and their ability to cope with disaster waste. Furthermore, flooding around the industrial estate areas has been reported, with possible hazardous waste contamination. The natural assets of Thailand, such as mangrove forests and biodiversity resources, have played a significant role in the livelihoods of local people, as well as maintaining an ecological balance. In light of the ongoing floods, it is crucial to continue to have frequent water quality monitoring and information dissemination at strategic locations. These natural assets contribute to the Thai economy in terms of food sources to the local population, tourism income or recreational activities. Any disruption of such natural assets will impose a cost on the Thai economy as well.

Waste from industrial estates in Ayuthaya and Pathum Thani provinces as a result of the flood is a concern, although the full extent of the impact is yet to be accounted for as many facilities are still flooded. A total of six industrial estates were affected by floodwaters as high as three meters. Although all of the six industrial sites constructed dikes and sand bag barriers, these preventive measures could not withstand the water pressure. The potential environmental impact of flooding at industrial estate sites are numerous, with particular concern regarding industrial wastewater and hazardous waste contamination from toxic substances used in the factories. In regards to hazardous waste contamination, there were reports of people experiencing skin infections and burns after coming into contact with water in the vicinity of flooded industrial sites. However, these complaints, and the exact cause of the skin reactions, are yet to be verified.

Municipal solid waste management facilities (the majority of which are open dump sites) have been adversely impacted, resulting in a reduced capacity to treat normal levels of waste not to mention the enormous volume of disaster waste. Although waste collection

in Thailand has been very effective, proper treatment and disposal of waste has not been managed with the same degree of effectiveness. There are only a few sanitary landfills in Thailand capable of properly treating municipal solid waste and the flood has increased the environmental and health risks of these dump sites.

The scale and scope of the current flood has led to a large amount of disaster waste generation that needs to be managed properly and promptly. Disaster waste refers to the stream of materials that, as the result of a disaster (earthquakes, hurricanes or floods), are no longer serving their original functions and therefore become waste. Trees that have fallen down during a twister or a carpet that gets coated with mud in a flood are two examples. Evidently, the disaster waste has found its way into canals, which further reduces the canals' ability to drain floodwater out of the affected areas. Figure 18: Disaster waste washed up by the floods, depicts the amount of waste in one of the canals.

Figure 18: Disaster waste washed up by the floods

Lower water quality from drained floodwater into rivers, streams, and the Gulf of Thailand has been observed by the Pollution Control Department as well as researchers from Mahidol and Chulalongkorn universities. The extremely high amount of floodwater with a very low amount of dissolved oxygen has led to fresh water intrusion in the upper Gulf of Thailand, as well as deteriorating river water quality. This has devastating impacts on coastal and marine resources as well as the fishing communities and fresh and seawater aquaculture sector. The Ta Chin River Delta, located about 50 kilometers to the west of Bangkok, is a brackish water ecosystem that serves the local residents as a source of income from brackish water shellfish farming, namely, mussels, horse mussels, and blood cockles. The heavy inflow of freshwater to the brackish ecology lowers seawater salinity and reduces the generation of shellfish and therefore the income of local farmers.

Protected areas and wetlands are normally well maintained.

- Sup Lanka Wildlife Sanctuary is home to both wild animal and plant habitat. The natural ecosystem is recognized for its biodiversity value. Tourism at Sub Lanka is not very significant. The flood has affected both the natural assets as well as built assets. The value of damage includes rehabilitation of natural assets such as animal breeding programs, clean up activities and reconstruction of roads.
- Bueng Boraphet is a wetland located in Nakhon Sawan province. Bueng Boraphet is classified as a non-hunting area covering an area of 106 square kilometers. The ecosystem of this wetland comprises of 15 types of amphibian, 49 types of reptile, 306 types of bird and 15 types of mammal. Aside from its ecological properties, Bueng Boraphet serves as an important recreational site for Nakhon Sawan residents and visitors.
- The Pasak Cholasit Dam non-hunting area is located at the Pasak Watershed. Although there are a small number of visitors, this non-hunting area serves as an ecosystem for wild animals. Flooding tends to have little impact on wild animals as they are able to adapt to water runoff rather well. However, there is a small clean up cost after the flood.

Damage and Losses[134]

The damage and loss assessment shows that the 2011 flood has generated a total of THB 375 million in terms of damage, 87 percent of which was damage caused to the industrial waste management sector. The estimates are based mostly on damage to infrastructure and equipment in the waste management sector and biodiversity conservation effort, including built assets such as roads and offices, while natural assets such as wildlife and plant species are able to withstand the floodwaters. (See Table 68)

Table 68: Environment sector – Damage in Thai baht, millions

	Public	Private	Total
Municipal Solid Waste	34	-	34
Biodiversity	13	-	13
Industrial Waste	-	328	328
TOTAL	**47**	**328**	**375**

All affected industrial estates have sufficient wastewater and solid waste treatment facilities that have sustained major losses during the flood. A complete assessment is unavailable due to the fact that several industrial estates were still inundated at the time of writing the report. For example, the Bang Pa-in Industrial Estate has solid waste treatment facilities using Pyrolytic Incinerators capable of handling 27 tons of solid waste per day. The wastewater is treated by activated sludge with a fixed film or biodisc, using an activated sludge system with super dissolved oxygen and a finishing pond. The treated wastewater is then released into nearby streams. The system has a capacity of 18,000

[134] The study team made field visits to four natural resource sites: 1) Ta Chin River Delta at Samut Sakhon province, 2) Bueng Boraphet Wetland at Nakhon Sawan province, 3) Pasak Cholasit Dam Non-Hunting Area at Lop Buri province, 4) Sup Lanka Wildlife Sanctuary at Lop Buri province, and 5) Bang Pa-in Industrial Estate, Ayuthaya province. During the field visits, the study team observed ecological sites and interviewed local government officials. Secondary data is used to assess the damage, losses and needs from industrial waste and possible hazardous waste contamination at Ayuthaya and Pathum Thani provinces.

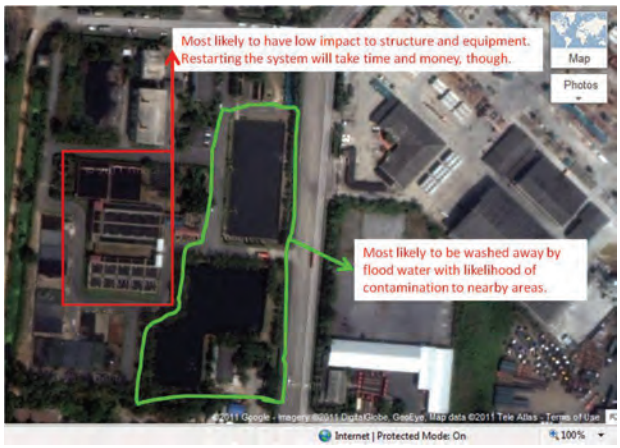


Figure 19: Waste water treatment facility plant

cubic-meters of water per day. Figure 19: Waste water treatment facility plant illustrates the Bang Pa-in Industrial Estate before the flood and the potential impacts of flooding. Normally the treatment structure can withstand minor flooding, however, certain equipment, the control system and the piping structure are vulnerable to heavy floods. Furthermore, finishing ponds or open lagoons are typically built at ground level, meaning they will be washed away and fully inundated during any flood, increasing the potential contamination risk to the surrounding environment and communities. Treatment of hazardous waste material is normally outsourced to licensed treatment facilities as transport and treatment of such materials are strictly controlled by law.

Several municipal solid waste treatment facilities have been adversely impacted by the flood, leading to loss of capacity, damage to equipment and infrastructure, and secondary impacts of increasing transport and time costs of diverting waste to other facilities. Two major examples are Ta Reng and Nong Kham waste treatment and transfer stations, managed by the BMA. The two facilities can handle 5,400 tons of waste per day with 2,000 tons/day and 3,400 tons/day for Ta Reng and Nong Kham, respectively. Ta Reng facility was not directly affected by the floods, however, the flooding in other areas meant it was not accessible. Therefore, the waste was first diverted to Nong Kham facility but it too became partially flooded, reducing its capacity to only 54 percent. The additional volume of the disaster waste will further stretch the capacities of existing municipal solid waste treatment facilities and the collection effort. Figure 20 shows trucks diverted from the affected facilities queuing to dispose of waste at an open facility.

Figure 20: Waste collection trucks

Damage to natural capital within the affected protected areas, wetlands, lakes, and bays is minimal, as the natural habitat is able to cope well with flooding, if it is not prolonged, as in the case of terrestrial protected areas in the upper Chao Phraya and Pasak river basins. A visit to the wetlands of Bueng Boraphet, Nakhon Sawan province, clearly indicated that the land use planning around the wetlands and the institutional facilities associated with the wetlands were simply not designed to factor in a flood event of this magnitude. Consequently, while there will be limited long-term ecological impact, there are significant short-term physical impacts, largely to management and commercial facilities. Most of the damage is to buildings, roads, and other structures in the protected areas. Related damage to aquaculture cages and other commercial equipment is captured in the agricultural sector.

Flood-induced losses related to the environment sector are suspended services normally provided by environmental assets, as well as waste treatment facilities. In terms of environmental assets, the flood has significantly reduced the level of salinity in the upper Gulf of Thailand at and around the mouths of the Bang Pakong, Chao Phraya, and Ta Chin rivers. As a result, the normal ecological services provided by mangrove forests and near shore ecological systems have been severely impacted, as the large amount of fresh water pushed the sea water further away from the shore. Immovable and small marine animals have perished. Data from researchers at Mahidol and Chulalongkorn universities show that the level of salinity is close to zero in the areas up to three kilometers from shore, and spread out as wide as 40 kilometers. Finally, in view of the high amount of run-off from paddy and other agricultural fields, urban wastes and domestic sewage, the nutrient load in the three main rivers and the upper Gulf of Thailand would be significantly increased, which could lead to a significant algal bloom in the coming three to nine months. Depending on the type of algal bloom, major damage and losses could be felt by the fishery and near shore aquaculture sectors.

Secondly, losses from affected waste treatment facilities are very significant in municipal areas, while lesser impacts are observed in the industrial sector, as the factories have ceased to operate. The amount of municipal waste that was not collected and properly treated is not expected to reduce, as affected populations will continue to exhibit similar behavior. On the contrary, the waste from containers of ready-to-eat food and drink and other necessities are expected to increase at the same time as when the capacities of the waste treatment facilities are expected to have greatly reduced. Therefore, about 60 percent of the total losses, is coming from losses in the municipal solid waste sector.

	Public	Private	Total
Municipal Solid Waste	101	-	101
Biodiversity	64	-	64
Industrial Waste	-	11	11
TOTAL	**165**	**11**	**176**

Table 69: Environment sector – Losses in Thai baht, millions

Table 70 shows the breakdown of the value of damage and losses by province. From the total of THB 550 million in damage and losses, as much as 60 percent, or THB 327 million, was sustained in Bangkok and Ayuthaya provinces where a greater number of affected people and major industrial installations are located. Other provinces in the central and northeastern regions take a smaller share of the flood destruction.

Province	Damage	Losses	Total
Ang Thong	3.21	1.20	4.41
Ayuthaya	209.00	10.12	219.13
Bangkok	19.80	88.30	108.10
Chachoengsao	1.00	15.91	16.91
Chai Nat	-	-	-
Kalasin	-	-	-
Khon Kaen	-	-	-
Lop Buri	29.88	0.96	30.84
Maha Sarakham	-	-	-
Nakhon Nayok	-	-	-
Nakhon Pathom	11.07	0.36	11.43
Nakhon Sawan	1.81	4.92	6.73
Nonthaburi	-	-	-
Pathum Thani	30.95	2.86	33.81
Phitsanulok	14.66	8.04	22.71
Phichit	-	-	-
Prachinburi	43.22	1.42	44.64
Roi Et	-	-	-
Samut Sakhon	1.50	41.21	42.71
Saraburi	3.13	0.10	3.23
Singburi	5.83	0.19	6.03
Si Sa Ket	-	-	-
Suphan Buri	-	-	-
Surin	-	-	-
Ubon Ratchathani	-	-	-
Uthai Thani	-	-	-
Total	**375.06**	**175.61**	**550.67**

Table 70: Environment sector – Damage and losses by province in Thai baht, millions

Recovery and Reconstruction Requirements

Recommendations for Resilient Recovery and Reconstruction

Substantial resources of THB 8.18 billion are needed for resilient recovery and reconstruction, 65 percent of which to fund measures that should be implemented within the next 24 months. These short- and medium-term measures include reuse and recycling and proper treatment of disaster waste, repair and rehabilitation of industrial waste management facilities, water quality monitoring, afforestation of mangrove forests, modernization of municipal solid waste and industrial waste management systems, and building a knowledge base for disaster risk reduction services provided by the ecosystems. Table 71 shows the detailed breakdown of activities and costs for short-, medium- and long-term recovery and reconstruction.

Strategy for Short-term Recovery (up to 6 months)

- Restoration of the affected waste management facilities and collection system and establishment of additional sorting facilities for reuse and recycling purposes. The first priority should be to remove disaster waste that is blocking the waterways to allow for the optimization of the drainage system. To minimize the amount

of waste going to the waste disposal facilities, sorting facilities should be established to segregate the waste streams closest to the source thus maximizing potential for reuse and recycling, as around 40 percent of the total municipal waste is comprised of recyclable materials.[135] This is aimed at municipal authorities. Finally, there will be a need for guidance on creation of additional landfill capacity. In most countries, creation of landfills is a socially sensitive issue due to the NIMBY (not in my back yard) problem, and if a conventional approach to creating landfill capacity is taken it will be years before additional capacity will be available, and in the meantime, the environmental damage would have already been incurred. Creative solutions that allow for the maximizing of recycling of waste streams, optimization of existing void space, fast tracking approval for additional space, and outsourcing to industrial solid waste treatment facilities (that have been recovered and have excess capacities) will need to be found.

- **Hotline on disaster waste streams.** There will be a number of waste streams which need specialized attention and customized solutions. Unless predictable and professional advice is available, the waste holders will find their own solution, which may not be environmentally appropriate.
- **Continuous monitoring of water quality at strategic locations in rivers, streams, canals, and the upper Gulf of Thailand as well as afforestation of mangrove forests.** To reduce further impact to ecological systems and linked productive activities, monitoring of water quality in strategic locations is necessary to provide early warning to the public, as stagnant floodwater is going to be drained into the rivers, streams, and canals which will end up in the upper Gulf of Thailand.

Strategy for Medium-term Recovery and Reconstruction

- Modernization of municipal waste management systems taking into account disaster risk management framework. The majority of municipal solid waste management facilities are open dumps that are very vulnerable to floods. Increasing health risks from wash out waste and its potential contamination of the surrounding environment need to be properly safeguarded. The municipal solid waste and wastewater management modernization plan should be revisited to integrate the disaster risk management aspects as well as the waste to energy or composting options which would help reduce greenhouse gas emissions.
- **Create knowledge base for disaster risk reduction services provided by the ecosystems**. A comprehensive study of the disaster risk reduction services provided by natural ecosystems should be undertaken, followed with valuing of those services. Approaches such as “makings space for water” and payment to private owners (e.g., rice field owners/renters) to periodically use their property as buffering storage to prevent downstream flooding should be developed.
- **Upgrading and climate proofing of industrial waste management facilities, taking advantage of cleaner technology and potential waste to energy options.** Most of the wastewater treatment facilities in the affected industrial

[135] World Bank, Thailand Environment Monitor 2003 Solid Waste Management

estates do not have extremely high organic content, which might make it suitable for anaerobic digestion systems where the generated biogas with around 60 percent methane (one of the greenhouse gases) could be captured for energy use.

Strategy for Long-term Recovery and Reconstruction

- Implementation of the municipal solid waste modernization plan. Investment to modernize the municipal solid waste management system with the following principles should be carried out: optimization of land requirement by reviewing the possibility of shared/clustered landfill, proper cost recovery to ensure long-term sustainability, utilization of landfill gas for energy, community participation, and reduce-reuse-recycling practices.

- **Participatory river basin management.** Thailand comprises 25 major river basins that up to now have not been managed by a unified body with a clear mandate and authorities. Administrative boundaries such as provincial governors and local government authorities are the norm, which are not effective when dealing with cross-boundary issues such as floods and droughts. Many advanced countries have learned from their past experience that river basin management with close participation from local communities is more effective.

- **A comprehensive strategic environmental assessment of the entire recovery program should be initiated rapidly with a view to identifying the key environmental and social issues that could arise from the recovery plan and make proactive plans to address them.** It is important to design an environmentally and socially sensitive recovery program that takes into account the possible adverse impacts and provides sensible mitigation plans. Furthermore, the recovery program should integrate the results from down-scaling of climate modeling to ensure that the rehabilitated and new infrastructure is build to withstand extreme weather events.

- **Reevaluation of land use and zoning laws, taking into account geographical and topology characteristics of Thailand's river basins, economic zones, housing areas and recreational areas as well as social considerations.** Enforcement and incentive mechanism should be strengthened to ensure effective use of the law.

- **Build knowledge base for assets (especially public infrastructure) and risks from impacts of extreme weather events and other hazards.** The government, which is the major owner of public infrastructure (a crucial factor to socio-economic development) should be aware of the level of risk borne by its infrastructure and should consider mitigation options to minimize those risks. The government cannot afford to adopt a wait-and-see approach as the current flood has underscored the desperate need for a long-term climate resilience plan.[136]

[136] See for example, UK 2011, Climate Resilient Infrastructure: Preparing for a Changing Climate

Category	< 6 months	6-24 months	>24 months
Municipal Solid and Disaster Waste Management	**2,404**	**77**	**2,233**
Collecting, sorting, recycling, reuse, and disposal of municipal solid and disaster waste	2,404		
Preparing Disaster Risk Reduction and Modernization plan for existing and planned treatment facilities		77	
Implementation of the Disaster Risk Reduction and Modernization plan			2,233
Bio-diversity	**927**	**200**	**340**
Repairing facilities at Bueng Boraphet	0.09		
Installation and operation of Continuous Water Quality Monitoring stations	907	159	310
Afforestation and maintenance of Mangrove Forests	19	41	30
Industrial Waste Management	**393**	**1,342**	**268**
Repair and rehabilitate existing waste treatment facilities	393		
Preparing and implementing Disaster Risk Reduction and Modernization plan for existing facilities		1,342	
Maintenance of upgraded facilities			268
TOTAL	**3,724**	**1,619**	**2,841**

Table 71: Environment sector – Activities and costs for short-, medium- and long-term recovery and reconstruction in Thai baht, millions

Figure 21: International Best Practice on Environmental Management

Figure 21: International Best Practice on Environmental Management

Because of the floods in Europe, the informal meeting of Water Directors of the European Union (EU), Norway, Switzerland and Candidate Countries held in Denmark Copenhagen, November
21-22 2002, agreed to take an initiative on flood prediction, prevention and mitigation. A core group led by the Netherlands and France prepared a “best practice document” on flood prevention, protection and mitigation, presented to the Water Directors meeting in Athens in June 2003.

The document at hand concerns the “best practice document”, which is an update of the United Nations and Economic Commission for Europe (UN/ECE) Guidelines on Sustainable Flood
Prevention (2000). It is a living document that will need continuous input and improvements as application and experience build up in all countries of the European Union and beyond. A few highlights related to environmental consideration are included here.

Need of a river basin approach

Experience has shown that effective measures for flood prevention and protection have to be taken in the level of river basins and that it is necessary to take into account interdependence and interaction of effects of individual measures implemented along water courses. It is absolutely necessary to organize the water management systems and improve forecasting, flood defense measures and crisis management on a river basin basis, cutting across administrative boundaries. This will be done in cooperation with the relevant organizations in the fields of hydrology and
meteorology, mitigation planning, river control, civil protection and crisis management units.

Structural Measures

Build, maintain and rehabilitate, where necessary, dams, flood ways, by-passing channels, dikes and other flood-control works, hydraulic structures and other water-construction works in order to ensure that they are safe and provide a sufficient level of flood protection, in keeping with
applicable construction standards or the best available technology. This should be done with a long term insight and by taking into consideration the impact of climate change on river run-off. Take upstream, downstream and environmental consequences into consideration. The risk of flooding, landslides and dam failures should not be increased if developing a flood-control work.

Prevention of Pollution

The impact of floods has considerable environmental and health consequences, in particular given the very specific vulnerability of domestic water supplies and the physical infrastructure necessary for sanitation. The disruption of water distribution and sewage systems during floods contribute greatly to severe financial and health risks. Preventive measures should be taken to reduce possible adverse effects of floods on these infrastructures. Alternative solutions should be planned and implemented to guarantee the operation of water distribution and sewage systems.

In flood-prone areas, preventive measures should also be taken to reduce possible adverse effects of floods on aquatic and terrestrial ecosystems, such as water and soil pollution: i.e. minimize diffuse pollution arising from surface water run-off, minimize the amount of surface water runoff and infiltration entering foul and surface water sewerage systems, and maintaining recharge to groundwater subject to minimizing the risk of pollution to groundwater.

3

ECONOMIC IMPACTS

3

ECONOMIC IMPACTS

3.1 Macroeconomic Impacts

Summary

This chapter summarizes the damage, losses[137] , and needs from 15 sectors in the 26 provinces covered by the Rapid Assessment of the floods, and assesses the first round impact of the damage and losses on real GDP and balance of payments in 2011–2013. In addition, it will assess the loss to government revenues and needed, additional expenditures resulting from the floods.

The summary of the damage, losses and needs are in Table 72 and Table 73. Total damage and losses amount to THB 1.43 trillion (USD 46.5 billion), with losses accounting for 56 percent of the total. The manufacturing sector bore roughly 70 percent of the total damage and losses due to six industrial estates in Ayuthaya and Pathum Thani provinces being flooded from mid-October to November 2011. Overall, around 90 percent of the damage and losses from the 2011 floods were borne by the private sector.

The recovery and reconstruction needs are estimated to be THB 1.5 trillion (USD 50 billion). The majority of needs, valued roughly at THB 1.3 trillion (USD 45 billion), will fall in the next two years and will be concentrated in the manufacturing sector and the finance and banking sectors; the latter will provide loans for recovery and reconstruction. As with the damage and loss distribution, a larger share of the needs is within the private sector.

Impact on Real Gross Domestic Product

The analysis of the impact of the floods on real Gross Domestic Product (GDP) compares the post flood real GDP with the pre-flood projections of real GDP, that is, the real GDP that Thailand would have had if the floods had not occurred. In this report, pre-flood projections of all macroeconomic variables will be those produced by the Office of the National Economic and Social Development Board (NESDB).

[137] Damage is destruction to physical assets that can be built back post disaster. Losses are forgone production or income and higher expenditures due to the flooding that cannot be recovered.

Calculations of the impact of the floods on real GDP are based on the DALA methodology. Losses to production and incomes are counted as negative contributions to GDP, while higher expenditures incurred in response to the flood were considered additional economic activity and positive contributions to GDP. Similarly, reconstruction of damage is considered an addition to GDP. Figure 22 summarizes the nominal losses, higher expenditures, and reconstruction costs by year.

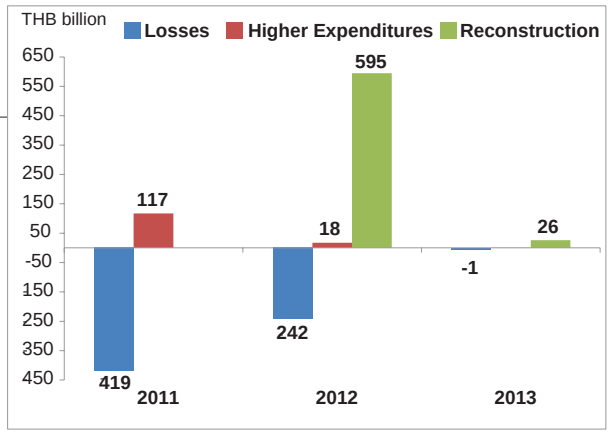
In order to compute the impact on real GDP, the nominal value of losses, higher expenditures, and reconstruction are converted into value-added terms before being categorized into their respective sectors in the national accounts. They are then converted into real terms by using GDP deflators. These values are either added or subtracted from the pre-flood real GDP levels to show the post-flood levels of real GDP. In the case of the 2011 floods in Thailand, almost all of the losses, higher expenditure, and reconstruction will be realized over three years. Hence, their impact on real GDP is calculated for those years (2011-2013).

Table 72: Total damage and losses, in Thai baht, millions

Sub-sector	Disaster Effects			Ownership	
	Damage	Losses	Total	Public	Private
Infrastructure					
Water Resources Management	8,715	-	**8,715**	8,715	-
Transport	23,538	6,938	**30,476**	30,326	150
Telecommunication	1,290	2,558	**3,848**	1,597	2,251
Electricity	3,186	5,716	**8,901**	5,385	3,517
Water Supply and Sanitation	3,497	1,984	**5,481**	5,481	
Productive					
Agriculture, Livestock and Fishery	5,666	34,715	**40,381**	-	40,381
Manufacturing	513,881	493,258	**1,007,139**	-	1,007,139
Tourism	5,134	89,673	**94,808**	403	94,405
Finance & Banking	-	115,276	**115,276**	74,076	41,200
Social					
Health	1,684	2,133	**3,817**	1,627	2,190
Education	13,051	1,798	**14,849**	10,614	4,235
Housing	45,908	37,889	**83,797**	12,500	71,297
Cultural Heritage	4,429	3,076	**7,505**	3,041	4,463
Cross Cutting					
Environment	375	176	**551**	212	339
TOTAL	**630,354**	**795,191**	**1,425,544**	**141,477**	**1,284,066**

Note: Losses for each sector include higher expenditures due to floods
Source: Rapid Assessment for Resilient Recovery and Reconstruction Planning, NESDB, and Ministry of Industry.

Figure 22: Losses, higher expenditures and reconstruction costs

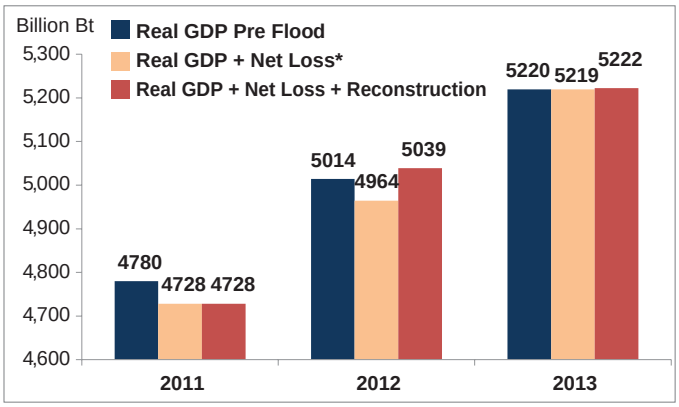


Source: Rapid Assessment for Resilient Recovery and Reconstruction Planning

Using the DALA methodology, it is estimated that the 2011 floods will reduce real GDP from its pre-flood projections by THB 52 billion (USD 1.7 billion) in 2011 before adding THB 25 billion (USD 832 million) in 2012. This assumes that reconstruction to build back the damage will start in 2012 and be largely complete by the end of the year. If there was no reconstruction, real GDP would fall by more than THB 50 billion (USD 1.7 billion) in 2012. In 2013, remaining reconstruction will add THB 2.6 billion (USD 85 million) to real GDP (see Figure 23).

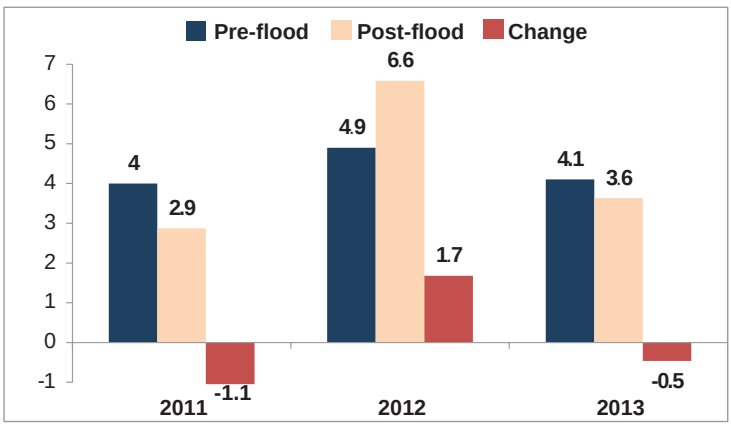
In terms of growth, the 2011 floods will result in a reduction in real GDP growth in 2011 by around 1.1 percent, increase real GDP growth in 2012 by 1.7 percent, and reduce 2013 real GDP by 0.5 percent. That is, real GDP growth in 2011 would fall from the NESDB's pre-flood real GDP growth projection of 4.0 percent to 2.9 percent (see Figure 24).

Figure 23: Impact of losses and reconstruction on real GDP levels



Source: Rapid Assessment and NESDB
Note: Pre-flood levels are NESDB's projections

Figure 24: Impact of losses and reconstruction on real GDP growth



Source: Rapid Assessment and NESDB
Note: Pre-flood levels are NESDB's projections

Sub-sector	Needs			Needs			
	Public	Private	Total	~6 mths	6-24 mths	>24 mths	Total
Infrastructure							
Water Resources Management	54,075	15,000	**69,075**	3,023	15,462	50,590	**69,075**
Transport	23,538	-	**23,538**	6,866	14,376	2,296	**23,538**
Telecommunication	2,026	2,052	**4,078**	1,675	1,422	980	**4,078**
Electricity	5,625	-	**5,625**	899	3,037	1,689	**5,625**
Water Supply and Sanitation	5,633	-	**5,633**	2,997	2,635	-	**5,633**
Productive							
Agriculture, Livestock and Fishery	4570	-	**4,570**	3,425	1,125	20	**4,570**
Manufacturing	-	854,356	**854,356**	172,640	668,045	13,671	**854,356**
Tourism	3,280	2,186	**5,466**	4,343	1,123		**5,466**
Finance & Banking	234,520	176,919	**411,439**	170,140	187,907	53,392	**411,439**
Social							
Health	2,318	-	**2,318**	1,128	870	319	**2,318**
Social	20,700	-	**20,700**	13,300	7,400	-	**20,700**
Education	13,343	-	**13,343**	8,045	5,298	-	**13,343**
Housing	5,110	46,870	**51,980**	14,990	12,510	24,480	**51,980**
Cultural Heritage	7,514	2,640	**10153**	6,183	3,971	-	**10,153**
Cross Cutting							
Environment	6,181	2,004	**8,184**	3,724	1,619	2,841	**8,184**
TOTAL	**388,431**	**1,102,027**	**1,490,458**	**413,378**	**926,801**	**150,278**	**1,490,458**
Private Needs				304,012	681,587	116,428	**1,102,027**
Public Needs				109,366	245,214	33,850	**388,431**
as % post-flood revenues				5.5	10.8	1.4	

Source: Rapid Assessment
Note: The needs of the manufacturing sector include loans from the finance and banking sector of around THB 160 billion. Similarly, the needs from the agricultural sector will be mostly financed from loans from the Bank for Agriculture and Agricultural Cooperatives (BAAC). The needs of these two sectors are also included in the finance and banking sector needs. Loan needs of the other sectors are not included in their respective sectors but are only counted in the finance and banking sector's needs.

Table 73: Total public and private needs for rehabilitation and reconstruction, in Thai baht, millions

Impact on Current Account

As with the calculations on the impact on real GDP, the impact of the floods on the current account compares the post-flood values with the pre-flood projections of the current account balance. Here, the following is calculated: (1) reduced exports as a result of the fall in manufacturing production; (2) rise in imports needed for reconstruction; and (3) reduced tourism.

The impact of the floods on the current account in 2011 and 2012 are summarized in Table 74. Export losses will be largest in 2011 when many firms in the manufacturing sector were flooded and unable to produce in the last quarter of the year. As a result, exports are estimated to fall by USD 7.8 billion. Coupled with the fall in tourism revenues, the current account balance in 2011 is estimated to fall to USD 11.9 billion compared to USD 20.6 billion had the flood not happened. In 2012, the current account balance will be USD 9.8 billion less than it otherwise would have been had the flood not occurred, mainly due to the large increase in imports totaling USD 7.5 billion due to reconstruction needs after the floods, and export capacity not resuming fully until the second quarter of 2012. The impact on the current account in 2013 will be minimal as export capacity is expected to resume to normal levels, while just addition imports of capital goods will be around USD200 million.

Table 74: Impact of floods on current account, in USD billions

2011	Pre-Flood	Change	Post-Flood
Goods			
Exports	233.21	-7.8	225.4
Imports	201.90	0	201.9
Services	-10.7	-0.9	-11.6
Current Account Balance	**20.6**	**-8.7**	**11.9**
% GDP	5.9	-2.5	3.4

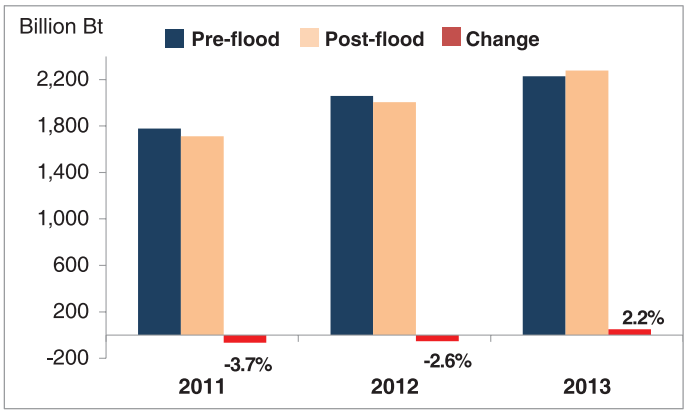
2012	Pre-Flood	Change	Post-Flood
Goods			
Exports	244.2	-1.9	242.3
Imports	208.6	7.5	216.0
Services	-10.3	-0.4	-10.7
Current Account Balance	**22.2**	**-9.8**	**12.4**
% GDP	5.9	-2.7	3.2

Source: Rapid Assessment and NESDB
Note: Pre-flood figures are NESDB's projections

Impact on Government Revenues

Figure 25: Impact of floods on government revenues

The impact on government revenues are the losses in tax revenues as a result of lower economic activities and the exemption of import taxes for machinery for the replacement of production facilities that were affected by the floods. The loss in revenues from lower production will mostly be realized in 2011, while the import tariff exemptions will be realized in 2012.



Source: Rapid Assessment
Note: Percentage figures are share of pre-flood revenue projections by World bank

Figure 25 presents the estimated revenues pre-flood and post-flood. Revenue losses will be highest in 2011 when there are halts in manufacturing production, especially of automobiles and electronics, hence, the reduction in the value added taxes (VAT) and excise taxes collected on them. The estimated loss is around THB 66.5 billion or 3.7 percent of the estimated pre-flood revenues. In 2012, the revenue losses of THB 52.6 billion (or 2.6 percent of projected pre-flood revenues) are mainly due to the reduction in manufacturing production, albeit smaller than that of 2011, plus import tariff exemptions on capital goods.

Estimated Rehabilitation and Reconstruction Needs and Impact on Government Expenditures

Rehabilitation and reconstruction needs[138] over the next two years and beyond are estimated at THB 1.5 trillion (USD 50 billion). Approximately three-quarters of the needs will be borne by the private sector and the remaining amount by the public sector. Within the private sector, 80 percent of the needs arise from the manufacturing sector. As for the government, much of the needs will be for water resource management and for the rehabilitation of transportation facilities such as roads and bridges. Moreover, the government's specialized financial institutions will need resources to extend loans to the private sector per government directives.

In the short term (next six months), recovery and reconstruction needs would be highest for the social sector through government programs to assist in the rehabilitation of people's livelihoods, the manufacturing sector in recovering from damage to factories, and the financial sector in providing loans for recovery and reconstruction to other sectors. From mid-2012 to end 2013, most of the needs from the government would be to rehabilitate water resources management and transport facilities; while the majority of the private sector's needs will be continued rehabilitation of the manufacturing sector. Table 73 summarizes the needs from the next six months to beyond 2013.

The government's rehabilitation and reconstruction needs could add up to THB 388 billion (USD 13 billion). It will be around THB 245 billion (USD 8 billion) or almost 11 percent of the government's revenue in 2013 when the bulk of the expenditures will be needed (see Table 73). The government will need to prioritize its spending and, at the same time, borrow additional resources to fund these expenditures. It should be noted that, under the current public debt law, the government still has enough headroom to fund these additional expenditures.

[138] The needs include not only building back a part or all of the damage in each sector, but also build-back that has a higher quality, more weather resilient, or has better technology.

3.2 Livelihoods and Employment

Introduction

The 2011, flooding in Thailand has severely harmed the livelihoods of millions and presents a grave threat to the nation's economy. The floods have already caused significant losses in terms of lost wages and damage to commercial, industrial, and agricultural property, facilities, and equipment. The effects of the flooding further jeopardize Thailand's overall economic well-being by reducing investor confidence and leaving those in flood-affected areas with a reduced capacity to provide for themselves and their families.

At the same time, post-disaster environments often provide a "recovery boom" should emerging demands in the market be appropriately captured. Employment-led recovery can foster a "recovery boom" and contribute to a smooth recovery and sustainable reconstruction.

Robust action is critical to counteract these threats and assist those affected. Immediate and short-term activities are required to assist those in urgent need. However, a robust mid-to-long term strategy is necessary to meet shifting market demands, limit the effects of future disasters, and restore foreign investor confidence. With all of these needs in mind, the ILO has created the recommendations that follow.

As noted, the impacts of the flooding have been severe. Even conservative calculations estimate at least THB 100 billion has been lost in wages alone. A large proportion of these losses have occurred among the most vulnerable sectors of Thai society, further emphasizing the need to employ the social protection strategies outlined elsewhere in the Rapid Assessment. For a more complete explanation of damage and losses related to livelihoods, please see the section on damage and loss.

Damage and Losses

Overview

Between THB 110 billion and THB 122 billion in wages have been lost since the beginning of the flooding.[139] A large proportion of these losses occur within the most vulnerable worker populations where limited social protections exist. The affected populations are drawn from the latest estimates at the district level – 1.9 million households are affected from the floods, which resulted in 562 deaths and approximately 5.1 million others who have been directly impacted by the floods. Within the 26 affected provinces, the floods covered 13.12 percent of the land areas on average, or 18 billion square meters. Within the affected regions, 15.79 percent of all agricultural land has been flooded.

The methodology for identifying the effect on employment is as follows. Firstly, employment is classified into three types: formal employment, informal employment and international migrant workers. Two sources were available for the baseline estimation. The number of affected formal employed persons is reported daily to the Ministry of Labor, and the area

[139] Estimated at the time of writing, November 25, 2011.

affected by the flood by the Rapid Assessment team. The informally employed are estimated from regional percentage shares of the 2010 informal employment figures to total employment and imputed to provincial data. Mean wage of formal and informal workers by province was then estimated from the 2009 Household Socio Economic Survey. The mean wage of the migrant worker is applied from a share of a survey, which reveals the average wage gap between formal Thai workers and registered migrant workers. This survey data is available on request.

The number of affected formal workers is gathered by the Ministry of Labor. Within the affected area, 15.9 percent of enterprises and 24.53 percent of formal workers have been negatively impacted by the flood. There is no official information available for affected informal employment or migrant workers. Accordingly, the post-flood affected income is projected by applying damage scenarios into the predicted income loss. The consumer price index of Thailand was then used to adjust the 2009 income to this present value. The imputed inflation rate is 10.8 percent. In addition, the estimation assumes a four-month income loss for affected workers since the start of the crisis (August through November) within the affected provinces.

The forecasted personal income loss from the beginning of the flood to 2014 can be estimated by the availability of the forecasted GDP growth and post-disaster production losses from the Rapid Assessment team. As a result, the reduction of employment-year loss is imputed by multiplying the number of workers and a ratio of post-disaster losses. With average wage information by economic activities from the Labor Force Survey, estimates of income loss are then yielded by the sectoral data.

The background figures are based on a baseline data analysis of the pre-flood employment and livelihood situation of the 26 assessed provinces to estimate the affected population that requires post-flood assistance. Pre-flood baseline data indicates that there are approximately 16 million workers from the 2011 Quarter 1 Labor Force Survey within the affected provinces. The overall population of the affected provinces consists of 25.2 million residents, 16.5 million households, and 8.49 million dwellings, according to the 2010 National Census.

The vulnerable population includes informal employment and migrant workers. Informal sector labor is defined as work that does not provide social security or other social protections. On average, 62.4 percent of total employment within these areas is informal which results in nearly 10 million workers who lack formal social protections. Roughly 0.9 million international migrants are officially registered within the flood-affected areas. There is no data available for unregistered migrants affected by flooding.

Damage and Loss Calculations

Due to the unavailability of official figures regarding the impact on informal employment and international migrant workers, two assumptions are made. The first assumption applies percentages of affected formal workers to the informal workers and international migrant workers. This implies that the flood is equally impacted on each group of workers (24.5 percent on average). Since the formal workers primarily work in the non-agricultural sector, the share of agricultural employment to non-agricultural employment is applied to capture the higher share of informal employment.

The second assumption applies the share of the damaged area by the flood to informal workers and international migrant workers (13.12 percent on average). The provincial data is applied and weighted by the density of agricultural employment and the share of the agricultural area in the flooded provinces to take into account the difference in cultivation area. It is based on the fact that most informal workers are primarily in the agricultural sector, which is largely area-based.

Table 75 provides evidence on the robustness of the findings, with respect to the assumptions made on the impact of agricultural land damage on household consumption. Results from both sets of specifications suggest that around 1.9 million households are severely affected and thus are in need of immediate assistance.

The total number of formal workers affected by the floods is estimated at approximately 1 million. Based on that estimation and the first assumption, it can be estimated that 2.3 million of the informal workers and 0.2 million migrants are suffering from the flood. However, if figures are calculated under the second assumption, different figures result. Under this methodology, approximately 2.1 million of informal workers and 0.3 million migrants have been affected by the flooding.

Excluding migrant workers, affected Thai workers account for 8.76 and 8.25 percent (Method 1 and 2) of total employment. These figures result in THB 110 billion (Method 1) and THB 122 billion (Method 2) total loss.

The forecasted estimates of the total income loss from the beginning of the flood to 2014 are around THB 129.1 billion. The total impact estimated under this method is higher than the impact of the first and second method by approximately THB 7 billion. The economic sectors that are highly affected are in the service sector, including wholesale and retail trade and repair, hotels and restaurants, and financial intermediation. These three sectors are negatively impacted by more than THB 25 billion in total losses.

Table 75: Estimates of income loss in the flood-affected areas in Thai baht, millions

Public	Formal	Informal	Formal and informal	Migrants	Total
Method 1	68,450.71	33,940.22	102,390.93	7,819.94	110,210.87
Method 2	68,450.71	36,535.51	104,986.22	16,963.42	121,949.64

Table 76: Forecasted estimates of personal income loss (2011–2014) in Thai baht, millions

	2011	2012	2013	2014	Total (at nominal price)
Agriculture, Livestock, Forestry & Fisheries (ALFF)	4,650.0	249.6	250.4	251.1	5,401
Mining & Quarrying	-	-	-	-	-
Manufacturing Industries (Mfg)	1,494.0	376.8	-	-	1,870.8
Electricity, Gas & Water Supply	231.4	-	-	-	231.4
Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles and Personal and Household Goods	11,413.6	21,298.5	10,726.5	-	43,438.6
Hotels and Restaurants	9,949.5	18,588.4	9,372.7	-	37,910.7
Transport & Communication	3,388.5	5,891.7	2,920.5	-	12,200.7
Financial Intermediation	479.6	24,474.3	-	-	24,953.9
Health and Social Work	36.9	-	-	-	36.9
Other Community, Social and Personal Services Activities	1,179.5	1,286.7	572.2	-	3,038.5
Total	**32,823**	**72,166**	**23,842.3**	**251.1**	**129,082.4**

	Total employment (thousands)
Within the affected provinces	16,022.0
All of Thailand	37,647.1

Table 77: The Thai workforce

	Number of affected workers (thousands)		
	Formal	Informal	Total
Method 1	1,005.01	2,293.63	3,298.64
Method 2	1,005.01	2,099.04	3,104.05

Table 78: Number of workers impacted by flooding

	Share of affected workers to the total employment within the affected provinces		
	Formal	Informal	Total
Method 1	6.3%	14.3%	20.6%
Method 2	6.3%	13.1%	19.4%

Table 79: Relative impact of flooding on local workforce

	Share of affected workers within all of Thailand		
	Formal	Informal	Total
Method 1	2.67%	6.09%	8.76%
Method 2	2.67%	5.58%	8.25%

Table 80: Relative impact on national workforce

Province	MOU	Hold Work Permits/ID	Hold Temporary Passport	Total
Bangkok	14,445	200,285	178,129	392,859
Nonthaburi	720	28,928	16,236	45,884
Pathum Thani	2,919	49,938	25,024	77,881
Ayuthaya	1,593	7,340	4,190	13,123
Nakhon Sawan	30	5,066	1,821	6,917
Nakhon Pathom	120	24,780	4,720	29,620
Lop Buri	1,705	3,328	1,681	6,714
Saraburi	2,048	10,398	2,456	14,902
Phitsanulok	4	1,232	485	1,721
Uthai Thani	-	599	156	755
Suphan Buri	63	7,140	1,940	9,143
Singburi	177	1,090	222	1,489
Chachoengsao	1,575	14,196	7,469	23,240
Nakhon Nayok	27	3,030	1,320	4,377
Phichit	-	2,960	23	2,983
Chai Nat	-	1,231	320	1,551
Samut Sakhon	1,294	128,697	37,908	167,899
Samut Prakan	4,181	46,718	20,199	71,098
Ang Thong	2	1,522	400	1,924
Sukothai	-	720	136	856
Total	**30,903**	**539,198**	**304,835**	**874,936**

Table 81: Number of recorded migrants in flood-affected provinces

Source: Ministry of Labor
Updated as of September 2011

Recommendations for Resilient Recovery

Labor Market Assessment

A thorough labor market assessment is required for several reasons. Firstly, at the time this Rapid Assessment was conducted, floodwaters still have not receded from many affected areas, numerous people remain displaced, and thousands of factories are still closed. Unfortunately, the true extent of the losses from these floods is still unknown.

While the assessments which appear in the damage and loss section give a good approximation of the losses incurred thus far, more specific information will be required to ensure that response activities are closely tailored to needs. Information on the Thai workforce, both baseline and post-flood data, must be analyzed according to age, wages and salary, employment sector, occupation and skills, formality, and gender. This will ensure that no vulnerable populations will be overlooked in response and recovery activities. Special attention must be paid to the elderly, disabled, migrant workers, young workers, and any other vulnerable groups identified.

Just as importantly, labor market demands may shift as a result of the flooding. For example, it is likely that there will be surge in the demand for workers with skills in construction and specialized cleaning techniques. Similarly, there may be mid-to-long range labor market shifts as demand increases for workers with skills related to future flood prevention. As will be discussed, vocational skills training programs will be critical to increase employment numbers and ensure that Thai workers are able to meet these demands. However, these trainings will only have this type of impact when they are based off of a detailed assessment conducted after the floods recede.

Review of National Labor Policy

The success of livelihood recovery plans is ultimately dependent on national labor policy. National policy must be consistent with recovery plans and offer sufficient social protections to those affected by the floods. Finely tuned policy will help to catalyze recovery and create important incentives for investors, employers, and workers.

The Government of Thailand has already put in place programs to provide employment protections and salary reimbursement to formal sector workers affected by the floods. This was an important step and extends critical protections to thousands. Once a detailed market impact assessment has been completed, these policies should be furthered reviewed and a gap analysis conducted to ensure that these protections exist for all who need them.

Similarly, the government has also created incentives for factories to hire workers who have been affected by the flooding as part of the ‘Friends Help Friends’ program. This is an important policy and should be further explored to provide opportunities for informal sector workers and migrant workers. There must be provisions within this program to allow those who temporarily work elsewhere to be able to return to their original jobs once they are available.

Demands for construction workers often increases in a post-disaster economy. Consequently, risks for workers to be exposed to hazardous working conditions rises unless labor standards are respected. Policies that encourage short-term, labor intensive recovery should therefore be reviewed to ensure they are in-line with established labor standards and statutory prevailing minimum wage. This will encourage the mainstreaming of decent work within reconstruction strategies.

There is also a need for a technical review of social security and universal healthcare schemes, including special response, to ensure they contain sufficient coverage of flood related health issues. The government has already established beneficial programs to provide free health checks for those in flood-affected areas. These policies should be reviewed to ensure these valuable benefits are available to all who need them.

Policy Protections for Informal Workers and Vulnerable Populations

All recovery and labor policies should be reviewed to ensure they contain adequate protections for vulnerable populations hit hardest by the flooding and currently at risk of being excluded from recovery plans. Chief among these are informal workers who lack the most basic employment securities. Government labor policy should create incentives for informal sector workers to participate in recovery efforts. Similarly the government should establish policy-based protections for workers of differing sexual orientation, age, gender, as well as migrant and differently-abled workers. For example, it will be important to enforce clause 12.1 of the Formal Migrant Workers Contract that holds employers responsible for all costs borne by migrant workers during natural disasters. More information on this may be found in the accompanying Social Protection portion of the Rapid Assessment.

Fostering Tripartite Dialogues, Private Sector Engagement, Pre-Disaster Planning and Disaster Risk Reduction

It is important to encourage and facilitate open dialogue between workers, government, and employers. This will allow all parties to maintain good relations and ensure a shared understanding of recovery plans. The government has already convened meetings between all three groups, which has proved to be a valuable first step. This success should be built upon to establish agreements and jointly agreed recommendations on ‘back to work’ best practices in view or rehiring, seniority, and re-placement/recruitment processes.

Additionally, this will allow the government to engage the private sector as a partner in recovery. This will help to extend recovery beyond enterprise impact towards broader community, human, and environmental development goals.

Similarly, the private sector should be involved in planning to prevent future crises. The government can develop a strong communications strategy to report progress. It is critical that private sector actors not lose their confidence to invest in Thailand or believe that this year’s disaster will repeat itself. Engaging the private sector as a partner in future planning will ensure that this does not occur.

Pre-disaster planning also presents an ideal opportunity to create mid- to long-range work opportunities for flood affected communities, as well as measures to mitigate disaster risks and reduce future damage and losses on livelihoods and employment. The government can work with communities, through community contracting modalities, to identify, design and implement small projects to, whenever needed, drain excess water using local resources (including labor) to the extent possible. This long range intervention requires collaboration with communities, local authorities and universities. Such an approach was successfully implemented by the ILO in the Philippines and could be adapted to the current Thai context. It will be important to incorporate provisions to ensure that these plans recognize the potential contributions of migrant workers and other vulnerable groups.

Protections for Migrant Workers

Thailand needs both Thai workers and migrant workers to rebuild certain sectors of the economy. The floods impacted on areas with a high concentration of migrants (see Table 81) thereby further exacerbating foreign workers existing vulnerabilities. Official statistics show that over 800,000 migrants, excluding irregular workers, lived and worked in provinces that have been devastated by the flood. As a result, a significant number of migrant workers have lost their jobs, either temporarily or permanently.

To its credit, the Ministry of Labor recently approved relevant measures to protect migrants by establishing a Flood Relief and Assistance Center for Migrant Workers. Assistances provided include the provision of food, shelter, limited work opportunities, and assistance relocating to their communities of origin. However, migrant workers are not well informed about these measures due to miscommunication during the flooding crisis and limited availability of information in their native language. As a result, many migrant workers cannot benefit from this support. Translating emergency messaging and relevant hotlines is crucial. There is a particular need for information related to registration, re-entry, changing employers, and obtaining replacement documents.

There have been troubling reports of exploitation of migrant workers including nonpayment of due wages and identification documents withheld by employers, as well as incidents of Burmese workers attempting to return to their communities of origin being detained at the border by immigration authorities, charged excessive amounts by brokers, and extorted once inside Burma. The best way to counter these abuses will be for the Thai government to escalate enforcement of existing protections and intensify bilateral negotiations on labor migration management with origin countries to ensure that migrants entering Thailand after the floods can do so through regular channels that are affordable and secure so as to avoid the worst consequences of irregular migration, such as human trafficking and other forms of exploitation. This implies ensuring that brokers are regulated, corruption is countered and violations of rights are effectively reduced. Creating policies to ensure migrants can speedily obtain and always have access to their documents will also be important. IOM has long lasting experience in advising and supporting governments to facilitate labor migration flows through the provision of relevant technical and global expertise and through supporting the establishment of fair and transparent recruitment practices.

The ILO is also well placed to provide support to address the additional vulnerability of migrant workers caused by the floods through its existing technical cooperation project (TRIANGLE). In order to ensure that migrants' rights are protected and their legal status is maintained, The TRIANGLE project will work with government, workers' and employers' organizations to ensure that migrant workers' rights are protected and their legal status is maintained.

Partners working with migrant workers suggest that, in the immediate term, migrants that decide to return to their home countries should be guaranteed safe return without the threat of arrest or extortion. They also suggest that, when the waters recede, there should be sufficient flexibility to allow registered migrants to re-enter the country and either take up their old positions, or transfer to a new employer in a new sector or in a new province if necessary.

Create Policy-Based Incentives to Ensure Credit and Financing is Available

Financing, loans, and credit will be crucial to rebuilding enterprises at every level to ensure that businesses can make necessary repairs and rebuild stronger to limit the impact of future disasters. Through the Social Security Department, the government has already implemented beneficial short-term projects to assist enterprises with existing loans and extend financing to registered employees.

To ensure medium- and long-range growth, policies should be extended to address new loans and encourage lending. This includes everything from large-scale recovery loans for factories and medium-large sized enterprises to microcredit and financing for small and medium enterprises, as well as informal sector entrepreneurs. The government should consider backing microfinance loans and consider subsidizing loans that encourage the hiring of new workers and business expansion.

While encouraging microfinance, policies should ensure that loans are accompanied by adequate training for recipients. These potentially beneficial policies must not lead to vulnerable groups entering into an irrecoverable level of indebtedness.

These policies must be preceded by an analysis of the financial needs and current credit availability within the flood affected areas. The ILO has a credit market and finance mapping tool that would assist in this effort.

Use the Recovery Effort as an Opportunity to Strengthen the Local Economy

In spite of the tremendous damage inflicted by the floods, it is still possible to foster a 'recovery boom' and create opportunities to use the recovery to strengthen the local economy in both the short and long term. Recovery and disaster prevention contracting mechanisms should be reviewed to ensure they favor local businesses wherever possible and encourage labor intensive and local-contracting strategies.

Promote Labor Intensive Recovery Strategies

As noted, labor intensive recovery programs have numerous benefits as they allow Thailand to simultaneously provide employment opportunities to flood-affected workers from all sectors, encourage physical recovery of affected infrastructure, and help rebuild in a manner which limits the effects of future disasters.

Cash-for-work programs are a particularly effective way to encourage this type of recovery. Local affected workers should be employed to remove debris, help to destroy facilities beyond repair, and clean or rebuild damaged facilities including factories, government buildings, schools, hospitals, and public markets. New projects should also be initiated to prevent future crises such as the construction of irrigation channels and drainage canals, shelters and flood protection barriers.

This type of work can be executed at all levels of the supply chain as there is sure to be a need for the production of construction supplies such as hollow or interlocking blocks, roofing, and ecological materials. To maximize local economic recovery, materials should be procured locally as much as possible. Similarly, contracting local enterprises for demolition, rehabilitation and construction work can boost local economy in disaster-affected areas.

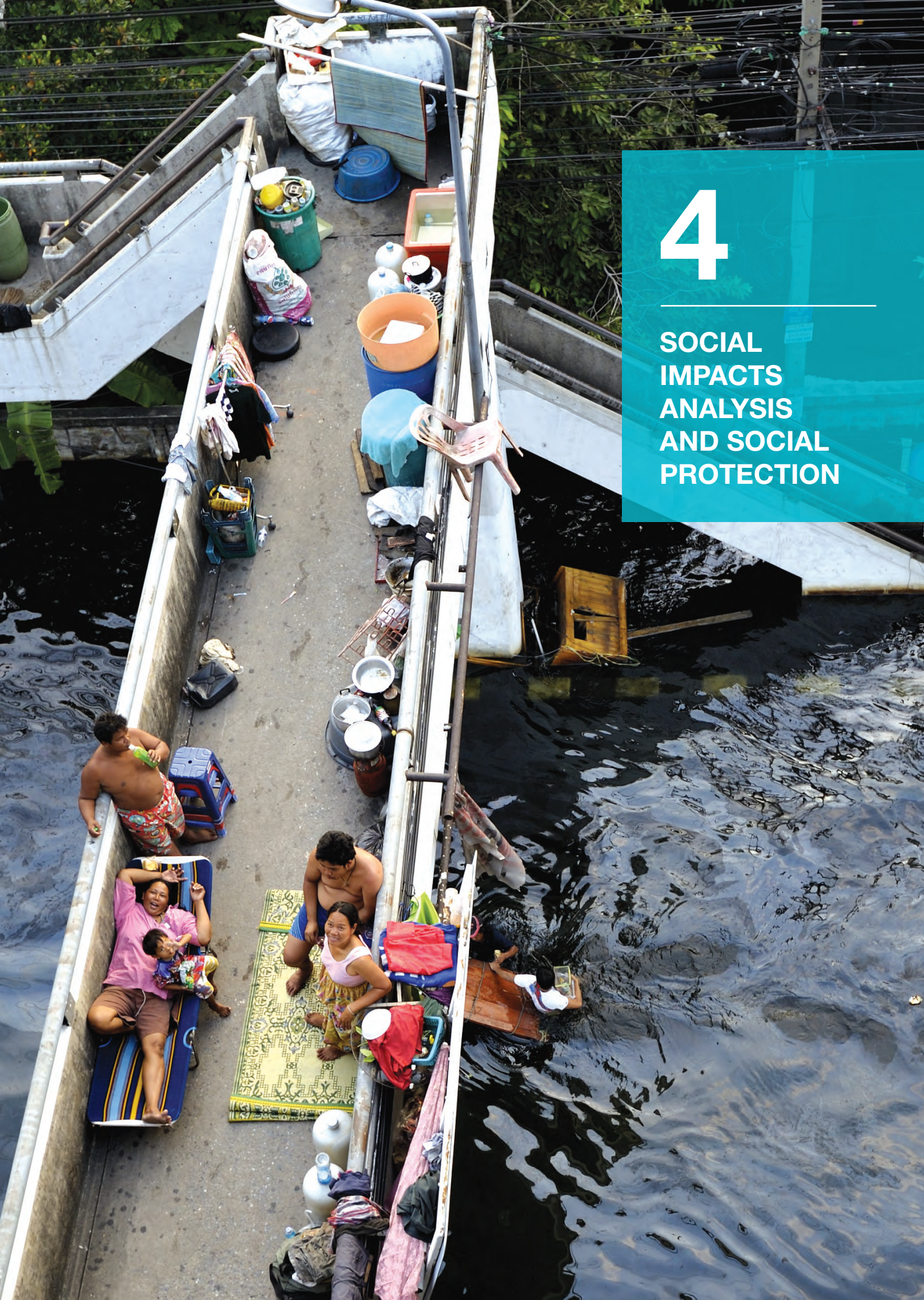
Migrant labor will be an important aspect of these recovery programs. Policies must be crafted in order to avoid an increase in illegal immigration and harness the benefits migrant workers can provide. The best way to accomplish this will be for the Thai government to work with origin countries to establish a simplified and cost efficient legal import process. For Burmese workers who have left Thailand, but wish to return, the Burmese authorities will issue a temporary passport following official request from the relevant employers.

Create Programs and Incentives for Vocational Skills Training for Recovery Based Jobs

As the flooding and subsequent recovery create demand for specific skills and shift labor markets, the government should support vocational skills training programs to meet new demands and ensure decent work opportunities for workers affected by the floods. Such programs can be supported with various incentives for attendance.

It is critical that such programs are based off of a detailed labor market analysis. Training programs that teach ‘general skills’ will be of limited utility as they utilize valuable resources without meeting the new demands created by the floods. These trainings should address both short- and long-term recovery with short-cycle skills training programs for local affected workers and longer-term training re-training programs to assist enterprises. Programs should be examined so they benefit vulnerable populations including informal sector workers, migrants, and women.

The ILO has developed a low-expense small and medium enterprise development program that can be adapted for flood recovery and implemented across flood-affected provinces at little to no cost. This is a beneficial option since it stresses community-led development and entrepreneurship, which is a critical component of overall economic recovery.



4

SOCIAL IMPACTS ANALYSIS AND SOCIAL PROTECTION

4

SOCIAL IMPACTS ANALYSIS AND SOCIAL PROTECTION

4.1 Introduction

A Social Impacts Assessment (SIA) was carried out in Lop Buri, Uthai Thani and Nakhon Sawan provinces in the Central Plains area of Thailand.[140] The field guide developed for the SIA focused on collecting data on the following three areas of inquiry using qualitative methodologies[141] : (i) livelihoods and coping strategies; (ii) social relations and cohesion and (iii) governance, with a particular focus on the distribution of relief assistance.

The SIA has a dual objective. It aims to provide an overview of the impact of the floods in these three key areas and to put forward a set of recommendations for the recovery and reconstruction process. The recommendations presented have a specific focus on social protection and take into account the insights provided by communities visited. The team collected insights from a mix of 12 sites (one urban and three rural sites for each province) to understand how the impact of the floods may have varied across sites.[142] A comparison of the impacts found by the team in urban and rural areas is provided in Table 83.[143] Focus Group Discussions (FGD) and Key Informant Interviews (KIIS) were held with the following groups within the communities: (i) informal workers (daily laborers), small business owners and low income civil servants, in urban areas (ii) in rural areas the team conducted three separate focus groups: two with individuals representing a range of occupation and a third exclusively with farmers.[144] In addition, the team ensured that KIIs

[140] The SIA was implemented between the 7th and 25th of November 2011 by a World Bank team in close collaboration with local civil society organizations and relevant ministries.
[141] The research tools, Focus Group Discussions (FGD) and Key Informant Interview (KII) guides were pre-tested in Prachinburi in the Eastern Region of Thailand.
[142] The following sites were covered by the SIA. In Lop Buri: (i) Ban Pom municipality; and (ii) Phonamob village (Patarn sub-district); Pho Kao Ton and Sratawaew sub-districts. In Uthai Thani: (i) Pakkabadsamphan, and (ii) Hardthanong in the sub-district of Thasung; Bungtaptae in Thasung sub-district and Wang Sathit and Neuan Tontarn in Nong Paiban sub-district. In Nakhon Sawan: (i) Nakhon Sawan municipality and (ii) the following three communities Tapkrit Pattana (Moo 8); Nuen Thong (Moo 7) and Yansawai (Moo 4). In addition, the team conducted additional informal interviews in Koksamutr in Lop Buri. These communities were selected in coordination with the Ministry of Social Development and Human Security, the Department of Disaster Prevention and Mitigation and civil society organizations
[143] Given to time constraints it was not possible for the team to collect information on the living conditions in temporary accommodation sites and evacuation centers
[144] A total of 30 FDGs and 70 KIIs were conducted for the SIA.

were systematically conducted with women in all sites visited and that FDG composition was gender-balanced. Informal discussions with youth were organized in two additional sites, with further interviews conducted with elderly community members.

The SIA was undertaken at a time when a large number of areas in Thailand were still flooded and relief operations were under way. It was, therefore, not possible for the research team to collect data from a broad range of regions where different pre-existing conditions in terms of poverty incidence, social organization and local governance would be expected to lead to different impacts and recovery trajectories.[145] A number of the sites visited in the Central Plains region experience periodic flooding and to some extent, communities have introduced adaptations to deal with regular, moderate flooding by adjusting their planting and harvesting schedules. However, none of the previous flooding incidents had the severity of the current crisis.

Socio-economic Impact

"My husband died years ago, I have no children, I live with my handicapped brother. I am old so I can only attend to my small rice shop and grow some vegetables at the backyard (for consumption and selling). But now my rice shop is flooded and I have no money to buy new stock (of rice). My vegetable garden was also flooded so now I have to use money to buy everything. My only income now is 500 baht (Elderly Living Allowance) from the government." Peri-urban resident, 75 years old

"Prices of goods sky rocketed. They can charge anything they want. Taking the boats to work cost me 2-300 baht per day. Cabbages used to be 10 baht now they are 50-100 baht. Our salary is gone." Government employee, Uthai Thani

Impact on Livelihoods

Livelihoods have been severely disrupted in all research locations with significant variations noted between rural and urban or peri-urban areas. Urban poor groups and tree crop farmers in rural areas emerge as some of the most affected groups in the visited communities. The urban poor have been particularly hard hit due to: (i) loss of stock and equipment for small businesses and home based enterprises [146] ; (ii) the drastic reduction in short-term informal work opportunities, and (iii) accumulated debt with informal lenders. [147] A large number of affected households in the urban sites visited relied on short-term, informal work for income prior to the floods, with typically uncertain earnings. Flooding has significantly reduced income generating opportunities for this category of urban workers with shops and markets remaining closed for the duration of the floods.[148]

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[145] The Provincial Poverty Incidence of the three provinces targeted by the SIA ranges between 6 for Nakhon Sawan, 19 for Uthai Thani and 10 for Lop Buri. Qualitative research conducted in the area prior to the floods has not shown significant issues pertaining to migration, peace and order (including violence against women and children) or substance abuse. There is a limited number of civil society organizations working in the area, the most active being located in Nakhon Sawan province.

[146] While street vendors were for the most part able to salvage their equipment, small business owners with establishments (such as restaurants, laundry businesses for example) were found to have suffered heavier losses. But note that the street vendors had less reserves and were thus put more at risk. The team also noted some difference across provinces, with more frequent reports in Uthai Thani of damaged equipment. The research team found that both men and women own small businesses in the affected areas. Women, however, tend to be more concentrated in lower income range, more precarious and less capital intensive occupations (street vendors of peanuts, deserts).

[147] With no income earned during the flood period, the urban poor are unable to service existing debts with informal lenders with high interest rates (20 percent daily) thus accumulating.

[148] These lasted from two months in Lop Buri to three months in both Uthai Thani and Nakhon Sawan.

The research team also analyzed the impact of the floods on low-income civil servants. A significant proportion of those interviewed were hired as temporary workers and resorted, prior to the floods, to supplementing their income through small-business activities, including small fish farming, offering boat transportation services, and cleaning houses in urban and peri-urban areas; a trend which was observed in all provinces. For the majority of civil servants, salaries continued to be paid in full and on time. Civil servants under temporary contracts have those renewed annually in September/October and therefore did not receive their salaries at the onset of the floods.[149] In addition, in all areas visited their additional sources of income were severely affected[150] resulting in an overall reduction in earnings. This was coupled with an increase in their workload (in terms of working hours and tasks), as civil servants were mobilized for some portions of the disaster response activities, including relief operations in evacuation centers. Wage workers in urban areas were also significantly affected, and factory workers were hard hit by the temporary suspension of production activities.[151]

In rural areas there was widespread damage to crops, although there were no reports of land being made unproductive and limited instances of equipment being damaged in the areas visited.[152] The floods hit at a time when rice was nearly ready for harvesting, which meant that for the vast majority of farmers the rice harvest was completely lost. In all but one of the villages visited, farmers reported that over 80 percent of the rice crop was destroyed. The flood affected the livelihoods of all rice farmers in the areas visited: (i) land-less agricultural laborers, small-scale farmers (5–10 rai)[153] ; and large scale rice growers (40–100 rai).[154] In the vast majority of areas visited, the inability to harvest in time was also due to the lack of available equipment to rapidly carry out the harvest before water levels rose. The sudden on-set of the floods due to breach of flood gates, coupled with the fact that farmers rent equipment for harvesting, which they then take turns in using, meant that time was not sufficient to harvest. The team only observed one exception to this overall pattern in Had Thanong in Uthai Thani Province.[155] The impact of the flood will, in a large number of cases, continue to be felt into the next harvest. At the time of reporting, where water levels had not yet receded farmers were concerned that they may not be able to start planting before January 2012. Delays in rice growth will put the new crop at risk of pest damage during the dry season and from insufficient water levels due to irrigation problems in their areas.

[149] Due to the flooding impacting the contract renewal process

[150] With the exception of those offering transportation by boat in flood affected areas.

[151] In spite of an overall agreement brokered by the government to ensure reductions in wage workers' salaries are minimized the research team found some reports that the agreed salary amounts are not currently being paid in the areas visited. In order to retain their workforce a small number of employers were reported to currently be paying their workers 50 percent of their full salaries. This was, however, found to be exception in the areas visited with the majority of factory workers reportedly not receiving their salaries.

[152] Farmers interviewed expect a good next harvest following the flood provided they are able to plant on time. Damage to equipment was reported by fish farmers.

[153] 2.5 rai = 1 acre

[154] In exceptional instances a small part of the crop had been harvested when the rice was still immature resulting in a sharp reduction in selling price (THB 3,000–3,500 per ton, compared to the normal price of THB 8,000–10,000).

[155] In this community, farmers were able to harvest their rice crop before the onset of the floods as the community has access to irrigation and therefore a greater degree of control over the timing of the harvest. In addition, farmers worked closely with the Bureau of Seed Modification (Department of Agriculture) that provides technical support on climate change adaptation and recommended that planting be advanced by one month.

Table 82: Profile of rice farmers interviewed

Province	Own land	Own and rent land	Landless (rent only)
Lop Buri - (Satawaew Community)	50%	40%	10%
Uthai Thani - (Thasoong Community)	10%	10%	80%
Nakhon Sawan - (Thabkrit Community)	40%	25%	35%

A similar pattern of extensive negative impact on livelihoods was observed for other crops[156] and for fish farming. Tree crop farmers in particular have been severely affected and consider themselves to have been drastically impoverished by the flooding.[157] Prior to the floods, tree crop farmers enjoyed relative financial security. Their crops require a significant level of initial investment due to the cost of young plants, fertilizers and pesticides and to the relatively long time required for trees to mature. However, these crops provide high return to the initial investment, with produce in high demand. This can be illustrated through some of the interviews conducted by the research team with guava farmers and orchard owners. One of the guava farmers interviewed in Uthai Thani, reported a daily income of around THB 1,000 during the guava season with another in the same line of activity reporting a steady monthly income of THB 7,000–8,000. With extensive damage to crops tree crop farmers have now lost the market for their products , in particular the opportunity to sell in the wholesale Talad Tai market.[158] Any replanting of similar species will require a few years before the yield of any produce. In addition, tree crop farmers were not engaged in other income generation activities and do not currently possess the skills that would enable them to easily find alternative sources of income. Out of the nine rural communities visited, farmers from seven communities indicated that they would attempt to shift to other agricultural activities (growing rice or vegetables, which requires smaller investments but which produces yields more rapidly). In the other two communities, farmers were hesitant to replant and re-invest due to the risk associated with shifting to other types of agricultural activities and concerns over cyclical flooding.

In the case of fish farming, small-scale growers are not usually registered with the Fisheries Department, as they are concerned over the restrictions or controls that may be imposed. The majority, who operate illegally, will therefore not be able to claim any compensation for losses. Fish is usually raised in cages or in ponds taking up to four months to grow before being sold. Better priced local species such as Giant Gourami are also raised along river banks and have a longer growth period (a year and a half). Both types of produce have suffered heavy damage. Strong currents have destroyed fish cages and ponds and polluted flood water (containing chemicals from farming) is the other main reason for the losses incurred.[159]

[156] The most commonly observed crops in these areas included fruit (mangoes, santols, guavas, jackfruit, limes) as well as vegetables and herbs such as acacia pennata (cha-om) and basil, lemon grass, eggplant, kale, morning glory. These have a shorter production cycle and are grown for sale and additional income as well as household consumption.
[157] All the tree crop farmers interviewed during the SIA reported owning their own land. In addition, there were no significant reports of loss of equipment for these farmers.
[158] This whole sale market purchases agricultural produce nation-wide. The large amounts of goods usually bought from flood affected provinces are already being sourced from other areas with new suppliers identified.
[159] For those growing larger and more profitable species of fish lost income from potential sales of the pre-flood fish stocks was estimated to be around THB 70,000.

Agricultural laborers have also been severely affected with their income generation activities temporarily suspended due to the floods. These usually include daily work in rice fields, vegetable gardens or orchards, as well as cleaning and construction work. Both on and off-farm sources of income were significantly reduced for this particular group with limited demand reported for domestic work, restaurant or construction jobs.[160]

In addition to the reduction of income outlined above, the research team also noted an increase in household expenditures in both rural and urban areas. In some of the affected urban areas, the poorest households were reported to have moved out of their homes during the flood and are currently living in evacuation centers, where they are able to get support covering basic expenditures. In particular, the ability to have three regular meals in evacuation centers was mentioned by participants in the study as crucial in helping them cope with lost income. For those remaining in their homes, the cost of transport has also increased drastically. This was more pronounced in areas that do not experience recurrent flooding and where boats are not usually available. Some of the households interviewed in Uthai Thani reported that the cost of their daily commute had increased to THB 200 to 500/day.[161] In addition, rural households in particular referred to the added expense of having to purchase produce they would normally grow themselves for consumption by household members.[162]

Coping Strategies and Livelihood Adaptations

"One Million Baht Urban Fund cannot help people anymore. We only provided loans to the people who have the capacity to pay. With the floods, no one wants to pay back. We had to skip the August and September payments, and extend out debt payment period to November. The poor in our community cannot get our loans. They rely on people with the helmet with high interests (informal money lenders)". One Million Baht Fund Manager in Nakhon Sawan Municipality area.

"I am the only income earner in the family. I earned 350 baht per day selling desserts and peanuts. I had to take three loans from the informal lenders to survive using one payment to pay for the others, and keep borrowing more. I have no savings". Poorest female identified by a Community Head of Nakhon Sawan Municipality.

The research team found no significant reports of reduction in food consumption in the areas visited. This can be partly attributed to the pre-flood situation in the targeted provinces (as outlined in the introductory section) as well as to the sufficient availability of relief goods. These were found to be adequate to meet nutrition needs of affected households in nearly all sites visited, with a number of instances reported of a surplus of relief items by respondents. In addition, there were no instances observed in the areas visited of negative coping strategies, including of children having to work to earn more money for the family in urban areas. In all sites visited, families seemed to have remained together.

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[160] Agricultural laborers expect that working opportunities will emerge once reconstruction activities start in affected areas.
[161] Most respondents previously walked to work or used motorcycles with limited costs incurred. Prior to the floods THB50 for commuting to work would have been considered already significantly high.
[162] Concerns regarding increase in food prices were also noted by the research team in the majority of the areas visited.

Additional financial support from family in the form of remittances was not observed in any of the sites visited. None of the farmers interviewed received remittances from their family in other provinces. Interviewees did report that they had relatives living in other cities but did not expect assistance from them, as a large number of factories had suspended their activities. A small number of farmers in the visited communities[163] also indicated that their children had returned home from urban areas as factories had closed. While affected households in both rural and urban sites aimed to take on additional work where available to compensate for lost income, alternative sources of livelihoods seemed equally difficult to find in rural and urban areas, particularly for unskilled workers.[164] For informal workers in urban areas FGD and KIIs confirmed that no jobs were available during the floods. Informal workers expect greater job opportunities to emerge once the recovery process starts (including house rehabilitation and farm work). Resorting to borrowing both for basic expenditures and for livelihood restoration activities seems, therefore, to have been a widespread coping strategy.

Access to Credit

Rural households in particular seem to be more negatively impacted as they regularly borrow for farming inputs. With their harvest lost, a second harvest in danger (in the case of rice-farmers) and significant additional investments required to re-establish livelihoods. There is mounting concern among affected households that they will default on their loans. All interviewees in rural areas indicated that they are currently in debt with loans contracted in all sites prior to the floods. Farmers, tree crop farmers, and fish farmers typically borrowed from the Bank of Agriculture and Agricultural Cooperatives (BAAC). While the pre-flooding debt burden is reported to be manageable in rural areas, the loss of crops, the fish farming equipment and assets damaged will require additional investments. Respondents in rural areas are particularly concerned that they will not be able to borrow further should they default on their loans.

BAAC has put in place a three year suspension for all farmers as well as a new lending window of THB 100,000 for reconstruction activities. Farmers will, however, be required to present their land titles as collateral. Landless farmers will therefore be illegible to access BAAC credit and may need to resort to informal lenders. In rural areas these are typically traders who sell farming inputs for which they charge higher rates (covering four to five months interest on loans contracted). Farmers will then be required to pay their loans once they harvest, with the possibility of making part of the payment in kind (in the case of rice for example). In addition, in some areas, farmers raised concerns over the conditions for accessing loans with BAAC with instances reported where borrowers were required to buy specific products from recommended suppliers. Farmers indicated a clear preference for choosing farming inputs themselves (considering they would be able to procure better quality and cheaper products on their own).

[163] Around eight interviewees.

[164] As outlined in the introductory section above, it is important to note that the SIA was implemented when a number of sites in targeted areas still remain affected by the floods.

For the urban poor, there is limited access to formal sources of credit such as private banks or the One Million Baht Community Fund.[165] These institutions and programs target clients with steady income and require collateral and guarantors that poor households do not have. Heads of community funds in various areas reported that they would need to exclude the urban poor from their beneficiary list due to their limited ability to pay (which would be damaging to the fund's reputation). Participants in the SIA also reported issues with elite capture of the fund, with members with close ties to the fund committee members more able to access funds; the only source of funds available to these groups (and sufficiently flexible to accommodate their irregular earnings) are then informal lenders.

Consultations in urban areas in Uthai Thani further highlighted that half of communities in the areas targeted already relied on loans from informal money lenders prior to the floods (with interest rates at around 20 percent and daily payments required). Interviews with urban poor groups further indicated that a number of households had already hit their debt ceiling with informal lenders. This can be illustrated with the reference to how the THB 5,000 cash transfer provided by the government to meet basic needs was used by some of the SIA respondents. While funds were expected to help these vulnerable households cope with basic needs in the aftermath of the floods, focus group discussions in Ban Pom municipality indicated that in some areas, informal money lenders collected these funds as soon as the money was made available to service households' existing debt. Little was therefore left for household consumption.

In addition, some interviewees in urban areas mentioned instances where defaulting households have had to leave the community for fear of debt collectors. The increased debt burden following the floods can be expected to aggravate the situation, with multiple loans now being taken out both to meet basic expenses and to pay outstanding debt. In the two urban areas covered in Lop Buri and Uthai Thani, focus group discussions with women indicated that schools were expected to open shortly. In spite of free education provided from kindergarten to grade 12, parents expressed concern about the need to borrow to be able to cover the cost of extra-curricular activities, clothes and equipment for their children. Interestingly, formal and informal lottery schemes were often mentioned among the urban poor as another "hopeful" source of income.

Livelihood Adaptations

Rural and urban communities articulated some livelihood adaptations they would like to pursue during recovery and reconstruction. Re-establishing economic activity in urban areas with the re-opening of small businesses will be critical to support informal workers. Farmers are currently considering adjusting their cropping calendar to start earlier. A first round of planting would, however, need to start in November for harvest in February or March. A second season would then run from April to July in order to avoid potential flooding whose onset is usually around July or August. Some suggestions were also noted within communities on the establishment of associations that would give farmers a bigger voice in their negotiations with government. This was noted among farmers in the Koksamutr community in Lop Buri who referred to the value of forming a group to provide

[165] The One Million Baht Fund operates in both rural and urban areas.

collective suggestions to the government on livelihood restoration. Some tree crop farmers indicated the possibility of switching to growing crops with a shorter production cycle such as chili or basil although this would imply a reduction in potential earnings. Others are contemplating switching to rice cultivation. The majority of fish farmers expect to continue in their current line of activity although, similarly to what was noted for farmers, they would prefer investing in fish species with a shorter growth cycle (so that they can start generating income earlier). Some are, however, likely to be forced out of business as they do not have the necessary additional capital to invest.

4.2 Social Relations and Cohesion

"Flood brings family together. We hardly spent time with our family at home. Each day we ride motorcycles to hang out with friends in different places. During the flood we couldn't go anywhere, and stayed together at the house. Our parents are stressed with "money" and debt. We never fished before but everyone learned how to fish to get more food to eat. If there are activities to earn more money after school and help our communities, we would join." Youth group of Ban Tapkrit Pattana, Nakhon Sawan.

Gender and Inter-generational Relations

The team found that men and women played different roles in the response to the floods, with no significant changes noted in gender roles or relations. Women were found in lower paid occupations, particularly in urban areas, although the team did not observe a greater debt burden compared to micro-businesses held by men.

At the village and community level, the team observed a small number of women leaders actively coordinating the relief efforts. Both men and women volunteered during the relief efforts, with their involvement being in line with traditional gender roles (e.g. women worked in the kitchen while men took charge of security). While participating in relief activities added to women's work load, there was a general sense in the areas visited that family members contributed to ease this additional burden. At the household level, men and women in all visited sites appeared to hold similar decision making power when it came to addressing the damage caused by the flood (this includes decisions such as protecting houses or deciding on whether to evacuate). During the flood, families tended to remain together either at the shelter or at their houses. Women in the rural areas indicated they were slightly better informed than men as they were the ones primarily attending village meetings.

Informal discussions were also held with youth (14 to 18) in two of the sites visited. As with the remainder of the informants, young people did not report negative coping strategies in their communities. They did, however, highlight some instances of family disputes due to stress over finances but no incidents of violence against women and children. Youth further reported their awareness of the difficult times being experienced by their neighborhoods and villages and highlighted their willingness to contribute to their family's income through cash-for-work or other income generation activities.

Social Cohesion

Better access to services, more effective governance and improved welfare outcomes tend to be associated with greater social cohesion and higher levels of social capital.[166] Data collected during the SIA indicates that there have been no significant changes in inter-group relationships or in community dynamics directly attributable to the floods. Social cohesion continues to be stronger in rural areas with more limited potential for collective action noted in the urban sites visited. In the three Central Plains provinces covered by the SIA the number of civil society organizations and their areas of intervention vary. There were more active civil society organizations in Nakhon Sawan province engaged in emergency support compared to Lop Buri or Uthai Thani provinces.

In rural areas, in general, government agencies and non-governmental organizations have actively supported the establishment of occupational or community-based welfare groups. These include networks of health volunteers, charitable clubs, women groups, farmer groups, One Million Baht Fund groups or other savings associations, as well as cooperatives. Village leaders are often active in many of these community-based organizations. In contrast in urban settings, people of different income levels tend to live in separate neighborhoods. Daily-wage earners and those self-employed in small enterprise tend to concentrate in densely populated areas near markets, with limited social cohesion within neighborhoods. A limited number of community groups and associations do exist in urban areas but have tended to be short lived.

In general, the flooding has brought communities together in the areas visited with a focus on providing assistance during the immediate relief phase. In rural and urban communities alike, research teams found examples of collaborative behavior where households have helped their neighbors to move household items to higher ground or with the distribution of relief goods and food. Some have taken turns cooking for vulnerable households while others offer their own boats help with transport of other community members. Using the health volunteer system, different color flags were put up in front of the homes of vulnerable individuals (the elderly and sick primarily) with other residents then better able to offer help during the emergency phase. Instances of collaborative behavior have also been noted across villages in rural areas. Village representatives in the Tambon Administrative Office (TAO) in Uthai Thani provided examples of support exchanged between communities (boats, food and relief goods).[167] Such examples have, however, not been found in urban areas.

In rural areas, village representatives have also highlighted the role played by local leaders such as sub-district heads or village heads during the relief phase. Interestingly, villagers participating in relief efforts do not identify themselves as members of particular community groups or associations but more broadly as village volunteers supporting community leaders. Informal institutions such as temples and schools have provided support for shelters and food supplies. In communities with strong social cohesion (and active community networks), sub-district and local government officials were better able to communicate with

[166] Thailand Social Capital Evaluation: A Mixed Methods Assessment of the Social Investment Funds's Impact on Village Social Capital, The World Bank, EASES, January 31, 2006.
[167] Nakhon Sawan, where Songkhla and Korat communities send their support to government and civil society organizations operating in urban areas.

all informal and formal leaders/groups, the structure of aid distribution was clearer and the distribution timely. In one of the communities visited, the sub-district leaders organized daily meetings to review the support to be provided and distribution plans. In less organized sites with weaker community structures the research team noted a greater potential for conflict to emerge among community sub-groups and for gaps in the provision of relief to emerge. In some areas, Kamnan[168] or sub-district heads formed specific groups to provide support for areas that did not receive assistance from elected representatives of the Sub-district Administrative Organization. Existing community networks and structures, therefore, have significant potential (primarily in rural areas) to support longer-term recovery efforts.

The social fabric was found to be more fragile in urban areas with a limited number of community associations and infrequent interactions between communities and local leaders. Instances of collaborative behavior were also less prevalent. These characteristics of urban settings have tended to make the distribution of aid less effective. Urban groups, especially low income groups, were often unable to participate much in relief efforts. They rely mainly on community leaders to identify sources of support. In the visited areas, the assessment team found that the responsibility for identifying sources of aid tended to rest with two or three people with established personal connections with municipalities or other sources of external support. This is likely to generate difficulties in the equitable distribution of relief assistance. The absence of community networks further impacts the distribution of aid with greater potential for particular sub-groups to be excluded. In some areas, the research team heard reports of complaints over the distribution of food and relief goods survival kits.

Potential sources of tension within communities were also noted. The perceived mismanagement of water resources by local communities has already resulted in some degree of tension between communities and local government representatives. In particular, conflicts arose about the timing for opening and closing of flood gates in a number of areas. In the sites visited during the SIA in the Central Plains, no particular tensions have emerged as yet. This is partly due to the fact that there were no significant disparities in the degree to which different sub-groups have been affected or in the support that has been provided so far. In the area where the SIA field test took place in Prachinburi, however, there appeared to be potential for escalating tension and conflict. In these sites, in particular, the irrigation/water management department is seen as favoring particular groups and areas at the expense of others. The perception being that while water levels are kept high in some areas, other communities are better protected with their homes and field remaining relatively dry. As the recovery process gets underway, this situation will need to be monitored very closely to avoid exacerbating existing tensions.

In addition, farmers reported concerns with the implementation of recovery programs by government once the emergency response phase is over. Farmers raised concerns about the implementation of previous programs by line agencies. They considered information

[168] The Minister of Interior is responsible for appointing provincial governors, who perform their duties as representatives of the central administration at the provincial level and have an oversight function over local authorities. Provincial governors are supported in this process by district officer or kamnan. The district officer is the top civil servant position within the district, with all staff in the local administration answerable to her/him. Additionally, the district officer exercises significant de facto control and oversight over the administration of TAOs or sub-districts which lie within her/his jurisdiction, irrespective of the fact TAOs have independent elected councils and executives.

about the programs to have been poorly conveyed and the support itself not well targeted and insufficient. Participants in the SIA reported a number of instances where support or compensation that had been promised (for example compensation for crop damage caused by pests) was never delivered or were inadequate.[169] Given the current level of mistrust of government programs observed in rural areas, tension among communities regarding equitable and timely access to recovery assistance is likely to intensify as the water subsides. This is particularly likely to affect areas, notably urban areas, that do not have strong community networks to rely on to oversee the equitable distribution of assistance.[170]

4.3 Provision of Relief Assistance and Governance

" Surprised...People are suffering this much. How can local authorities keep taking sides? If people are not in their group, no way to get help. It's others from outside who lend their hands."

IDI male, 49 years, from Patan sub-district, Muang district, Lop Buri province, at Shelter: Technical College.

Types of Assistance Provided

Government institutions have taken the lead in the provision of relief which has reached all communities included in the SIA.[171] While the presence of civil society organizations and private sector foundations in particular areas have brought in significant additional resources [172] a set of basic interventions implemented under the coordination of local governments were as follows:[173]

- **In kind assistance and relief goods** – Food assistance was provided in evacuation centers by the Ministry of Social Development and Human Security (MSDHS) and in coordination with the TAO with the involvement of communities. In addition, both food and non-food items were also distributed to households outside of evacuation centers in the form of "emergency survival bags." While the distribution was coordinated by the Ministry of Interior through the Governors' Office and the DPM, a number of private donors funded contributed with additional resources.[174]

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169 With complaints also reported regarding the quality of farming inputs provided such as rice seeds.

170 As outlined above no negative coping strategies were observed in the targeted areas. However, there were isolated references by participants in focus group discussions in Nakhon Sawan over the potential for drug use and crime to increase in the area in the coming months if sources of income for the urban poor continue to decline. These respondents referred to the recent financial crisis as a recent example of how hardships experienced in their communities led to increased rates of crime. Internal stresses (lack of social cohesion in urban areas) where in these case exacerbated by external stresses (brought on by the financial crisis).

171 It is important to note that the SIA did not collect data on the conditions in evacuation centers.

172 For example, agribusiness companies such as CP and Betago supported the provision of food through their networks of local producers and a number of local foundations were involved in the distribution of food and non-food items. In addition in the three Provinces included in the SIA Mae Fah Luang Foundation provided support in the form of agricultural inputs and World Vision supported the implementation of a needs assessment in affected areas.

173 Additional support was provided to deal with sanitation and transport needs, which will be reflected in the respective sector reports.

174 "Emergency Survival Bags" usually include rice, canned tuna, sugar and cooking as well as toiletries (including sanitary napkins). There was no sex or age differentiation in the content of these kits.

- **Cash assistance** – consisting of the THB 5,000/household provided to all affected families, In addition, a second fund (THB 20,000 to 30,000 depending on the level of damage done to homes) was made available for rapid cash-for work schemes for housing renovation or small-scale rehabilitation works. Both programs are funded through the Offices of the Governors by the DPM. The emergency cash for work program was targeted to poor households in the community and implemented through Tambon Administrative Office (TAO) with the involvement of village heads and funding from MSDHS. While no gaps were reported in terms of the geographical coverage of the program there were a number of issues reported with the targeting of beneficiaries within particular areas and the level of funding received (based on the assessment of damage). SIA participants indicated that the compensation allocated to some households had been insufficient, while other had received more than was required for repairs. Some households are already benefiting from a three year debt moratorium instituted by BAAC approximately a year ago. "One Million Baht Village Fund" beneficiaries will in addition only be required to pay interest on their loan (rather than make debt payments) for a one year period.

Aid Coordination Structure

Aid distribution has been implemented through the formal government administrative structure given the unprecedented level of damage and losses. At the provincial level, in kind support from central government and line agencies were coordinated through the Flood Relief Operations Center (FROC) and transferred to the affected provinces. In each province, the governor is primarily responsible for coordinating relief assistance. Aid would, therefore, be coursed through local governments: (i) the municipality for the urban area, and (ii) to the district and sub-district levels for rural areas. Local governments set up a distribution system in their own areas to ensure equal distribution and fairness. In the areas visited, the distribution of assistance seems to have in general been considered fair with the exceptions reported in terms of the emergency cash-for-work program highlighted above. A coupon system with the names of each household registered in targeted areas was used for the distribution of the "Emergency Survival Bags". The mayor and sub-district head designated members of their administrative committees to supervise the distribution of relief assistance. A similar mechanism was put in place at community level, where the community head or village head assigned areas for staff or village committee members to supervise[175]. The village-level health volunteer system was also used in some areas for the supervision of aid distribution with a particular focus on the outreach to vulnerable and marginalized households.

Support Provided to Vulnerable and Marginalized Groups

Existing government systems to care for vulnerable and marginalized groups (particularly the elderly, people with disabilities and the poor) were observed to be functioning in the areas visited by the research team. Relief activities specifically geared towards these groups were implemented under the coordination of Ministry of Social Development and Human Security, the Ministry of Interior in coordination with local governments, and a

[175] The Kamman or sub-district headman reports to the district office. The sub-district headman is elected directly by villagers in the sub-district for a five-year term of office; however, they also are considered to be government officers under the central administration, and are upwardly accountable to the district officer. The village committees mentioned were established to support relief operations and are not a formal part of the local administrative structures.

system of village health volunteers. In both rural and urban areas health volunteers are assigned the responsibility of caring for a group of vulnerable households. In addition to healthcare, additional support in terms of food distribution was channeled to these groups. Income support schemes provide much need resources to help vulnerable households cope with the reduction in income and additional expenditures brought about by the floods. The amounts provided are, however, limited. The team observed instances in the visited areas where elderly and disabled individuals supplement their income support through small businesses (street vendors in particular). A growing debt burden was, however, also observed with the limited profits made being used to pay high interest rates to informal money lenders.

Gender Mainstreaming in Relief Operations

Relief operations, in all three provinces visited were managed by men with high ranking officials interviewed all being male (provincial governors, heads of each provincial department, and presidents of the local administration organizations). As a result, women's voices were mostly absent from high level decisions and coordination of government response to the disaster. The research team did not find examples at field level of implementing agencies using gender sensitive approaches for disaster relief. For example, the training on Disaster Risk Mitigation did not specifically include a gender dimension in the planning and mitigation sessions.

In the initial relief stage, consultations on gender-specific relief needs were not held. The distribution of support, such as seeds and inputs for farms or cash for work programs so far did not seem to take into account gender-specific needs. For example, women in the villages visited also reported that the cash for work scheme (with the exception of cooking activities) tend to be very labor intensive and focused on heavy work usually done by men. As a result, women believe that they are not able to benefit much from these programs, and thus may be unable to access these temporary work opportunities particularly during the relief and recovery period. Sex-disaggregated data was mostly not collected, making targeting support more challenging. For example, the initial numbers of deaths and other emergency assistance information were not sex-disaggregated, resulting in the first phase of emergency assistance missing opportunities to target women and men's different needs (such as content of emergency bags, and gender conscious shelter management). The emergency survival kits, for example, were not "gender specific" although they did contain some of the items needed by men and women (such as sanitary napkins, razors, flashlights).

Availability of Information

In spite of the generally positive findings regarding the coverage of assistance, communities also reported that the information provided on the type of support available was often contradictory. For example, participants in the study in all provinces reported being informed that the THB 5,000 was intended for emergency support and in other occasions being told that it would be programmed for the repair of damaged housing. Some communities received accurate information about the support available for housing reconstruction but their areas did not receive the funding to implement the programs. Communities specifically requested that the information be simplified (with less technical jargon) and provided on a timely basis to enable them to access the relevant programs.

Political Economy of Aid Distribution

While the overall coverage of aid was found to be good, participants in the SIA did highlight gaps in the provision of assistance in areas where the distribution of relief has been subjected to some degree of political instrumentalization. In some areas, the research team found that the local election process where local groups and leaders compete for positions and resources has had a direct impact on aid distribution. Communities in areas considered to be aligned with leaders who recently lost local elections reported limited or delayed support, with resources for relief channeled through local elected governments. Leaders and politically affiliated groups in these areas strive to find resources to ensure primarily the well being of their supporters. In these cases, local government leaders are found to rely on personal relationships and political networks to help mobilize resources and distribute support. In this context, aid distribution could potentially sharpen the already intense tensions observed at the local level. In addition, gaps were also observed in areas where local governments have limited resources and capacities in terms of expertise in disaster response and of available equipment to distribute relief. With provincial elections expected in the next two months, communities have also reported additional resources being channeled to the areas and additional activities being implemented. They further indicated that this additional support provided by electoral candidates would, however, have had to stop as it could be seen as influencing voters' decisions.

Different dynamics were also observed in aid distribution in rural and urban areas. As outlined in section 4.1 above, urban areas were found to have a more fragile social fabric with limited community-based organizations that could be mobilized to aid distribution. In addition, interaction between communities and local government was found to be limited. The pattern of aid distribution usually followed the channels of political relations at local level with community heads with links to the mayor being in a stronger position to access resources in all urban areas visited. In rural areas, greater social capital and cohesion seems to have led to comparatively better or generally more equitable outcomes in terms of aid distribution. In all rural areas visited, the responsibility for aid distribution has shifted to formal leaders such as sub-district head or village head through in coordination with the TAO. Where sub-district or community leaders were able to communicate with a broad range of informal and formal leaders/groups, the structure of aid distribution was clear and the relief assistance seems to have taken place in a timely manner. Participants in the SIA reported less mistrust regarding the aid distribution process in rural areas of Nakhon Sawan.

In regards to the role of the media and civil society, the team noted that private sector and civil society organizations played an important role in filling in gaps in aid distribution when government agencies and local governments do not have sufficient reach or where local politics have skewed the distribution of aid toward certain communities. In many instances, civil society organizations are able to mobilize local support networks for additional aid distribution. In addition, participants in the SIA have stressed the critical monitoring role played by the media. People received information on the flooding situation through various channels such as TV, radio programs, newspapers, internet and other social media. Media has also guided people's perceptions of the flooding situation and emergency response. In particular, media coverage has focused on emerging conflict/tension linked to the management of flood water levels. Participants in the SIA indicated

that high media coverage has strengthened the accountability of the relief efforts. Different aspects of the flood crisis are extensively broadcasted through public and social media channels. Because of this coverage, concerned agencies, both formal and informal, tend to feel that they are being closely observed. In addition, communities feel that they can use the media to report particular incidents with relief or voice their opinions and frustrations regarding the support provided.

Table 83: Summary of impacts observed (rural and urban areas)

	Rural	Urban
Socio-economic impacts		
Livelihoods	• Loss of crops (tree crops, rice) • No reports of land being made unproductive. • Heavy losses for fish farmers (produce and equipment) with no compensation expected for illegal operations. • Reduction of informal work opportunities for agricultural laborers.	• Loss of stock and equipment for small businesses and home based enterprises • Reduction of informal work opportunities • Low income civil servant lost complementary sources of income but salaries continued to be paid on time
Coping strategies and livelihood adaptations	• No reports of negative coping strategies in rural and urban areas (including reduction in food consumption or child labor). • Additional financial support from family was not observed with alternative sources of livelihood being equally difficult to find in rural and urban areas. • Issues reported with elite capture of existing financing schemes at community level.	
	• Concerns over defaults on loans contracted for agricultural inputs. • Limited availability of credit to re-start economic activities. • Concerns raised about the conditions to access formal agricultural (attached requirements of purchasing inputs from specific suppliers). • Use of informal lenders (usually small business owners) with payments due after the next harvest and interest collected through the purchase of agricultural inputs.	• High levels of debt with multiples loans (partly used for basic consumption needs) • Limited access to formal credit sources for the urban poor. Interest rates of 20%/daily currently accumulating with most income earned going to debt service
Social Relations and Cohesion		
Gender and Intergenera-tional relations	• No differences observed between rural and urban sites in terms of gender with no significant changes in terms of gender relations observed. In terms of the disaster response: (i) limited female leadership in the overall coordination of relief operations, (ii) no consultations on gender-specific needs to inform relief efforts; and (iii) limited collection of sex-disaggregated data. • Youth signaled their willingness to contribute to reconstruction activities and to increase household income in both rural and urban areas.	
Social Cohesion	• Better social cohesion observed in rural areas • Strong role played by local leaders in relief effort with participation of village groups.	• More fragile social fabric. • Limited number of community associations and less frequent interactions with local leaders.
Relief Assistance and Governance		
Types of assistance provided	• No differences noted in terms of the types of assistance provided across rural and urban areas for: (i) food and non-food items: (ii) cash assistance.	
Political Economy of Aid Distribution	Instances of political instrumentalization of relief were observed in rural and urban areas. Mistrust regarding Government implementation of future recovery program.	
	Better cohesion seems to have led to more equitable distribution (less mistrust regarding aid distribution process noted in rural areas of Nakhon Sawan).	Distribution of relief more likely to follow political networks (Community Heads and Mayors).

4.4 Community Needs for Resilient Recovery and Reconstruction

Overview

Based on the SIA findings outlined in sections 4.1 to 4.3 above and on additional analysis and consultations with the Ministry of Social Development and Human Security (MSDHS), Ministry of Labor, and SSO, as well as development partners and civil society organizations, a set of short- and medium- to longer-term measures are outlined in the present section (summarized in Table 84). These aim to provide adequate responses to needs of specific groups which have been differently affected by the floods and have a different rate of endowments with which they can engage in recovery and reconstruction activities.[176]

The proposed activities aim to cover:

- **Impacts on vulnerable and marginalized households** with limited sources of income and no ability to participate in labor-based recovery and reconstruction interventions (including the elderly, sick and people with disabilities and children). These measures are intended to support their short-term recovery and prevent a further worsening of their current living conditions.
- **Impacts on a range of socio-economic groups in urban and rural areas,** which suffered heavy losses during the floods. The activities put forward cover both short- and medium/long-term support.
- **Mitigate impacts on villages and urban areas that are particularly vulnerable to recurrent disasters** by putting in place community-based disaster preparedness and rapid response systems.

Short-term Interventions (in the first 6 months)[177]

The short-term measures proposed build on existing systems to allow a rapid response during the post-disaster recovery phase and take into account the support already provided by the government as part of relief operations. In addition, the team has made recommendations to the way in which the implementation of programs could be modified (where field research revealed challenges with the delivery of support).

Additional Cash Transfer to Vulnerable Groups

- **The Thai government has already taken action to allocate THB 5,000 to all registered[178] households in flood affected areas.** Data collected during the SIA, however, highlighted that households with existing loans contracted with informal lenders saw this amount go to a great extent towards debt service. In addition, there were concerns expressed about the documentation needed to claim these benefits, with requests made for beneficiaries that the application process be further simplified. This is already happening in Bangkok for example, where photographs of damaged houses are no longer required and utility bills can be used as proof of residence. In order to reinforce the support extended to vulnerable groups, two additional actions are proposed:

[176] It is important to note that participants in the SIA reported limited consultations with communities on their needs for reconstruction undertaken so far by government agencies as the relief effort is still underway.

[177] While the proposed activities would be launched immediately it is likely that they will continue in the medium term.

[178] The registration process in order to receive the transfer includes the submission of an application form, copy of IDcard, copy of house registration form, rental contract or rental verification from local authorities and proof of damage (such as photographs).

A one-off supplemental cash transfer of THB 4,000 targeted to the poorer affected households with an additional cost of THB 800 million (for a total of 400,000 beneficiaries).[179] The loss of income and means of livelihood observed through the SIA for some of the lower-income groups (informal workers in rural and urban areas for example) and the increasingly high levels of debt observed warrant that additional funds be channeled to the poorest affected households. The transfer currently proposed by government (up to THB 2,000 per household) would be insufficient given that rent payments (in particular) and basic expenditures were reported to have increased.[180] In addition, the team would recommend that, given the absence of a social assistance register and the fact that a number of "new poor" are likely to emerge following the floods, community targeting be used to select beneficiaries. This is in line with the approach planned by the government. A stringent community validation process for beneficiary lists will be needed with close involvement of local government offices (TAO). Social accountability measures will be equally necessary to ensure effective targeting of the poorest and address difficulties in targeting and potential elite capture of recovery programs.[181] Despite the lower social cohesion observed in urban areas, local leaders would be able to set up consultations with community members to select affected households.

- **Temporary doubling of old age and disability pensions in affected areas from THB 500 to THB 1,000 for an estimated three-month period (for a total of 1.2 million beneficiaries). The payments would be made to beneficiaries who already registered through the existing channels. These payments have a total cost of THB 2 billion.** Thailand currently has universal old-age and disability pension schemes[182] The Living Allowance for the Elderly and the Living Allowance for People with Disabilities currently provide support to a combined total of 9.6 million beneficiaries. With the poverty line currently at THB 1,700 the amount provided by these schemes is considered to be insufficient to meet basic needs and assumes that additional financial support will be provided by the family. There is evidence, that in poorer rural areas, with high rates of out migration, the old age pension is already being spent on grand-children who stay behind in the villages.[183] In addition, a means tested Child and Family Assistance Fund (CFA) of up to THB 3,000 is provided up to three times per year based on the submission of a request by the beneficiary household. As with the Elderly and People with Disabilities Living Allowances, the current CFAF amount is not considered sufficient to help with the loss of income and increase in living expenses observed during the floods through the SIA.

[179] This would double the THB 800 million already made available by the government.
[180] Consultations with MSDHS officials.
[181] These issues were highlighted with reference to the housing reconstruction program and "One Million Baht Fund" in the SIA.
[182] The disability pension system covers 1.15 million beneficiaries nationwide currently, while the old-age pension currently covers 8.6 million beneficiaries.
[183] The high cost of housing in urban areas means that wages earned by parents are not always sufficient to send remittances home.

Creating Short-term Employment Opportunities and Re-establishing Livelihoods

- **Implement labor intensive public works' programs using community participation and giving priority to vulnerable and marginalized groups (such as informal sector workers and migrants). These schemes would target approximately 700,000 beneficiaries providing employment for three months** [184] **using minimum daily wage rates of THB 200**[185] **and have an additional total cost of 10.4 billion.**[186] Access to income would be critical in the short-term to enable households to meet basic expenditures and to prevent further increases in household debt. Informal workers in urban areas and landless farmers who rely on temporary work have been severely hit with no jobs currently available in affected areas, as outlined in section 4.1 above. Small business owners, farmers and fish farmers as well as factory workers were other groups whom the assessment found would benefit from this type of intervention while they work to recover working capital and re-establish their previous livelihoods. Community targeting of beneficiaries for these schemes would be critical to identify the most affected households and those made poor by the disaster. In addition, consultations with communities to ensure that the rehabilitation activities proposed do address the needs of affected villages and neighborhoods would be essential. These can include housing reconstruction and village/neighborhood infrastructure rehabilitation

  The proposed schemes could be implemented in partnership with the TAO and existing organizations with a track record of implementing such schemes (such as CODI). Particular attention will need to be paid to construction standards and technical supervision given the issues raised with the quality of labor intensive public works in a recent NESDB study.[187] The International Labor Organization (ILO) has developed guidance manuals in Thai that can help with implementing this program. The ILO already trained all TAO officials in the country in 2003. The training modules still exist and can be used again if necessary. These schemes would follow a gender sensitive design to ensure that women are able to take advantage of work opportunities generated through these schemes. The team also proposes to include specific gender targets to ensure that 50 percent of beneficiaries are women. A set of social accountability measures would need to be developed for the implementation of these schemes given the issues with targeting outlined in the SIA.[188]

- **Provision of working capital to small-businesses, farmers and fish farmers through grants and loans at SFI rates.**[189] The SIA indicated that the main obstacle to the resumption of livelihood activities by small scale businesses in rural and urban areas is the lack of working capital. Farming households were con cerned they may default on pre-existing loans with the BAAC as harvests have

[184] 25 days per month

[185] THB 200 is the minimum wage which is going to be increased next April. Evidence is that those with other options do not work at this wage and the wage can be a self targeting wage.

[186] Cash for Work schemes would also be implemented in areas where an influx of workers returning home due to factory closures can be expected. It is likely that the actual number of beneficiaries in the first month will be higher than 700,000 with numbers reducing in subsequent months as farming starts and other regular jobs recommence.

[187] Monitoring and Evaluation report for "Projects under the Strong Thailand Project 2010–2012", NESDB, January 2011.

[188] Additional details on social accountability measures are provided in page 238.

[189] Communities will be well placed to identify the neediest groups in their areas.

been lost, and would thus be unable to borrow further. In urban areas, informal workers have limited access to micro-finance institutions and resort to borrowing from informal lenders. Beyond the existing BAAC moratorium on debt re-payment, additional lending windows with longer repayment periods and lower interest rates would be required to enable those affected to re-capitalize. Grants may be considered for micro-businesses where formal sources of credit are more difficult to access and limited or no collateral may be available. The government has just added a new SML window for the flood affected areas and also plans to capitalize the village funds. These sources could finance the actions in this recommendation with no additional cost. The new village fund should try to target the groups that had not been covered by previous credit schemes.

Medium to Longer-term Interventions

- **Restructure credit for those borrowing from informal money lenders using existing community funds targeting 16,310 communities with a total cost of THB 6 billion.**[190] Affected households in urban and rural areas have an increasing debt burden with a number of instances found where the most vulnerable are taking multiple loans and using borrowed funds to cover basic consumption needs. With limited collateral the remaining sources of credit for poorer households are often informal money lenders as outlined in section 4.1 above. Interest rates charged reach 20 percent/daily in urban areas. Cash transfers intended for emergency assistance are being collected by money lenders with isolated reports of households now having to relocate to avoid collection. A recent NESDB report[191] cites the experience of five banks in providing easier access to credit with limited collateral noting positive results. The report, however, further recommends additional action to reach the poorest. It notes that the Banks still unable to reach the lower echelons of those with limited access to credit. This had partly to do with the process required to apply for loans. This process needs substantial simplification. The team would recommend that additional government resources be channeled to loans at specialize financial institutions (SFI) rates, which would still result in considerable savings. These loans would particularly target urban areas, through non-profit organizations and the expansion of the membership of community-based savings groups. The latter have substantial experience of working with the target group (rural and urban poor) and currently have the outreach system in place. CODI in particular currently runs community welfare funds in approximately 3,000 communities, which could be used to channel the additional resources needed to re-structure existing loans. The loans should be at the maximum amount of THB 20,000 per household. Those receiving loans from other sources such as BAAC, GSB or commercial banks would not be eligible.[192] These collateral free loans (using group savings as collateral) have been used successfully in other countries.[193] These local groups could also provide an outlet for savings such as the government's existing "One Baht a Day Program".

[190] This measure would be launched in the medium term but is likely to take considerable time to complete.
[191] Monitoring and Evaluation report for "Projects under the Strong Thailand Project 2010–2012", NESDB, January 2011.
[192] An immediate relief program is needed on an ad-hoc basis with a longer term approach to be determined after the microfinance study in the finance section.
[193] For example, the program implemented in Bangladesh has a default rate of less than 5 percent.

- **Provide gender-sensitive training and technical assistance through extension workers for alternative livelihoods.** Data collected during the SIA indicated that those affected in rural areas in particular intended to make some changes to their livelihood strategies during recovery, partly to diversify their sources of income and minimize the risk of future losses. Both tree croppers (who plan to grow different crops with shorter growth periods) and fish farmers (who foresee not being able to re-establish their previous business) mentioned the lack of skills to make these changes. In addition, participants in the SIA also mentioned that previous training provided through various agencies had not resulted in improved livelihoods with limited linkages provided to markets. A combination of improved training and technical assistance provided by extension workers could help support affected households' transition to more diversified livelihoods. In addition, women, commonly found in lower paid, less skilled occupations in rural areas are likely to require different types of skills and learning curriculum should they want to move into different occupations following the floods. In addition, given their heavy workloads (and range of domestic tasks typically performed in addition to farm and off-farm work), the manner in which training or technical support will be delivered will need to be adapted to both men and women's schedules to ensure both are able to benefit equitably from these opportunities. A more detailed needs assessment would be required to identify exact numbers of beneficiaries through the existing local government structures in the approximately 1,100 affected sub-districts. Existing training budgets from the ministries of agriculture and social development and human security could be re-programmed with minimal additional costs and technical assistance provided through the current network of extension workers.

- **Devise mechanisms to involve communities in disaster preparedness, prevention and response activities.** A number of the areas currently affected by flooding experience recurrent albeit moderate annual floods. As highlighted in section 4.3 above, in spite of early warning that flood waters would rise rapidly there were a number of instances where households decided not to evacuate, or evacuated late. There was a perception in some areas that flooding would be moderate and to some extent is a normal part of daily life in these areas. In addition, the SIA found that the disaster preparedness and response was highly variable at local government level with limited disaster response capacity noted in some instances. Establishing a community-based disaster prevention system would help ensure that locally relevant information about risk, safe areas and response plans can be provided in a timely manner to communities. Putting in place a community DRR system can be achieved with the support of local leaders and community organizations a number of which were found to be actively involved in disaster response. Appropriate capacity building interventions would also be geared to local governments to improve disaster preparedness and response at the local level. In addition, where communities and local government identify needs for disaster prevention infrastructure, these may be built with paid labor inputs from the communities themselves, generating additional income to

often poor, disaster-prone areas.[194] Finally, using existing community structures to channel funds for reconstruction activities ensures that money can reach those in need rapidly thus speeding up the pace of recovery. In these cases, communities are able to quickly identify rehabilitation needs in partnership with local government and participate labor intensive reconstruction activities, where needed, generating income for affected households.[195]

- **Develop a single register for benefits, which can be quickly triggered in future disasters, as well as be used for non-disaster time cash transfers to poor households.** A national targeting system, identifying poor households potentially eligible to receive cash transfers would greatly ease the distribution of cash assistance during relief. The development of such a system would not only help to verify eligibility criteria, but also improve the transparency of targeted assistance. The government has declared this as a medium-term objective and allocated funds in the current fiscal year to start developing this approach. It is suggested that preparation of the list be done initially through community or village identification as well as self-identification. One possibility could be that all of those identified through this process would be subject to a short questionnaire based on a Proxy Means Test (PMT). This can be developed using the last round of the household income and expenditure survey[196] and would be updated periodically.[197] Initially the PMT variables are identified using a statistical analysis that would use income/expenditure as an easily observable, verifiable independent variable. These are then converted into a questionnaire that can then be pre-tested. The next step would be to apply the questionnaire to all households identified by community/village groups as well as to those who request help. Adequate publicity is needed to ensure that those inadvertently left out by their community groups have the information to self-identify. The PMT questionnaire would then be administered to all potential beneficiaries and their eligibility verified. Those left out would have the right to appeal. Another more exhaustive approach would be to start with a national census in which all potential target categories would be administered the PMT questionnaire with the list generated in this manner to be verified by the community. Generally, the PMT can be used for multiple programs with the highest poverty threshold being required for pure cash transfers, with lower scores for programs such as educational assistance for example. To be useful, the list must be updated regularly. The PMT approach has been illustrated here as a possible approach before the government develops the capacity to do case management. Other approaches could be used such as categorical targeting, which may work better in urban areas. This involves specifying eligibility by family situation, health, occupation etc. Over time, the government will need to move to a case management approach and the case managers would be working with families in the basic list plus others requesting support.

[194] China has implemented such a program in the Loess plateau where a labor intensive terracing program was conducted with community participation.

[195] For example, community-based disaster response activities are successfully implemented through the Indonesia National CDD Program (PNPM).

[196] As noted earlier, a proxy means test can be developed using observable variables such as housing, land, and livestock to fit a regression equation with income or consumption as the dependent variable. Given the variation in economic activity in Thailand the equation should include dummy variables for regions plus dummy variables for urban, peri-urban, rural and Bangkok.

[197] Following a household income and expenditure surveys or other milestones.

- **Long-term: Add a social assistance pillar to supplement universal pensions and social insurance to complete the country's social protection system.** During the past crises and disasters, Thailand has had to develop ad-hoc measures to respond. Measures first implemented during shocks/disasters then tend to continue after the crises have subsided (this has been the case with free bus transportation which once started could not be stopped). A comprehensive and well developed social protection system would enable better/smoother disaster response. It would also help the country complete the missing part of Thailand's progression to the Social Protection Floor. Generally social protection consists of several pillars – social assistance or safety nets, pensions, social insurance and active labor market programs. Thailand already has universal non-contributory old age pensions and pensions for persons with disabilities (PWDs). There needs to be some adjustment to the benefit levels but this is already being considered by the government in the form of an age supplement to existing universal pensions. It would also be useful to add a means tested supplement to cover the additional needs of poorer households. The country also faces a hollowed out family structure in areas from which migrants originate to work in the major employment centers of the country – in that households are composed of children and grand parents as adults have moved away in search of work opportunities. Thus, either a universal or means-tested child benefit, which would be predictable and not ad-hoc, will help. The creation of a single register proposed earlier would help the country develop a comprehensive social assistance system. A recent analysis for the government by the Thailand Development Research Institute shows that a social assistance system would be fiscally sustainable.

  The expansion of social insurance is made challenging by the high degree of informality of the Thai economy – it is unusual for an upper middle income country to have almost 70 per cent of the economy classified as informal.[198] So far, only 565,000 have joined the system and there is a risk of adverse selection in which the most risky volunteer to be covered which could cause long-term risk management problems for the social security system. The approach needs to be reviewed before the adverse selection risk causes financial problems for the system – one way to modify this to reduce the adverse selection risk could be require a minimum number of years of participation before full eligibility for benefits and until then the benefits would be linked to the total value of contributions including government subsidy similar to the approach proposed in the National Savings Fund Law. It is targeted to getting the informal sector to save for retirement with government sub sidies topping up the established funds. At age 60, the value of the savings is converted into an annuity paid monthly as a pension – in cases where the annuity is less than the minimum pension, the government provides additional funds with the total being paid as a living allowance.

[198] Only about 9.4 million out of Thailand's 36 million employed are covered by social insurance and another 2.7 are covered by government pensions and benefits. There has been an attempt by social security to voluntarily bring in some of the remaining 24 million under social insurance coverage by offering incentives such as government subsidies but so far only 800,000 previously formal sector employees who left covered formal employment have exercised their option to continue in the scheme by making contributions themselves.

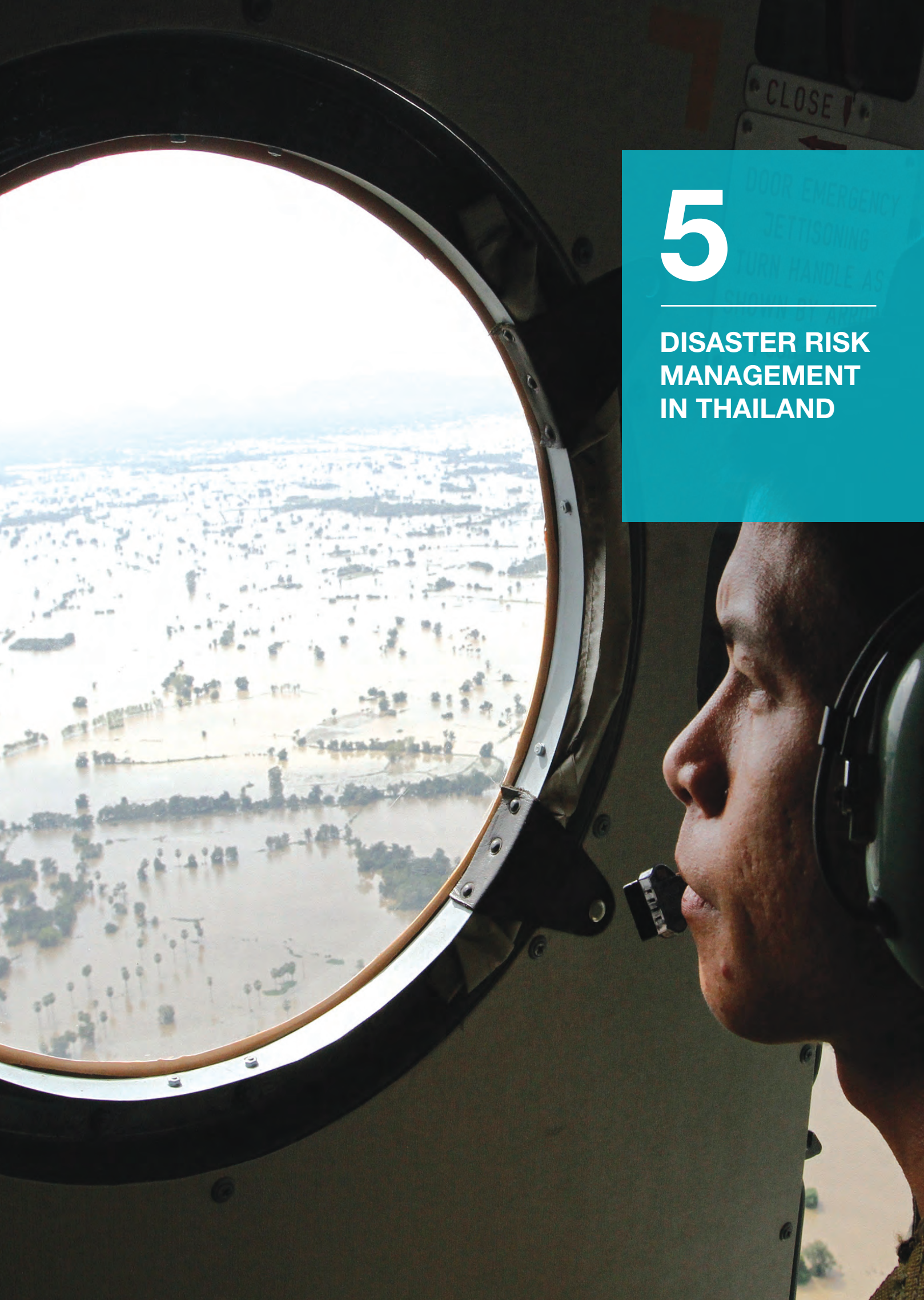
Social Accountability, Transparency and Participation: Minimizing Tension and Conflict in the Delivery of Recovery Assistance

The SIA highlighted some instances where communities reported: (i) lack of information regarding available assistance: (ii) concerns with elite capture of a range of programs (such as the cash assistance provided for housing reconstruction and the "One Million Baht Fund"; (iii) instances where they were required to purchase inputs from particular suppliers using agricultural loans; (iv) mistrust and concerns regarding future recovery interventions; and (v) instances where relief had been politically instrumentalized (as part of future electoral bids for example). With the potential for localized conflict over the allocation of recovery resources already emerging in visited sites, additional resources channeled through these communities may exacerbate existing tensions. Developing a comprehensive social accountability framework to accompany the recovery program will be critical. In particular: (i) ensuring that information on available programs, resources and levels of assistance are made public and accessible to beneficiaries on a timely basis through appropriate channels and that a complaints mechanism is established (using a confidential hot-line for example); (ii) that stringent community validation processes are used to confirm lists of eligible beneficiaries for the measures proposed above (in particular for the targeting of cash transfers and selection of participants in public work schemes); and (iii) that partnerships with civil society organizations, research institutions and the media are established for effective third party monitoring of the recovery effort. Media in particular has played a critical role in improving the transparency of the relief effort.

Table 84: Cost of proposed measures in Thai baht, billions

Proposed Activities	Current Cost	Additional Cost	Total
Develop and implement a comprehensive social accountability framework to accompany the recovery program.[199]	-	0.1	0.1
Increase value of means tested supplemental grants from THB 2,000 per household to THB 4,000 per household.	0.8	0.8	1.6
Temporarily double the value of Elderly and People with Disabilities Living Allowances for three months to THB 1000.[200]	-	2.0	2.0
Cash for work programs in flood affected areas to help clean up and rebuild after the floods.[201]	0.3	10.4	10.7
Restore working capital to small businesses, farmers and fish producers by a combination of grants and restructuring credit.[202]	-	-	-
TOTAL Short-term costs 0-6 months	**1.1**	**13.3**	**14.4**
Credit line at SFI rates to refinance those borrowing from informal sector money-lenders for 16,310 communities.[203]	-	6.0	6.0
Restructure training and technical support programs to meet needs of workers and farmers who need to adapt to changes in the economy induced by the floods. No additional costs but more responsive choice of approaches.	-	-	-
Devise mechanisms to involve communities in disaster preparedness, prevention and response activities.	-	0.8	0.8
Develop a single register for benefits, which can be quickly, triggered in future disasters, as well as be used for non-disaster time cash transfers to poor households. No additional costs - already budgeted.	-	-	-
Put in place mechanisms to involve communities in disaster preparedness, prevention and response activities.	-	0.6	0.6
TOTAL Medium-term costs (7–24 months)	-	**7.4**	**7.4**
GRAND TOTAL Short- and medium-term costs 0–24 months	**1.1**	**20.7**	**21.8**

[199] Includes two rounds of third party monitoring with independent research institutions and one round of community score cards in a sample of affected sub-districts.
[200] Noting that monthly poverty line is THB 1,678
[201] 1.5 million person months in flood affected areas AND 0.2 million person months in areas to which workers have returned
[202] No extra costs with programs covered by existing schemes such as village fund, SML allocation.
[203] Cost of fund and administration



5

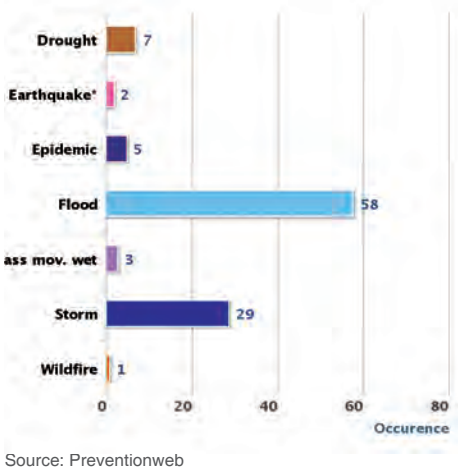
DISASTER RISK MANAGEMENT IN THAILAND

5

DISASTER RISK MANAGEMENT IN THAILAND

5.1 Risk Profile

Thailand is regarded as highly vulnerable to natural disasters caused by hydro-meteorological phenomena (floods, landslides, storms, droughts, etc.). Thailand is ranked as the seventh most flood prone country in the world,[204] they occur almost annually, and they are, by far, the most devastating disaster in the country. Official statistics from 2002–2008 show that the country floods an average of approximately 10 times per year, with an average of 44 provinces affected, 96 deaths, and THB 5.88 billion in economic loss. [205]



Source: Preventionweb
Note: The X-axis shows the number of events during 1980–2010)

Table 85: Natural disaster occurrence reported (1980–2010)

Multi-hazard disaster risk maps indicate that Thailand is significantly affected by hydrological and drought events, particularly in the central, eastern, and southern regions. Though floods pose the greatest threat to Thailand, in terms of mortality and impact on GDP,[206] the population exposed to drought is roughly three times as high and cyclones pose a risk primarily in coastal areas that are the landing ground for the frequent tropical storms. Thailand also faces earthquake and tsunami risk, as has been experienced in 2004, with a loss of 8,221 lives.[207]

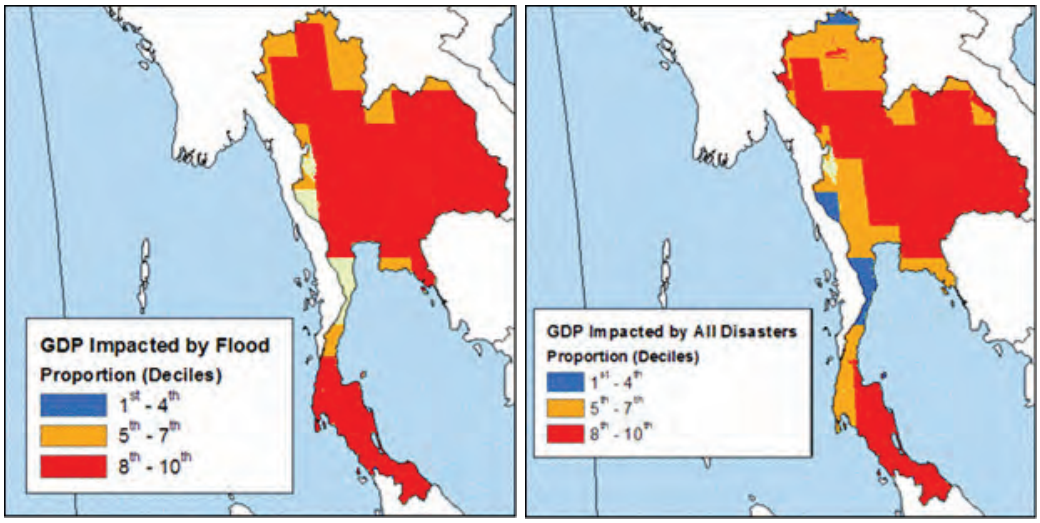
Hazard	Population exposed	Country ranking
Cyclone	5,147	52nd out of 89
Drought	2,444,010	31st out of 184
Flood	819,822	7th out of 162
Landslide	2,496	42nd out of 162
Earthquake	22,860	92nd out of 153
Tsunami	3,487	54th out of 76

Source: Preventionweb

Table 86: Population exposed to hazards and country rank (1980–2010)

[204] Preventionweb: http://www.preventionweb.net/english/countries/statistics/index.php?cid=170
[205] National Disaster Preparedness and Mitigation Plan, p4.
[206] Natural Disaster Hotspot: Global Risk Analysis http://www.ldeo.columbia.edu/chrr/research/profiles/pdfs/thailand_profile1.pdf
[207] Prevention web

Figure 26: Thailand risk profile showing the impact of all disasters



Source: Natural Disaster Hotspot [208]

Looking to the future, it is important to incorporate the anticipated impacts climate change will have on Thailand's risk profile, and integrate the anticipated needs and vulnerabilities into risk management activities and adaptation plans across sectors. In climate change research, Thailand is expected to be 4th – after the USA, Russia and Japan – on the list of countries expected to incur climate-related economic losses by 2030. Bangkok is in South East Asia and is considered a high-risk, hazard-prone city due to its coastal location, on-going land subsidence, and its mean sea level elevation. A population of more than 14 million living in high-density zones makes the risk to human life and assets significant. As the Bangkok metropolitan area contributes approximately 40 percent to the national GDP,[209] any disasters that impact this mega-city will also have significant impacts on the country.

5.2 DRM Policy and Institutional Framework

The Department of Disaster Preparedness and Mitigation (DDPM) was established in 2002 *under the Ministry of Interior as a result of the restructuring of five government institutions.* In 2007, The National Disaster Prevention and Mitigation Act (NDPMA) was passed, and mandated that the DDPM be the focal organization for the coordination of all types of disasters. The DDPM operates in all 76 provinces and has 18 regional centers.

Some of NDPMA features are,[210]

(1) The scope of disaster management activities has been extended to encompass all types of disasters,

[208] Natural Disaster Hotspot: Global Risk Analysis http://www.ldeo.columbia.edu/chrr/research/hotspots/documents/hotpots_backgrd_acknowl.pdf
[209] Climate Vulnerability Monitor 2010 – the State of the Climate Crisis, DARA, 2010
[210] Disaster Prevention and Mitigation Act B.E.2550 (2007), Department of Disaster Prevention and Mitigation, Ministry of Interior, RTG.

(2) Designating National Disaster Prevention and Mitigation Committee as the coordinating body for policy formulation through the National Disaster Prevention and Mitigation Plan (NDPMP),
(3) Designation DPPM as national focal point for disaster management activities,
(4) Formulation of three disaster prevention and mitigation plans (for National, Provincial and Bangkok Metropolitan Administration),
(5) Clear identification of responsible authorities and persons for disaster management tasks at all levels.

The National Disaster Prevention and Mitigation Committee (NDPMC) is a national multi-sectoral body responsible for policy formulation and planning for disaster preparedness, mitigation, and response. The NDPMC is chaired by the Prime Minister or the Deputy Prime Minister. The NDPMC includes representatives of line government organizations and qualified persons appointed by the Cabinet.

The National Disaster Prevention and Mitigation Plan (NDPMP) (2010–2014) provides a basis for national-level DRM activities, such as: 1) conceptual framework of disaster management; 2) classification of disaster scale; 3) roles and responsibility of government ministries, agencies, state enterprises; and 4) standard operating procedures.

Apart from above there are numerous ministries and actors for various aspects of disaster risk reduction (DRR), such as (1) Thai Meteorological Department (TMD) providing weather forecasts and disaster warnings, (2) The Royal Irrigation Department (RID) who manages most of the hydraulic facilities such as drainage canals, sluices and dams, etc.[211]

The Strategic National Action Plan (SNAP) on Disaster Risk Reduction 2010–2019 was produced by the DDPM to ensure disaster risk management is mainstreamed in the national plans of all government institutions, and remains a national priority, as agreed to in the Hyogo Framework of Action (HFA).[212] However, this strategy, being very recent, has not been made familiar within government institutions.

Institutional Arrangements for Flood Response

Due to the dramatic impact of the floods, Prime Minister Yingluck Shinawatra announced the use of Section 31 of the Disaster Prevention and Mitigation Act on 21 October, 2011.[213] Under Section 31, the Prime Minister has the full authority to command and direct all government agencies and local administration agencies to implement measures for disaster relief and protection, as well as provide assistance to affected people in designated areas. The newly-established Flood Relief Operations Centre (FROC) is chaired by the Justice Minister and comprises experts tasked in advising, monitoring, and setting guide-lines and measures to divert water and lessen the impact of the floods. The organogram of FROC as of November 8, 2011 is attached as Annex 24.

[211] National Disaster Prevention and Mitigation Plan B.E.2553-2557 (2010–2014), Department of Disaster Prevention and Mitigation, Ministry of Interior, RTG.
[212] Strategic National Action Plan (SNAP) for Disaster Risk Reduction 2010–2019, Department of Disaster Prevention and Mitigation, Ministry of Interior, RTG.
[213] Disaster Prevention and Mitigation Act B.E. 2550 (2007), DDPM, Ministry of Interior, p 85

On 25 October, the Cabinet approved a four-phase relief and recovery plan and package for immediate response, flood assistance, post-crisis rehabilitation and long-term phase. Relevant ministers also carried out their respective responsibilities on social protection, sanitation and hygiene, transportation, education and water management, etc.

The government also set up a National Committee to prepare a comprehensive strategy for the country's rehabilitation to make Thailand better, safer and stronger. The strategy is separated into three parallel phases, namely, the 3R's – Rescue, Restore and Rebuild. Immediate relief and rescue efforts include receiving donations, distributing relief assistance, providing medical care and temporary shelters and dispatching support personnel to the fields.

5.3 Lessons from the 2011 Floods

Evidence-based learning is essential for implementing DRM policies that cater to the needs of affected people and responsible institutions. Based on findings from field visits to Nakhon Sawan and Phitsanulok provinces, Bang Phlat district, and meetings with RTG, public and private institutions, the assessment team captured the following lessons.

Risk assessments for public knowledge Information about hazard and risk is the critical first step to any comprehensive risk management plan, and community and country-wide preparedness. In Thailand, however, the flood risk assessment results were not adequately understood by citizens, who were, therefore, unable to make decisions based on known risk. The risk assessment institutional environment is partly responsible for the lack communication and confusion; according to NDPMP, more than ten ministries and organizations are designated as key implementing agencies for undertaking risk assessments for floods and landslides.

Risk assessments can require a high-level of scientific and analytical inputs involving satellite, meteorological and hydrological technologies, and varying models or technologies may be used for rural and urban areas, and different geo-spatial zones. Simulation exercises may be useful with various mega-hazard patterns, such as to taking into consideration cyclones, assuming the worst-case scenario, causing a huge storm surge, matched with high tide. By exercising multiple hazard simulations, preparedness and response planning would be enriched. Technical risk assessments can be translated to user-friendly tools such as hazard maps and simulation outcomes for policy makers, practitioners and the general public. In conjunction with detailed scientific and technology-based modeling, community-based risk assessments that mobilize communities with area-specific knowledge of historic disasters – such as recent flood marks – and an understanding of the resources available for preparedness and mitigation, can be very effective. Community-based assessments are also useful forums for awareness raising and building a sense of ownership of DRM plans amongst residents.

It is never too late to distribute risk assessment information – dovetailing an immediate post-flood drive to build-back-better-and-safer and sharing risk assessment information through a public awareness campaign would ensure the recovery and reconstruction process can reduce vulnerability to future risks.

Early warning communication In the case of the 2011 floods, despite the constraints of existing forecasting tools and the associated limitations on authorities' ability to predict flood behavior, early warning information was issued in a timely manner. That said, conflicting information from different government bodies responsible for varying areas of flood information management resulted in a lack of clarity on the part of the public.

Emergency management and coordination A number of national disaster response committees were set up, on an ad-hoc basis, in response to the changing and evolving flood situation. These include the Emergency Operation Center for Floods, Storms, and Landslides (EOC), set up on 22 August, and the Flood Relief Operation Center (FROC), set up on 21 October. Though in-line with protocol outlined in the NDPMA, establishing FROC was not an adequate response to addressing the emergency. Roles and responsibilities were blurred, which caused confusion. However, such ad hoc approaches are not uncommon in emergency situations, and this is seen in other countries as well. This reflects the need to review DRM plans, take a less rigid approach that can respond to different disasters, types and scales, and avoid the one-size fits all model.

Coordinated emergency preparedness Emergency and disaster management mechanisms are largely based on local needs and plans and rely on provincial and local administrative structures. This arrangement brings local knowledge and understanding of needs, but during the flood the lack of coordination on flood prevention and management planning across administrative areas was notable. This led to conflict within and between communities that border different administrative zones.

Disaster response versus preparedness Field teams found that DRM plans often focused on emergency response, awarding little focus preparedness and prevention.

Urban vulnerability While flooding in rural areas and urban riverfront settlements is a regular occurrence, many urban and sub-urban areas have not experienced flooding for more than 10–15 years. Spatial dynamics of urban areas such as high-density settlements combined with this lack of experience has resulted in lower resilience and adaptive capacity of urban communities as compared to their rural counterparts. Many sub-district, district, and provincial administrators expressed concerns over effectiveness of city planning and land use enforcement in the context, as well as the dearth of guidance on how to effectively plan and prepare for disasters in urban areas. That said, good DRM practice was noted amongst some NGOs working in poor, urban communities, including the Community Organizations Development Institute (CODI), the Asian Coalition for Housing Rights (ACHR) and the Bangkok Metropolitan Administration's conflict management and coordination experiences.

Evacuation planning Whilst evacuation plans were in place during the floods, officials expressed concern that the public was not willing to evacuate safely. One interviewed official said: *"people will not evacuate when they can, and want to evacuate when it is not possible."* [214] Past experiences of relief being delivered directly to affected households, and fear that household belongings would be stolen whilst they were away, were cited as reasons residents were not willing to evacuate safely, with theft being the main reason in urban areas. Once public nervousness about theft was understood, the FROC established a peacekeeping, public safety and traffic committee, which should be considered as an integral part of any preparedness plan and the future NDPMP. Stories of poorly-planned and ad-hoc shelters also highlighted the need for comprehensive preparedness plans.

Community Based Disaster Risk Management (CBDRM) Communities with strong leadership and Disaster Prevention and Mitigation (DPM) teams – comprised of DDPM volunteers, rescuers and community volunteers – as well as greater engagement of civil society organizations typically respond to and recover more quickly from disasters. CBDRM training has been delivered in many communities and among community volunteers. DDPM has identified 27,000 communities living in high-risk areas of which 5,400 have received CBDRM training from the DDPM. The DDPM's 'One Tambon- One Search and Rescue Team' (OTOS) program aims to train 77,000 people and establish 7,000 teams nationwide. Partnerships with local NGOs and civil society organizations are often found to be successful at training, coordinating and preparing communities for disaster risk management and response, and such partnerships could extend the reach of government plans, and increase community awareness and preparedness. These are excellent non-structural DRM measures that can be considered, in addition to structural DRM measures.

5.4 Disaster Risk Financing in Thailand

The extent of the flooding may lead the international reinsurance market to reclassify Thailand as a high-risk country subject to catastrophe risks for the next reinsurance season starting on 1 January, 2012. This would imply limited reinsurance capacity, and/or lower coverage limits and/or higher reinsurance premium rates. It will be critical to restore the confidence of the reinsurance market on the capacity of the government of Thailand not only to manage major floods, but also to have greater domestic capacity to absorb losses when they occur. Without this, the international reinsurance market is likely to assume that a similar level of loss may happen again at any moment, which will make flood reinsurance either unaffordable or potentially unavailable.

According to the Office of the Insurance Commission, the vast majority (90–95 percent) of property catastrophe risk insurance is underwritten by domestic insurers and reinsured abroad. This means that the net retention of the domestic insurers should not exceed THB 10–15 billion. In this context, domestic insurers should be able to pay their claims in full, though some may face significant depletion of capital.

[214] Team assessment interview

Building on the recent disaster risk financing and insurance framework proposed at the ASEAN–World Bank Forum on Disaster Risk Financing and Insurance,[215] the government of Thailand may want to consider an integrated disaster risk financing strategy to increase the financial and fiscal resilience of the country against natural disasters, as part of its overall disaster risk management agenda. Such a financial strategy would complement risk mitigation investments (such as investment in water management).

In the light of international experience, such insurance pools rely on close partnerships between the government and the private sector, and require strong and continuous support and commitment from the government. There may also be a need for some government guarantee (in the form of line of credit and/or reinsurance of last resort). This is difficult to quantify at this stage as it depends on the type of perils and crops covered under this pool, and thus is not included in the calculations at this stage.

5.5 Recommendations for Improved Disaster Risk Management

Strengthened Communication and Risk Awareness

Short-term

Continue the needs assessments Many parts of the country are still under water and gathering data for assessments has been a challenge. Though the government and other organizations are already responding with immediate relief and early response plans, continued monitoring and assessments will be important for the development of comprehensive recovery and reconstruction plan.

Communications strategy With the next flood season only months away, it is essential to set up a communications strategy that can provide clear and consistent messages in a timely manner. Key topics for communications should include: hazard awareness and preparedness; early warning; response and recovery plans and programs related to compensation including eligibility; access and grievance and redressal mechanisms; and guidance for both rural and urban recovery including build-back-better-and-safer messages. The strategy should also explore how to best streamline formal and informal communications channels.

Medium-term

Multi stakeholder capacity assessment and resource mapping Many stakeholders in the public and private sphere employed significant resources and expertise in response to the floods, though a formal reporting or coordination mechanism linking these entities with the government has been observed. Mapping resources of all stakeholders, including government agencies from region to sub-district level, defense (police, army, etc.), private actors and organizations, NGOs and civil society institutions will help identify the resources available to respond to future disasters. Managing this information in a database or in open

[215] ASEAN/WB Forum on Disaster Risk Financing and Insurance, November 8-10, 2011, Jakarta

source data would help government and other actors understand who is doing what where, which could, if used correctly, ensure timely responses to all communities, and avoid the replication of efforts. A range of tools exist to manage this information exist, such as Open Data Platforms, data sharing protocols amongst the involved institutions, crowd-sourcing tools, and Open Street Map.

Integrated early warning with multi-hazard mapping Thailand's hazard mapping and monitoring system includes a number of actors that are each responsible for different hazards. An integrated early warning system that brings together these different organizations into a shared structure that is able to react to alert the public regarding any hazard.

Program planning with defense and civil society institutions Engage with a range of civil society actors and other key populations including the defense sector – specifically to establish disaster security and an evacuation plans – grass-roots organizations, both men and women's groups and the private sector in DRM planning, implementation, monitoring and evaluation processes. This will allow the government to demonstrate accountability and transparency for future decision-making. For example, crowd sourcing is a tool that can help to develop this mechanism in place.

Scientific and socio-economic analysis Undertake an analysis of the 2011 flood with collection of gender disaggregated data to inform disaster planning and institutional capacity strengthening. Academic institutions, research bodies, community development organizations and private sectors can be engaged to share experience and initiatives from within Thailand and from countries across the region.

Improve information management Before, during and after a disaster, strong information management is crucial for DRM. Upgrading the reporting, disaster database, relief inventory system by using modern technology will help cross-sectoral and cross-governmental coordination for timely decision making. Examples of potential developments are the enrichment of "Desinventar", for data collection of past disasters, and developing logical and efficient computerized systems for warehouse management that includes tracking systems of relief goods and external aid acceptance. These systems can be used at the central level and the local, as was proposed by a DDPM member:

> *"If GIS database is available in sub-district and community level, then it will be easy to manage information to know centrally and to allocate resources accordingly. Some provinces already have this system in place."* [216]

Long-term

Conduct a risk assessment including climate change projections There is a need to incorporate risk assessment results into future development plans. Hazards will continue to affect the country as seen, and more so as the climate changes, putting the country and Bangkok, in particular, at greater risk. The RTG may be considering strategic planning decisions regarding whether to further protect Bangkok, or to relocate parts of the city. This decision is particularly difficult and pressing considering the importance of the Chao Phraya River Basin and the multiple threats of continuing subsidence, rapid development,

[216] Meeting with DDPM Bangkok, November 18, 2011, field visit to Phitsanulok province, November 16, 2011

sea level rise and increasing rainy variability. To ensure buy-in to a holistic, long-term solution, a range of stakeholders and considerations will need to be a part of these discussions. Environmental adaptation, both grass roots and high tech, should be incorporated in the longer term recovery planning, and cities and communities, civil society and the private sector will need to be a part of the discussion.

Strengthened DRM Mainstreaming

Medium-term

Different DRM strategies for urban and rural settings Examples from many disasters show that urban recovery is more complex and time consuming than rural recovery. Therefore it will be essential to ensure that these differing needs are reflected in the recovery strategy, and in disaster risk reduction mainstreaming plans. Working with the private sector and civil society institutions, the BMA and DDPM could develop appropriate DRM strategies for urban, provincial urban and rural areas.

Strengthen Community Based Disaster Risk Management As stated in the lessons learnt, the current search and rescue program is effective and now needs to be scaled-up nation-wide. Experience sharing, exchange visits across cities, villages, sub-districts, provinces, regions, and neighboring countries to learn on adaptability to climate change and preventive measures will also enhance the quality of community and citizen-led initiatives. Learning from the plethora of community-based DRM initiatives and partnering with community organizations, DDPM and BMA will be able to extend their outreach. Thailand's vast community volunteer network could be strengthened through good practice training, incentives and awards, such as volunteer of the year, and national, regional and provincial award systems. CBDRM is also a good avenue for promoting better gender equality, and including the needs of vulnerable populations including elderly, disabled, women, men and children in disaster risk reduction and disaster recovery programming.

Mainstream structural and non-structural measures Participatory environmental impact assessments, evacuation strategies, conflict resolution, and multiple-hazard mapping are examples of non-structural measures that should be well integrated during infrastructure recovery and planning processes. Evacuation strategies can be strengthened by engaging the defense sector to protect communities and homes when people are away – thereby eliminating the fear of theft as a disincentive to evacuation. Conflict resolution can help address issues regarding protection of some communities at the expense of others – as seen in the suburbs of Bangkok – as well as the environmental impacts that are a consideration with multiple hazards.

> *"First of all we don't need to only build more infrastructure, but also provide skills to empower people for disaster prevention. Mostly we have seen the use of sandbags as a preventative measure up to one meter high. But when you try to protect your own territory, you let the water pass through your neighbors' territory. New initiatives should focus on empowering provinces on prevention."*
>
> *Mr Songchai Rohitachart, Director, Disaster Prevention and Promotion, DDPM* [217]

[217] Meeting with DDPM officials, Bangkok, November 18, 2011

Long-term

Promote a culture of safety resilience Though many parts of Thailand face regular hazards such as typhoons, fire, floods, landslides, drought and epidemics, few had experienced a disaster of this scale. Lessons from resilient communities, countries, institutions and their community driven development programs need to be translated into community disaster risk management strategies and plans, and disseminated to the public to increase awareness of response plans and coping mechanisms in future hazards, as well potential future threats that climate change will bring. While the experiences and memories are still fresh, the flood recovery process could be seen as an opportunity to strengthen DRM mainstreaming, and promote a safety culture in preparation for future disasters.

Institutional Reform

Medium-term

Enhance DDPM's authority and capacity For the mid- to long-term perspectives, the assessment recommends that the DDPM be the central and official coordination body for disaster risk management. DDPM's role would, therefore, need to be enhanced to ensure its capacity to manage future large-scale disasters. Raising DDPM's legal status within the governance system, to ministry level, or as an organization directly attached to the Prime Minister's Office, would help enhance its authority. Many countries have such a structure, including Indonesia, Malaysia, Japan and the Netherlands. Institutional capacity building and staff training, collaborating across sectors, and investing in operational and program resources are all necessary for building the capacity of the DDPM.

Institutionalize the disaster prevention and mitigation mechanism stated in the DPM Act B.E. 2550 (Chapter 1 Section 6) and National DPM Plan (Chapter 4, section 4.3 and Chapter 6, Section 6.3.2): In the case of mega disasters such as the 2011 flood, the rapid establishment of a trained and prepared emergency coordination body, as mandated in the DPM plan and Act, is necessary. As seen in many disasters in many countries, the overwhelming nature of large-scale disasters needs international and cross-governmental cooperation and centralized decision-making power that this single entity can provide. Lessons from recent flood management will be essential to inform future planning processes and policy reviews of such organizations as SNAP and NDPMP, but and also for a resilient flood recovery and DRM planning for future disasters.

Establish institutional clarity As was established in the NDPMP, many ministries and organizations are responsible for similar and related DRM activities. For example, risk assessments, 12 ministries, organizations, and local administrative bodies are appointed as implementing agencies. To establish a shared understanding and avoid duplication of efforts, contradictory assessments and wasted resources, it is important to clarify the roles and responsibilities of each organization, and ensure strong coordination and reporting. [218]

[218] National Disaster Prevention and Mitigation Plan, B.E. 2553–2557 (2010–2014), DDPM, p 83

Long-term

Mainstream DRM into development planning/capacity building Though national plans for DRM prioritize a holistic approach for disaster risk management, these new plans have not yet been incorporated into sectoral and local action plans, nor mainstreamed into development planning. At the local level, disaster risk management is largely dominated by emergency response and recovery operations, rather than prevention and preparedness. Government institutions, especially the Budget Bureau and The National Economic and Social Development Board (NESDB) should support the mainstreaming of DRM into a national and local development plan and budget plan. Operational agencies such as the DDPM and BMA, can take the lead in promoting a holistic approach by investing in staff, resources and enhancing partnership opportunities. Therefore training and capacity building on disaster management should be incorporated in development planning processes.

Review DRM policies Though Thailand has a sound legal foundation for emergency management and recovery, existing laws and regulations would benefit from further clarification, harmonization and improvements based on lessons from the floods. The system for disaster management is seen as highly complex in practice, requiring integration of related government agencies, defense, NGOs, the private sector and civil society to work effectively. The lack of clear operational procedures and fragmentation of roles and responsibilities led to ad hoc responses and resulted in inefficient and untimely interventions, especially when it required coordination among different agencies.

Restore accountability and transparency While the floods largely brought the people of Thailand together, there were some conflicts related to environmental resource management, and flood protection strategies. How relief and recovery funds are administered may also create tensions and rifts, particularly if support is regarded as lacking transparency and favoring particular groups. The above recommended communications campaign will be particularly important for ensuring transparency and understanding of the system, as well as accountability measures including appeals and grievance structures, which should all be a standard part of all recovery and reconstruction operations.

Disaster Risk Financing

Medium-term

Undertake a disaster fiscal risk assessment An assessment of the fiscal risk associated with natural disasters, as part of the broader fiscal risk assessment strategy is recommended. It would require a detailed analysis of the explicit and implicit contingent liability of the state associated with natural disasters, including the development of probabilistic catastrophe risk models for major perils such as earthquakes, floods and tropical cyclones – including detailed risk mapping from an insurance liability point of view. Developing such a risk model for major perils (including floods) usually costs around THB 60 million.[219]

Review financial management related to budget volatility associated with natural disasters In particular, the short-term spending needs in the aftermath of a disaster

[219] Highly dependent of the exposure database already available.

should be carefully estimated and any potential liquidity gap should be managed through retention, such as reserves and contingent credit, and risk transfer, such as (parametric) insurance.[220] A program to develop an improved disaster risk financing strategy would normally cost around THB 12 million.

Develop an insurance program for public assets Public buildings and infrastructure can be particularly affected by natural disasters, particularly floods. The government could identify and prioritize critical public assets and develop a catastrophe risk insurance program for those assets. This would ensure that funds would be immediately available post-disaster for their rehabilitation and/or reconstruction. This strategy could rely on either (i) the placement of a group insurance policy for key public assets, or (ii) the establishment of a dedicated fund for the insurance of public assets. Developing such an insurance program would normally cost around THB 12 million.

Promote the property catastrophe risk insurance market for private dwellings and SMEs The property catastrophe risk insurance market is still under-developed in Thailand. It is estimated that less than one percent of the private dwellings are insured against natural disasters, and particularly floods. The government could support the development of a property catastrophe risk (re)insurance pool, which would allow domestic insurers to pool their catastrophe risks and access the international market with a single, more diversified portfolio when it is the most efficient. The government could support this program by providing (i) technical assistance to the private insurance industry for the preparation of this program, (ii) a line of credit to the newly established pool during its first years of operations to help it retain some risk, and (iii) provide reinsurance capacity of last resort, beyond the private reinsurance layer, to cover extreme losses. The government could also assist the private insurance industry in developing new delivery channels to increase property catastrophe risk insurance penetration among homeowners and SMEs. Based on international experience, there may be a need for some compulsion to generate a stable and large enough business for the pool. In Turkey for example, earthquake insurance is compulsory for urban homeowners. One could also explore a compulsory catastrophe risk insurance policy for mortgages. Assumed costs are THB 30 million for the design of this catastrophe risk insurance pool (including operational manual), and a THB 1.5 billion line of credit from the government, to back a total of THB 3 billion in the pool. No other cash injection from the government would be assumed at this stage. Note that these figures are very rough estimates that will need to be reviewed during the design stage.

Promote agricultural insurance Farmers are particularly affected by the floods. Building on the ongoing rice insurance pilot program, an agricultural insurance pool could be developed for the agricultural sector.

[220] Existing government planned spending on the current flooding is still emerging, but includes about THB 20 billion for disaster relief scheme of households (THB 5,000 each), THB 40 billion (US$1.3 billion) under the agricultural disaster relief scheme (THB 2,222 per rai), up to THB 230 billion of grants/write-offs to the financial sector, THB 5 billion in energy subsidies, an unknown amount of corporate tax rebates/holidays, and the list surely goes on.

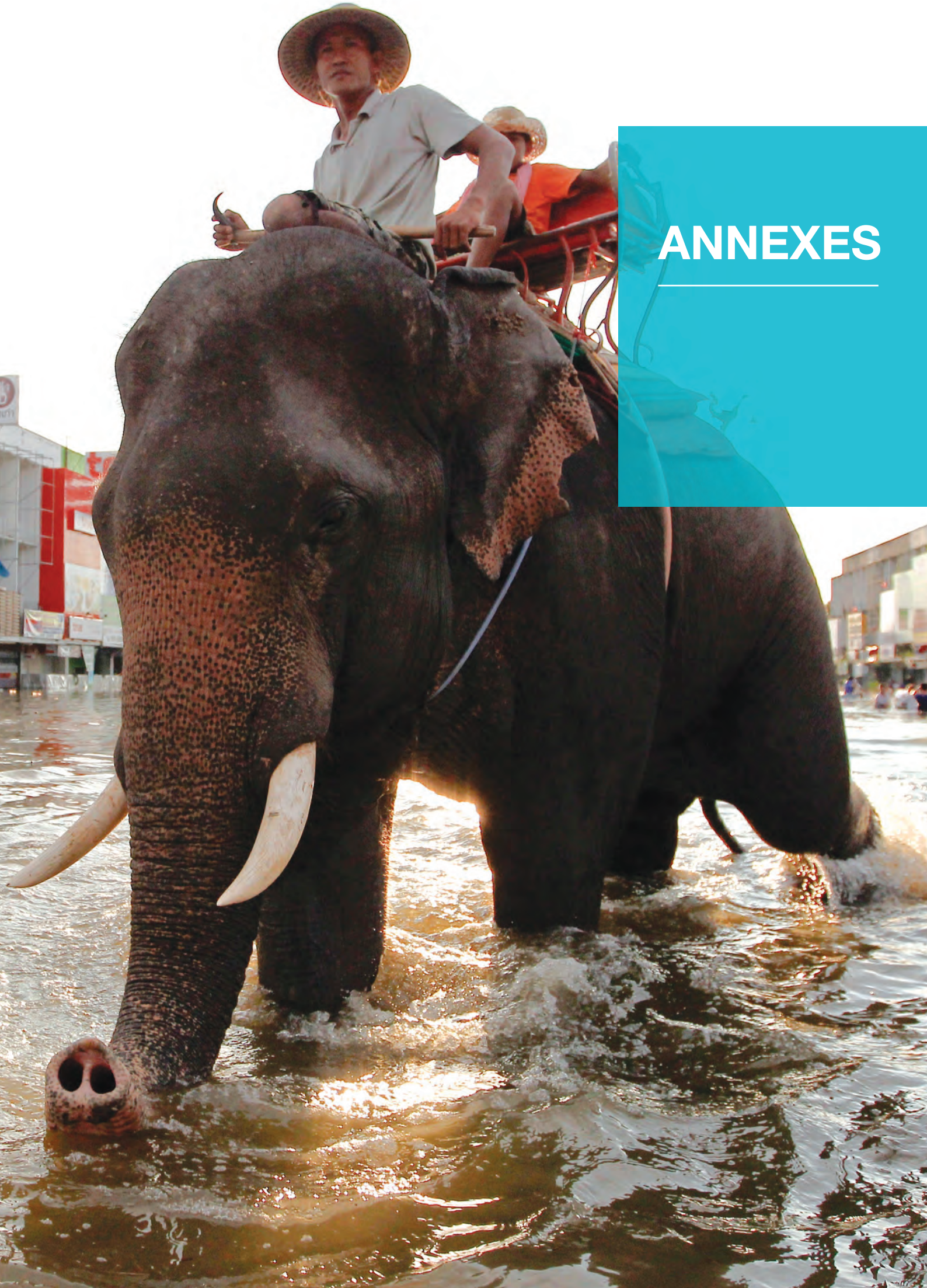
Summary of DRM Needs and Recommendations

Some recommendations here are similar to those in the Flood Control, Drainage and Irrigation chapter and the Transport Sector chapter and coordination amongst responsible agencies will be necessary to avoid overlap and duplication of efforts.

A. Strengthened communication and risk awareness	
Short-term needs	**Recommendations and suggested activities**
Continue needs assessment	-Given the flood situation prevails, the damage assessment should continue in order to establish accurate, final needs
Communication strategy	-A communications strategy with media and inter-governmental agencies needs to be improved to avoid confusion amongst the general public for any future disasters and also to disseminate compensation and recovery policy information on 'Build Back Safer' campaign for a resilient Thailand.
Medium -term needs	**Recommendations and suggested activities**
Mapping resources and capacity assessment	-Mapping all available resources amongst all stakeholders, government agencies from region to sub-district level, defense, private sector, NGOs and civil society institutions for better disaster response and preparedness
Integrated early warning system with multiple hazard mapping	-Integrated and improved coordination among agencies concerned with early warning functions that monitor multi-hazard scenarios -Mainstream media, informal and formal communication channels for consistency and accuracy of information -Invest in forecasting and equipment
Comprehensive assessment of 2011 flood event	-Socio-economic and scientific assessment and analysis to be widely exercised with collection of gender disaggregated data, to draw findings and lessons -Engage with academic and research institutes, think tanks locally and internationally
Information management	-Enrich the Desinventar as proposed by DDPM. Install data from past disasters in the Desinventar system, to provide historical data for more accurate analysis -Develop a computerized and efficient logistical system for warehouse management including tracking systems of relief goods, external aid acceptance, etc. -Provide GIS systems at local level to track resources and capacity
Long-term needs	**Recommendations and suggested activities**
Risk assessment including climate change impacts	-Climate change impacts are assessed together with multiple hazards and incorporated into various development plans , including integrated town and country plan

B. DRM Mainstreaming	
Medium-term needs	**Recommendations and suggested activities**
Separate policies for urban and rural recovery	-Compensation policies should consider particular urban and rural needs -BMA to share their lessons with DDPM and provincial capitals
Community Based Disaster Risk Management (CBDRM)	-Increase the training budget for CBDRM -Organize exchange visits across villages, sub-districts, regions, etc. -Promote incentives and awards for volunteers and communities -Increase the number of trained volunteers both men and women -Increase partnership with multiple stakeholders to cover climate change adaptation issues and urban communities -Introduce conflict resolution and community development training
Non structural measures to incorporate any and structural measures	-Introduce participatory decision making at all levels and stages of DRM -Develop participatory environmental impact assessments, conflict resolution processes -Incorporate multiple hazard mapping into planning new infrastructure
Evacuation Strategy	-Set up urban and rural evacuation strategies, considering community needs and appropriate use of infrastructures -Engage grass-roots agencies, the defense sector and communities in the planning and implementation process
Long-term needs	**Recommendations and suggested activities**
Safety culture	-Hold awareness raising and lessons sharing events within provinces, communities and institutions -Exchanges of good practices from other countries
C. Institutional Reform	
Medium term needs	**Recommendations and suggested activities**
DDPM's leadership and capacity enhancement	-Upgrade DDPM's legal status -Enhance its coordination role both within the government and with outside stakeholders -Increase resources and budget -Train staff internally and externally on climate change, conflict management and DRM -Develop a strategy for urban areas, especially those prone to hazards -Create a database and an information management system -Compile hazard maps from all sources -Encourage CBDRM activities to cover all high-risk urban communities
Institutionalization/materialization of mechanism stated in the DPM Act and Plan	-Translate the mechanisms stated DPM Act as well as in the NDPMP into action and learn from it -Learn from recent flood and implementation of the NDPMP to revise the plan or regulations as necessary
Engagement of grass-roots and private sector organizations	-Engage grass-roots organizations, representing vulnerable and marginalized populations, both men and women's groups and private sector in recovery planning, implementation, monitoring and evaluation processes
Integrated coordination system	-Train staff from all government sectors on DRM mainstreaming -Manual preparations for all concerned agencies for better unified incident command system
Information campaign for DRM, accountability and transparency	-Inform the public about compensation policies -Include messages on hazard awareness and safety massages, to restore people's confidence to 'build back safer'

C. Institutional Reform	
Long-term needs	**Recommendations and suggested activities**
Disaster management capacity building	-Enhance trainings on multi-hazard disaster management from national to community level
Institutional capacity building for longer term planning	-Facilitate emergency response and preparedness capacity building for communities, and strengthen ERT, OTOS and civil defense volunteers
Revise DRM policies	-DRM-related legal settings could be revised so that governmental agencies, defense, NGOs, private sector and civil society could work in more integrated manner. Clear operational procedures should also be developed.
Restore accountability and transparency	-Civil society and media engagement for consistent information strategy to raise public confidence for longer term recovery
D. Disaster Risk Financing	
Medium -term needs	**Recommendations and suggested activities**
Assessment of the fiscal risk as part of the broader fiscal risk assessment strategy	-Conduct a detailed analysis of the explicit and implicit contingent liability of the state associated with natural disasters, including the development of probabilistic catastrophe risk models for major perils
Financial management of the budget volatility associated with natural disasters	-Estimate the short term spending needs in the aftermath of a disaster and develop plans to address any potential liquidity gap, preferably through retention and risk transfer
Development of an insurance program for public assets	-Identify and prioritize critical public assets and develop a catastrophe risk insurance program for those assets
Promotion of the property catastrophe risk insurance market for private dwellings and SMEs	-Develop a property catastrophe risk (re)insurance pool, supported by the government, that allows domestic insurers to pool their catastrophe risks and access the international market with a single, more diversified portfolio
Promotion of agricultural insurance	-Develop an agricultural insurance pool for the sector as a whole



ANNEXES

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ANNEX 1:
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Phumpatrakom, Puttachard Suphalucksana, Rotchna Sintee, Rungsun Maneelek, Sakda Thavornpoch, Saranphat Sathirang-goon, Somded See-sang, Supreedee Rittironk, Thavorn Thipawan, Veera Chumnong, Waraporn Rengthong (MOE).

Financial Sector

Boonthai Keawkhuntee, Nipath Kuasakul, Gedgomon Praitaweepong (BAAC); Kobsak Pootrakool, Chaliga Saengudomlert (Bangkok Bank); Budsakorn Teerapunyachai, Nawaporn Maharagkaga, Siritida Panomwan Na Ayudhya, Somchai Lertlarpwasin, Wanwisa Vorranikulkij (BOT); Chutatong Charumilind, Lavaron Saengsanit (FPO); Vichai Viratapan (GHB); Yongyuth Tariyo (GSB); Siriyot Srisuksawadi, Chutidej Chayuti, Tana Tanarugsachock (KTC Card); Winyoo Eiamsherangoon (Mahachai Hospital); Natee Khlibtong, Sowat YooKongDee (National VF Office); Pravej Ongartsittigul (OIC); Siree Jongdee (PDMO); Wiboon Perm-Arayawong (SBCG); Paralee Sukonthaman, Thawatchai Pittayasophon (SEC); Nongram Wongwanich, Naree Boontherawara, Supakit Jirapraditkul (SET); Soros Sakornvisava (SME Bank); Somkiat Anuras, Tassanee Thanakornsombut (TCC); Sirimas Watanachoti (Thai Banker Association); Ariya Tiranaprakij, Niwat Kanjanaphoomin (Thai Bond Market Association); Jiraphant Asvatanakul (Thai General Insurance Association); Amnaj, Arnon Opaspimoltum, Egapob Mongkuntong, Leighton D Fowles, Pattama Wongsrichalalai, Pichit Mekkittikul, Pornpring Suksantisuwan, Pravidhya Suvaruchiphorn, Reungvit Nandhabiwat, Vannee Kongpakdeepong, Vichai Santimahakullert, Virapan Pulges (Private Sector).

Flood Control, Drainage and Irrigation Sector

Chainat Niyomtoon (BMA); Adri Verwey, Bas Jonkman, Mathijs van Ledden (Deltares and the Royal Haskoning, The Netherlands); Sumrit Chusanathas, Winai Samart (DGR); Thierry Facon (FAO); Anond Snidvongs (GISTDA); Royol Chitradon, Porranee Thanapakpawin (HAII); Kimio Takeya (JICA); Petai Sutthanunt, Tawalyarat Onsira, Vilaiwan Siringampen (Marine Department); Montri Boonpanich, Danucha Pichayanan (NESDB); Auttaporn Poonyachaom, Boewdeang Takeaw, Chalit Damrongsak, Chalit Netpipat, Chanon Seupituk, Chawalit Chalorm, Chawalit Woonprasert, Darongkorn Somtone, Krit Poonsawat, Montri Nueamrod, Nopporn Chaiwichit, Paiboon Tinmanee, Paitoon Youngruksa, Payoaw Sukawaree, Pongsak Akaramanee, Rathsayam Tiyarathagarn, Sombat Sontisri, Somkiat Prajamwong, Supakorn Chearncharoen, Surachet Pheaopaijit, Thayida Siritreeratomrong, Tummanoon Aumpunchai, Uogrit Thawornkrikul, Wasawat Narknuean, Winai Aunaok (RID).

Health Sector

Sureerat Ngamkiatpaisarn (Chulalongkorn University); Kullaporn Unnanon, Orawan Prasitsiriphon (HISRO); Bunnat Laohathongtip, Chakkrit Makpin, Chatchai Detrath, Chutarat Pasuk, Kriangsak Suriyapr, Pasu Sihawong, Patchara Sridurongtham, Prakob, Prateung Chamnoi, Sanan Pisamai, Visanu Sabaitae, Wanna Wijit (MOPH).

Industry Sector

Buathong Chanthasit, Chanatthanaphon Sangsuk, Supaporn Puengsaengjun, Monrudee Phuttirodtaworn (FTI); Supaporn Wilairean (OIE); Anusorn Kongwarakom, Bancha Chamnanchak, Chaiporn Chuekrugn, Eric Trivitayakhun, Kriangkrai Danchaivichit, Naruewan Trichod, Panupong Dintordaen, Puntharee Israngkul na Ayudthaya, Rattana Vongsasuthikul, Santi Watpapub Worawit Mahas (Private Sector).

Social Impacts Sector

Amnart Phonmart, Boontham Lertsukekasen, Chatchai Promlerd, Kamron Imneuy, Nattapat Suwanprathep, Sunthorn Nonthaket, Theerasak Sapsiri, Wanchai Osukholthip (MOI); Anat Thasanakit, Prissana Benjathikul, Sant Soisang (MSDHS).

Tourism Sector

Udom Hongchatikul (ABAC); Ben Montgomery, Bert van Walbeek, Jutamas Wisansing, Martin J Craigs, Parita Niemwongse (PATA); Jaturon Phakdeewanit, Manu Anantha-chaisiri, Seksan Narkwong, Tanyada Chiramatathorn, Thanitta Savetsila Maneechote, Urairatana Tan Naothaworn (MoTS); Narissara Chan-E, Withaya Pewpong (TAT); Pornthip Hirunkate, Thanate Vorasaran (TCT); Petcharavalai Vadhanapanich (THA); Prasith Wichaisuchart (Thai Boats Association), Walter Jamieson, Pawinee Sunalai (Thammasat University); Thaksin Pongjiranithi (TTA); Anake Srishevachart (TTAA); Opas Chuenchue, Chamnan P. Wattana, Rapeeporn Nilmongkol, Napatsakorn Kitwatananusont, Youngyuth Kitwatananusont, Nathanicha Kitwatananusont, Nongnuch Boonklum, Peter Caprez, Semer Alhaj, Panissara Boonyathanyakul, Marcel Sawyere, Luzi A. Matzig, Eric Hallin, Watchiranont Thongtep, Catherine McNabb (Private Sector).

ANNEX 2:
AGRICULTURE SECTOR - GOVERNMENT COMPENSATION POLICY

Crops Compensation

Types of Crops	Compensation (THB per rai)
Rice	2,222
Field crops	3,150
Permanent trees and others	5,098

Notes:

1) The compensation will cover 100% of total damaged areas without a maximum quota
2) If the permanent trees are partially damaged and resulted in limited production, the government will provide THB 2,549 per rai
3) In the case of landslides, the government will provide THB 7,000 per rai, with the maximum of 5 rai per farmer

Fisheries Compensation

Type of Fish	Compensation (THB per rai)	Maximum assistance per farmer
All fish	4,225	5 rai
Shrimps, crams and craps	10,920	5 rai
Cage and fish nets	THB 315 per m^2	80 m^2

*Note: If the total area of damaged are beyond the maximum quota, the government will compensate half of the total areas

Livestock Compensation

Type of Livestock	Compensation (THB per head)	Maximum assistance per farmer
1) Cattles - Buffalo	3,600	Max. 2 heads
- Less than 6 months	7,800	
- Older than 6 months and less than 1 year	10,500	
- Older than 1 year but less than 2 years	15,800	
- More than 2 years	15,800	
2) Swine		Max. 10 heads
- Aged between 1- 30 days	1,200	
- Older than 30 days	2,500	
3) Thai Broilers		Max. 300 heads
- Aged between 1-21 days	20	
- Older more 21 days	40	

Type of Livestock	Compensation (THB per head)	Maximum assistance per farmer
4) Chicken for Eggs		Max. 1,000 heads
- Aged between 1-21 days	15	
- Older than 21 days	60	
5) Broilers		Max. 1,000 heads
- Aged between 1-21 days	15	
- Older than 21 days	35	
6) Ducks for Eggs		Max. 1,000 heads
- Aged between 1-21 days	15	
- Older than 21 days	40	
7) Ducks for meat		Max. 1,000 heads
- Aged between 1-21 days	15	
- Older than 21 days	40	
8) Quail		Max. 1,000 heads
- Aged between 1-21 days	5	
- Older than 21 days	10	
9) Goat	1,400	Max. 10 heads
10) Lamb	1,400	Max. 10 heads
11) Ostrich	200	Max. 10 heads
12) Goose	50	Max. 300 heads
Seeds	220	Max. 20 Rai per farmer
Seedlings	625	

ANNEX 3:
AGRICULTURE SECTOR - ASSUMPTIONS FOR DAMAGE AND LOSSES CALCULATIONS

	Assumptions	Calculation	Data Sources
Agriculture Crop			
Damage			
1. Damage on machinery and equipment (M&E)	(1) 50% of affected farmers had damaged M&E (2) The replacement cost accounted 50% of the value buying the new one	Avg.2008/2009 costs of M&E per farmer adjusting for inflation in 2009/2010 and 2010/2011*% of discounted value of the new one*% of affected farmers had damaged M&E * shares of farmers who have M&E	2008/2009 OAE Socio-Economic Survey
2. Damage on destruction of storage& buildings	(1) 50% of affected farmers had damaged storage/buildings (2) The replacement cost accounted 50% of the value buying the new one	Avg.2008/2009 value of storage and buildings adjusting for inflation in 2009/2010 and 2010/2011* %of discounted value of the new one*affected farmers* % of affected farmers had damaged storage and building* shares of farmers who have storage & buildings	2008/2009 OAE Socio-Economic Survey
3. Damage on irrigation system	(1) 50% of affected farmers had damaged irrigation system (2) The replacement cost accounted 50% of the value buying the new one	Avg.2008/2009 expense of irrigation equipments adjusting for inflation in 2009/2010 and 2010/2011*% affected farmers had damaged irrigation system* shares of farmers who have shallow ponds	2008/2009 OAE Socio-Economic Survey
4. Damage as cost of replanting permanent trees	(1) Estimated Loss of Oct-Dec 2011 - Coconut 4% - Durian 1% - Other fruit tree 95%	Production cost of permanent tree per land size* % loss *% Production Oct-Dec*% affected permanent tree planted area* total permanent tree planted area	OAE

Losses			
1. Production losses in 2011			
- Permanent Crop	Loss of Oct-Dec 2011 - Coconut 4% - Durian 1% - Other fruit tree 95%	% loss *%production in affected season*% affected area* value of production in 2011	OAE
- Field Crops	Loss of Oct-Dec 2011 - Sugar cane 40% - Cassava 30% - Orchid 80% - Pineapple 80% - First rice 90%; sale at low price 10% - Shallot 36% - Soybean (1) 20%, (2) 13% - Corn, garlic, green bean, peanut 100%	% loss*% production in affected season*% affected area* value of production in 2011 Rubber: -% loss*% production in 3 months*% affected area* % trees giving latex (60%) *value of rubber in 2011	OAE
2. Production loss of permanent tree 2012-2014	Loss in 2012=80% of loss in 2011; 2013=50%; 2014=20%		OAE
3. Higher production cost	Production cost increases by 15%		OAE
Livestock			
Damage			
1. Dead of Animals	% dead of affected animal from MOA report; cattle 3%, buffalo 0%, breeding pig 5%, layers 80%	#of affected animal* unit price *% dead of affected animal	MOAC- flooding effected report and assumption from field survey
2. Damage of barns or building/ cages	%Damage Cattle buffalo 20% Swine and breeding pigs 50% Duck, local chicken 10% Broiler&layer 50% Unit cost of building Cow THB 400 /head Buffalo THB 100 /head Swine THB 2000 /head Local chicken THB 200/head Broiler, duck THB 125/head	(1) building /barns cost value * % damaged barn/ building (2) cost value = effected animal * unit cost of building/cage	Assumption from field survey

Losses			
1. Loss of production due to death animal 2011-2012		Production loss*affected area* value of production in 2011	OAE
2. Losses due to higher cost of sick animal or deaths	(1) % Sick & loss for cattle, buffalo, duck, chicken and swine are assumed in the below table. (2) Unit price - vet cost : THB 187/ head for buffalo /cattle; THB 338/ head for swine	Affected animal * % sick *unit vet cost per head	OAE
3. Losses due to forced early sale of animals	25% reduction in unit price % loss due to selling lower price: 20% for cattle,10% for swine	Affected animal * 25% *unit price * % loss of selling lower price	OAE
Fishery			
1. Loss of production in 2011		Production loss*affected area* value of production in 2011	MOAC flooding effected report
2. Losses due to higher production cost	Production cost increases by 15%		
Needs			
1. Provide agriculture/livestock/ fisheries inputs and other support		In the short-run: 55%* losses due to higher production cost. In the medium-term: 20%* replacement cost of M&E.	Rapid Assessment
2. Cash for work	Wage is THB 200/day for 10 working days. 11% of affected farmers join cash for work.	Wage*Working days* % of participation	
3. All crops/livestock /fishery insurance program	Operating cost/farmer = 2 Baht gov. targets for 2 million farmers in the medium term and for 5 million farmers in the long-term		
4. Monitoring and research study works	Short-term: Budget for Monitoring of short-term recovery action is THB 4 million. Medium term: Budget for the study of limiting crop intensity is THB 3 million, for DRR&DRM is THB 4 million.		

ANNEX 4:
INDUSTRY SECTOR - FIELD SURVEY QUESTIONNAIRE

INTRODUCTION: Good morning/afternoon. We are from _____ and, on behalf of the Government of Thailand and the World Bank, we are currently conducting a survey assessing the damages and needs arising from the recent flooding that has affect our country. We would like to seek your assistance by answering the questions below to the best of your knowledge. Rest assured that all information gathered from you will be treated with the utmost confidentiality.

<table>
<tr><td>Date of interview: [day/month/year]
วันที่สัมภาษณ์ (วัน/เดือน/ปี)</td><td>1. AREA พื้นที่
City 1.....1
City 2.....2
Province 1.....3
Province 2.....4
Province 3.....5
Etc .....6</td></tr>
<tr><td colspan="2">2. Address ที่ตั้งโรงงานอุตสาหกรรม หรือ สถานประกอบการ
Street Subdivision Province/City/Municipality
ถนน.....ตำบล.....จังหวัด.....เทศบาลเมือง เทศบาลนคร</td></tr>
<tr><td colspan="2">3. Name of the company (processing or manufacturing unit):
ชื่อบริษัทหรือสถานประกอบการ</td></tr>
<tr><td>4. Respondent number:
___ ___ ___</td><td>5. Contact phone number (if any)
เบอร์โทรศัพท์ติดต่อ
Landline: สายตรง
Mobile Phone: มือถือ</td></tr>
<tr><td>6. Name of Respondent
ชื่อผู้ตอบแบบสอบถาม</td><td rowspan="2">7. Business Size
(please check definition...)
ขนาดธุรกิจ<table><tr><td></td><td>Assets (in mill. THB)
มูลค่าทรัพย์สิน
(หน่วยล้านบาท)</td><td></td></tr><tr><td>Micro</td><td>0 – 2.0</td><td>1</td></tr><tr><td>Small</td><td>2.1 – 50.0</td><td>2</td></tr><tr><td>Medium</td><td>50.1 – 200.0</td><td>3</td></tr><tr><td>Large</td><td>Over 200.0</td><td>4</td></tr></table>*total assets – premises equipment/machinery finished products หรืออาจมี materials</td></tr>
<tr><td>8. Position in the company ตำแหน่งของท่าน
President/CEO.....1
GM/COO.....2
AVP/CFO.....3
Owner/Proprietor.....4
More Junior (to be avoided).....5</td></tr>
<tr><td>9. Type of Business
Agricultural Production.....ผลิตภัณฑ์ทางการเกษตร.....1
Manufacturing/Processing.....อุตสาหกรรมการผลิต/ประกอบขึ้นส่วน.....2
Services.....ธุรกิจบริการ.....3
Wholesale and Retail.....ค้าปลีก/ค้าส่ง.....4</td><td>10. What do you process, produce, sell, or distribute? Identify primary products, goods, service provided
ระบุสินค้า ผลิตภัณฑ์ หรือการบริการของท่าน
VERBATIM: _____
_____</td></tr>
</table>

MAIN QUESTIONNAIRE

Encircle/Write answers in the grids provided.

BUSINESS OPERATION การดำเนินธุรกิจ

Q1. Has the business been affected by Flooding?
ธุรกิจของท่านได้รับผลกระทบจากเหตุการณ์น้ำท่วมในครั้งนี้หรือไม่

ได้รับ	1	CONTINUE TO Q2 ต่อข้อ 2
ไม่ได้รับ	2	TERMINATE
คาดว่าจะได้รับกระทบ	3	

Q2. If yes, in what way has the business been affected? You may choose more than one answer.
หากได้รับผลกระทบ กรุณาประเมินมูลค่าความเสียหายที่ธุรกิจของท่านได้รับผลกระทบในด้านต่างๆ (ตอบได้มากกว่า 1 ข้อ)

MULTIPLE ANSWERS

	MA	Amount (K THB)
Damage to premises ความเสียหายด้านตัวโรงงาน/อาคาร/ร้านค้า	1	
Damage to equipment/machinery ความเสียหายด้านอุปกรณ์/เครื่องจักร	2	
Damage to finished products ความเสียหายของสินค้าที่พร้อมจำหน่าย	3	
Reduced labor force มีการลดจำนวนพนักงานลง	4	
Shortage/lack of electricity ขาดแคลน/ไม่มีระบบไฟฟ้าใช้	5	
Shortage/lack of water ขาดแคลน/ไม่มีน้ำใช้	6	
Shortage/lack of raw materials ขาดแคลน/ไม่มีวัตถุดิบที่ใช้ในการผลิต	7	
Productivity decline กำลังการผลิตลดลง	8	
Demand decline for products/services ความต้องการสินค้าลดลง	9	
Others (specify) อื่นๆ โปรดระบุ _____	( )	

Q3. Had the business stopped due to Flooding?
ธุรกิจของท่านต้องหยุดดำเนินงานเพราะเหตุการณ์น้ำท่วมหรือไม่

Q4. How many times did you stop operating?

ธุรกิจของท่านต้องปิดดำเนินการมาแล้วกี่ครั้ง

1 ครั้ง	1
2 ครั้ง	2
มากกว่า 3 ครั้ง	3

Q5. What is/are the reason/s why you stopped operating the first time? Second time? Third time?

เหตุผลที่ท่านต้องหยุดดำเนินธุรกิจ คือ (ตอบได้มากกว่า 1 ข้อ)

MULTIPLE ANSWERS

	MA ครั้งแรก	MA ครั้งที่ 2	MA ครั้งที่ 3
Could not reach the premises ไม่สามารถเข้าไปที่โรงงานหรือสถานประกอบการหรือร้านค้าได้	1	1	1
Absence of most of the employees that were affected by Flooding พนักงานส่วนใหญ่ต้องขาดงานเนื่องจากได้รับผลกระทบจากเหตุการณ์น้ำท่วม	2	2	2
Damage to premises ความเสียหายด้านตัวโรงงาน/อาคาร/ร้านค้า	3	3	3
Damage to equipment/machinery ความเสียหายด้านอุปกรณ์/เครื่องจักร	4	4	4
Shortage/lack of electricity ขาดแคลน/ไม่มีระบบไฟฟ้าใช้	5	5	5
Shortage/lack of water ขาดแคลน/ไม่มีน้ำใช้	6	6	6
Shortage/lack of raw materials ขาดแคลน/ไม่มีวัตถุดิบที่ใช้ในการผลิต	7	7	7
Demand decline for products ความต้องการสินค้าลดลง	8	8	8
Others (specify) อื่นๆ โปรดระบุ	( )	( )	( )

Q6. Is the business currently in operation?

ขณะนี้ ท่านยังคงดำเนินธุรกิจอยู่หรือไม่

ใช่	1	ทำต่อข้อ 7
ไม่ใช่	2	ข้ามไปข้อ 8

Q7. On what date did your business have to close due to the flooding:

โปรดระบุวันที่ท่านต้องทำการปิดการดำเนินธุรกิจจากเหตุการณ์น้ำท่วม .....

และปิดเป็นระยะเวลาทั้งสิ้น .....วัน

TOTAL NO. OF DAYS NOT IN OPERATION _____

NOTE TO THE ENUMERATOR/INTERVIEWER: Count no. of days with x marks

Q8. If still not in operation, when do you anticipate to start operating again?
ถ้าธุรกิจของท่านยังไม่สามารถเปิดดำเนินการได้ในขณะนี้ ท่านคาดว่าจะสามารถเปิดดำเนินการอีกครั้งได้เมื่อใด
(ตอบเพียงข้อเดียว)

SINGLE ANSWER

	SA
ภายในสัปดาห์นี้ นับจากวันนี้	1
ภายใน 2 สัปดาห์ นับจากวันนี้	2
ภายใน 1 เดือน นับจากวันนี้	3
ภายใน 3 เดือน นับจากวันนี้	4
มากกว่า 3 เดือน นับจากวันนี้	5
ไม่สามารถเปิดดำเนินการได้	6
ยังไม่สามารถคาดการณ์ได้	7

BUSINESS OUTPUT/REVENUE LEVEL
ระดับ ผลผลิต/รายได้ ของธุรกิจของท่าน

Now let us talk about the output/revenue of your business
NOTE: GIVE PRIORITY TO OBTAINING INFORMATION ON REVENUE. IF NOT AVAILABLE, GET INFORMATION ON PRODUCTION
หมายเหตุ: กรุณาระบุรายได้ของธุรกิจของท่านเป็นลำดับแรก หากไม่ทราบ กรุณาระบุระดับการผลิต

Q9. What was the level of average output/revenue per month before Flooding?
ก่อนเหตุการณ์น้ำท่วม ธุรกิจของท่านมีรายได้ หรือผลผลิตต่อเดือนอยู่ในระดับใด

9a. Input average monthly value of gross sales (in K THB) ☐
ยอดขายโดยเฉลี่ยต่อเดือน.....บาท

9b. Input average monthly market value of production (K THB) ☐
มูลค่าราคาของสินค้าที่ผลิตโดยเฉลี่ยต่อเดือน.....บาท

IF CODE 2 IN Q6, SKIP TO Q11

Q10. Has output/revenue been reduced?

10a. ผลผลิตของธุรกิจของท่านลดลงหรือไม่

ใช่	1	ทำต่อข้อ 11
ไม่ใช่	2	ข้ามไปข้อ 13

10b. รายได้ของธุรกิจของท่านลดลงหรือไม่

ใช่	1	ทำต่อข้อ 11
ไม่ใช่	2	ข้ามไปข้อ 13

Q11. What is the level of average output/revenue that you expect/project for the month after Flooding?
โปรดประมาณการมูลค่าผลผลิตหรือรายได้หลังจากเหตุการณ์น้ำท่วมของธุรกิจของท่าน

11a. Input average monthly value of gross sales (in K THB)
(TO BE FILLED IF Q9a IS ANSWERED)
โปรดคาดการณ์ยอดขายโดยเฉลี่ยต่อเดือน.....

11b. Input average monthly market value of production (K THB)
โปรดคาดการณ์ราคากลางของสินค้าโดยเฉลี่ยต่อเดือน.....

Q12. When do you anticipate output/revenue to revert to its pre-disaster level?
ท่านคาดว่าผลผลิตหรือรายได้จะกลับไปสู่ภาวะปกติเมื่อใด (ตอบเพียงข้อเดียว)

SINGLE ANSWER

	SA
ภายในสัปดาห์นี้ นับจากวันนี้	1
ภายใน 2 สัปดาห์ นับจากวันนี้	2
ภายใน 1 เดือน นับจากวันนี้	3
ภายใน 3 เดือน นับจากวันนี้	4
มากกว่า 3 เดือน นับจากวันนี้	5
ไม่สามารถเปิดดำเนินการได้	6
ยังไม่สามารถคาดการณ์ได้	7

DAMAGE TO BUILDING STRUCTURE, ASSETS AND STOCKS
ความเสียหาย ต่อโครงสร้างอาคาร สินทรัพย์ และคลังสินค้า

Now let's talk about the effect of Flooding to your buildings/structures, assets, and stocks

Q13. Do you own the building/structure where this business is located?
ท่านเป็นเจ้าของอาคารหรือโรงงานที่ตั้งอยู่หรือไม่

เป็นเจ้าของ	1
ไม่ได้เป็นเจ้าของ	2

Q14. Was any building/structure damaged/destroyed by Flooding?
ตัวโรงงานได้รับผลกระทบจากเหตุการณ์น้ำท่วมครั้งนี้หรือไม่

ได้รับความเสียหาย	1	ทำต่อข้อ 15
ไม่ได้รับ	2	ข้ามไปข้อ 16

Q15. If yes, how much money do you think it would take to repair/restore the damaged/destroyed building structure?
ท่านคิดว่าจะต้องใช้เงินทุนในการซ่อมแซมหรือฟื้นฟูตัวอาคารที่ได้รับความเสียหายประมาณเท่าไหร่
ประมาณ.....

Q16. Were other assets owned by this business like equipment, tools, furniture, etc. damaged by Flooding?
จากเหตุการณ์น้ำท่วมครั้งนี้ สินทรัพย์ภายในโรงงาน เช่น อุปกรณ์เครื่องจักร อุปกรณ์สำนักงาน เป็นต้น ได้รับความเสียหายหรือไม่

ใช่	1	ทำต่อข้อ 17
ไม่ใช่	2	ข้ามไปข้อ 18

Q17. If yes, what was the value of these assets that were damaged by Flooding?
โปรดระบุมูลค่าความเสียหายต่อทรัพย์สินที่ได้รับคิดเป็น.....บาท

Input value (K THB) ☐

Q18. Was the stock of raw materials or finished goods of this business damaged by Flooding?
วัตถุดิบหรือสินค้าพร้อมจำหน่ายได้รับความเสียหายหรือไม่

ได้รับความเสียหาย	1	ทำต่อข้อ 19
ไม่ได้รับ	2	ข้ามไปข้อ 20

Q19. If yes, what was the value of the stock that has been damaged by Flooding?
มูลค่าความเสียหายของวัตถุดิบหรือสินค้าพร้อมจำหน่ายคิดเป็น.....บาท

Input value (K THB) ☐

Q20. On top of the reconstruction needs mentioned above, how much would it cost to secure your enterprise so that it would not be damaged if similar flooding were to happen again?
หากเกิดเหตุการณ์น้ำท่วมเช่นครั้งนี้ ท่านคิดว่าจะต้องใช้งบประมาณในการป้องกันโรงงานหรือธุรกิจจำนวนเท่าไหร่เพื่อป้องกันความเสียหายที่เกิดจากเหตุการณ์น้ำท่วมที่อาจเกิดขึ้นอีก .....บาท

Input value (K THB) ☐

FINANCING RECOVERY AND RECONSTRUCTION

Q21. Before the floods, did your enterprise have a loan with any financial institution, or any equity?
ก่อนเกิดเหตุการณ์น้ำท่วมธุรกิจของท่านได้มีการกู้ยืมเงินจากสถาบันการเงินหรือขายหุ้นกู้หรือไม่

มี	1	ทำต่อข้อ 21
ไม่มี	2	ข้ามไปข้อ 27

Q22. If yes, what were the details surrounding this (these) loan(s)?

แหล่งเงิน	Commercial Bank ธนาคารพานิชย์	SFI สถาบันการเงินเฉพาะกิจของรัฐ	Finance Company สถาบันการเงิน	Leasing Company บริษัทให้เช่าสินทรัพย์	MFI สถาบันการเงินขนาดย่อม	Village Fund กองทุนหมู่บ้าน	Loan Sharks เงินกู้นอกระบบ	Family / Friends ครอบครัวหรือเพื่อน	Other อื่นๆ	TOTAL รวมทั้งสิ้น
(a) What was the original principal value of the loan? แหล่งเงินกู้หลักของท่านคือ										
(b) What is the current value of the loan? ยอดเงินกู้ในปัจจุบัน										
(c) What was the maturity (i.e., number of months)? กำหนดระยะเวลาคืนเงินกู้ / สินทรัพย์เช่า										
(d) Was the loan fixed or floating interest rate? ประเภทอัตราดอกเบี้ยแบบคงที่หรือลอยตัว										
(e) What was the interest rate? อัตราดอกเบี้ยเท่าไหร่										
(f) What was the value of the collateral required for the loan? มูลค่าหลักทรัพย์ค้ำที่ใช้ประกันเงินกู้										

แหล่งเงิน	Commercial Bank ธนาคารพานิชย์	SFI สถาบันการเงินเฉพาะกิจของรัฐ	Finance Company สถาบันการเงิน	Leasing Company บริษัทให้เช่าสินทรัพย์	MFI สถาบันการเงินขนาดย่อม	Village Fund กองทุนหมู่บ้าน	Loan Sharks เงินกู้นอกระบบ	Family / Friends ครอบครัวหรือเพื่อน	Other อื่นๆ	TOTAL รวมทั้งสิ้น
(g) What was pledged as collateral (i.e., buildings, equipment, etc.)? หลักค้ำประกันที่ใช้ เช่น ตัวอาคาร เครื่องจักร เป็นต้น										
(h) Is the loan in local currency or foreign currency (i.e., US Dollar)? โปรดระบุสกุลเงินของเงินกู้ (ในหรือต่างประเทศ เช่นบาท ดอลล่าร์สหรัฐ เป็นต้น)										
(i) What is the name of the bank that provided the loan? ระบุชื่อธนาคารพานิชย์ที่ปล่อยกู้										
(j) Is the bank local or foreign? ท่านกู้เงินกับธนาคารในประเทศหรือธนาคารต่างชาติ										
(k) What date was the loan taken out? เริ่มกู้เงินเมื่อไหร่ (ระบุวัน/เดือน/ปี)										

Q23. Are you experiencing any difficulty in connection with pre-existing loans due to Flooding?
จากเหตุการณ์น้ำท่วมในครั้งนี้มีผลกระทบกับการกู้ยืมขององค์กรท่านในช่วงก่อนหน้านี้หรือไม่

ใช่	1	ทำต่อข้อ 24
ไม่ใช่	2	ข้ามไปข้อ 27

Q24. If yes, what financial difficulty are you experiencing?
คุณได้ประสบปัญหาเกี่ยวกับการกู้ยืมในเรื่องใดบ้าง (ตอบได้มากกว่า 1ข้อ)

MULTIPLE ANSWERS

Difficulty in paying outstanding loans ความลำบากในการจ่ายเงินที่ค้างชำระ	1
Need to renegotiate existing loans มีความต้องการในการเจรจาต่อรองเพื่อชำระ	2
No hope of ever repaying existing loans ไม่มีความสามารถในการชำระอีกแล้ว	3
Need short-term fresh loan มีความต้องการกู้เงินเพิ่มในระยะสั้น	4
Need long-term fresh loan มีความต้องการกู้เงินเพิ่มในระยะยาว	5
Other อื่นๆ ระบุ (specify)_____	( )

Q25. If yes, what amount of loans/credit would you need to restructure, but eventually be able to pay through your earnings?
โปรดระบุจำนวนเงินที่ท่านต้องการนำไปฟื้นฟูธุรกิจของท่านโดยที่สามารถจ่าย

Input value (K THB) ☐

Q26. If you have no chance of paying back your loans, what amount of loan will have to be recovered through liquidating your assets or bankruptcy?
หากท่านไม่สามารถที่จะชำระหนี้สินได้ ท่านคิดว่าจำนวนเงินมูลค่าเท่าไหร่ที่ท่านจะต้องขายทรัพย์สินของท่านเพื่อใช้หนี้หรือจำนวนเงินมูลค่าเท่าไหร่ที่จะทำให้ท่านล้มละลาย

Input value (K THB) ☐

Q27. Has your enterprise raised any equity?
บริษัทหรือธุรกิจของท่านได้ปล่อยขายหุ้นหรือไม่

ใช่	1	ทำต่อข้อ 28
ไม่ใช่	2	ข้ามไปข้อ 29

Q28. If yes, then:
ถ้าใช่

	ใช่	ไม่ใช่
(a) Did your company raise equity through a public share offering (i.e., stock market)? บริษัทหรือธุรกิจของท่านได้ปล่อยขายหุ้นกู้ให้กับสาธารณชนหรือไม่ (เช่น การขายหุ้นในตลาดหลักทรัพย์)		
(b) Did your company raise equity through private placements (i.e., private equity)? องค์กรของท่านได้ปล่อยขายหุ้นกู้ให้กับบุคคลในวงจำกัดหรือไม่ (เช่น กองทุนส่วนบุคคล)		
(c) Who were the main investors (i.e., public, institutions, investment funds, etc.)? ใครคือผู้ลงทุนรายหลักขององค์กรท่าน (เช่น นักลงทุนรายย่อย นักลงทุนสถาบัน กองทุนเพื่อการลงทุน เป็นต้น)		
(d) How much was raised in equity financing? การระดมทุนขององค์กรท่านมีมูลค่าเท่าไหร่		
(e) What date was the financing raised? คุณทำการระดมทุนเมื่อใด		

Q29. Does your company use any of the following financial products?
ธุรกิจหรือบริษัทของท่านได้ใช้บริการด้านการเงินเหล่านี้หรือไม่

	ไม่ใช้บริการ	ใช้บริการ	จำนวนเงิน (บาท)	No. of Payment missed จำนวนครั้งที่ผิดนัดการชำระหนี้	Will you be able to repay? ท่านจะสามารถจ่ายคืนได้หรือไม่
(a) Insurance? ประกันภัย					
(b) Trade financing? สินเชื่อเพื่อการค้า (letter of credit, packing credit)					
(c) Leasing? บริการเช่าซื้อ					
(d) Hedging products (for foreign currency, etc.)? การประกันความเสี่ยงจากภาวะความผันผวนของราคาสินค้าหรือเงินตราต่างประเทศ					
(e) Others? อื่นๆ ระบุ.....					

Q30. Is your business insured for flooding: YES / NO
บริษัทของท่านได้ทำประกันภัยเพื่อน้ำท่วมหรือไม่

ใช่	1
ไม่ใช่	2

30a. In terms of damage/losses to assets:
ประกันภัยคุ้มครองด้านการประกันความเสียหายของสินทรัพย์

30b. If so, what is the amount of assets that were insured against flooding?
ท่านทำประกันภัยความเสียหายดังกล่าวด้วยวงเงินประกันเท่าไหร่

Input value (K THB) ☐

30c. Have you made any claims on your insurance?
ท่านได้เรียกร้องค่าชดเชยจากประกันภัยบ้างหรือไม่

ใช่	1
ไม่ใช่	2

30d. If not, why not?
หากท่านไม่เคยเรียกร้องค่าชดเชย เพราะเหตุใด

I don't have flood coverage ประกันภัยไม่ครอบคลุมด้านอุทกภัย	
I thought I had flood coverage, but my insurance company says no chance ท่านคิดว่าประกันภัยที่ท่านซื้อครอบคลุมด้านอุทกภัย แต่บริษัทประกันปฏิเสธ	
Insurance company told me to wait (e.g. for a representative to come) บริษัทประกันให้รอตัวแทน	
Flood damage not over, waiting to know how much damage there will be รอการประเมินมูลค่าความเสียหายเนื่องจากเหตุการณ์น้ำท่วมยังไม่สิ้นสุด	
I don't know how to claim ไม่ทราบวิธีการเรียกร้องค่าชดเชย	

30e. Have you had an indication from your insurance company of the value of asset losses that they will in fact re-imburse? If so, what is that amount:
ท่านได้รับแจ้งจากบริษัทประกันภัยเกี่ยวกับมูลค่าความเสียหายของทรัพย์สินที่จะทำการชดเชยให้บ้างหรือไม่ ถ้าได้รับแจ้ง มีมูลค่าจำนวนเท่าไหร่

As a % of your asset losses: %
มูลค่าที่ได้รับการชดเชยจากบริษัทประกันคิดเป็นกี่เปอร์เซ็นต์ของทรัพย์สินที่ได้รับความเสียหาย

In nominal terms: Input value (K THB) ☐
มูลค่าที่ได้รับการชดเชยจากบริษัทประกันคิดเป็นจำนวนเงินเท่าไหร่

30f. Was your business ensured against losses in revenues?
บริษัทหรือธุรกิจของท่านได้ทำประกันที่คุ้มครองความเสียหายด้านรายได้หรือไม่

ใช่	1
ไม่ใช่	2

30g. If so, what is the amount of losses in revenues you thought you were insured for, in the case of flooding?
ถ้าใช่ กรณีน้ำท่วม ท่านคิดว่าจะได้รับเงินชดเชยเท่าไหร่ Input value (K THB) ☐

30h. Have you had an indication from your insurance company of the value of revenue losses that they will in fact reimburse? If so, what is that amount?
ท่านได้รับแจ้งจากบริษัทประกันภัยเกี่ยวกับมูลค่าความเสียหายด้านรายได้ที่จะทำการชดเชยให้บ้างหรือไม่ ถ้าได้รับแจ้งมีมูลค่าจำนวนเท่าไหร่

As a % of your forecasted revenue losses: %
ท่านคิดว่าจำนวนเงินที่จะได้รับการชดเชยจากบริษัทประกันด้านการสูญเสียรายได้ คิดเป็นกี่เปอร์เซนต์ของรายได้

In nominal terms: Input value (K THB)
มูลค่าที่ได้รับการชดเชยจากบริษัทประกันคิดเป็นจำนวนเงินเท่าไหร่

PROCEED WITH Q31 IF ANSWERED CODE 1 TO Q14 or Q16 or Q18, OTHERWISE GO TO Q35.

ถ้าท่านตอบใช่ ในข้อ 14,16 และ 18 กรุณาตอบคำถามข้อ 31
ถ้าท่านตอบไม่ ในข้อ 14,16 และ 18 กรุณาข้ามไปตอบข้อ 35

Q31. Where do you intend to source the funds needed to replace building, structure, assets, and stocks damaged/destroyed by Flooding? You may choose more than one answer.
ท่านตั้งใจจะหาแหล่งเงินกู้จากที่ใด ในการฟื้นฟูโครงสร้างอาคาร ทรัพย์สิน สินค้าที่ได้รับความเสียหาย หรือสูญเสียไปจากเหตุการณ์น้ำท่วม (ตอบได้มากกว่า 1 ข้อ)

SOURCE แหล่งเงินทุน		Q31a Indicate fore-casted amount (K THB) โปรดระบุจำนวนเงิน
Accumulated profits กำไรสะสม	1	
Other savings เงินออมประเภทต่างๆ	2	
Company funds/budget งบประมาณ / เงินทุนของบริษัท	3	
Commercial Banks ธนาคารพาณิชย์ทั่วไป	4	
SFIs สถาบันการเงินเฉพาะกิจ	5	
MFIs สถาบันไมโครไฟแนนซ์ เช่น สหกรณ์ออมทรัพย์ เครดิตยูเนียน	6	
Village Funds กองทุนหมู่บ้าน	7	
Cooperatives กลุ่มสหกรณ์ต่างๆ สหกรณ์การเกษตร / ข้าว / แม่บ้าน	8	
Insurance Payment เงินประกัน	9	
Loan sharks การกู้เงินนอกระบบ	10	
Remittances from family working abroad การได้รับเงินจากครอบครัวที่ทำงานอยู่ต่างประเทศ	11	
Loan from family, relatives, and friends in Thailand การกู้เงินจากครอบครัว ญาติ หรือเพื่อนๆ ในประเทศไทย	12	
Others (specify) อื่นๆ ระบุ_____	13	
	TOTAL:	

Q32. Have the intended creditors mentioned above already responded positively to your queries about financing?
แหล่งเงินทุนดังกล่าว อนุมัติคำร้องขอของท่านหรือไม่

อนุมัติ	1	ทำต่อข้อ 33
ไม่อนุมัติ	2	ข้ามไปข้อ 35

Q33. If yes, what amount of loans/credit have they indicated that they would lend you?
หากได้รับการอนุมัติ มูลค่าเงินกู้ที่ได้รับจากแหล่งเงินหรือสถาบันการเงินต่างๆ คิดเป็นจำนวนเงินเท่าไหร่

SOURCE แหล่งเงินทุน		Q21 Indicate promised amount (K THB) ระบุจำนวนเงินที่คาดว่าจะได้รับ
Accumulated profits กำไรสะสม	1	
Other savings เงินออมประเภทต่างๆ	2	
Company funds/budget งบประมาณ / เงินทุนของบริษัท	3	
Bank/microfinancial institution loan ธนาคาร/สถาบันการเงินขนาดย่อม (สถาบัน microfinance)	4	
Cooperatives กลุ่มสหกรณ์ต่างๆ	5	
Insurance Payment เงินประกัน	6	
Loan sharks การกู้เงินนอกระบบ	7	
Remittances from family working abroad การได้รับเงินจากครอบครัวที่ทำงานอยู่ต่างประเทศ	8	
Loan from family, relatives, and friends in Thailand การกู้เงินจากครอบครัว ญาติ หรือเพื่อนๆ ในประเทศไทย	9	
Others (specify) อื่นๆ ระบุ_____	10	
	TOTAL:	

Q34. Have you already received any of the post-flood loans? If so, what amount?
หลังจากเหตุการณ์น้ำท่วม ท่านได้รับเงินกู้แล้วหรือไม่ หากได้รับแล้ว ท่านได้รับจำนวนเงินเท่าไหร่

SOURCE แหล่งเงินทุน		Q21 Indicate obtained amount (K THB) ระบุ
Accumulated profits กำไรสะสม	1	
Other savings เงินออมประเภทต่างๆ	2	
Company funds/budget งบประมาณ / เงินทุนของบริษัท	3	
Bank/microfinancial institution loan ธนาคาร/สถาบันการเงินขนาดย่อม (สถาบัน microfinance)	4	
Cooperatives กลุ่มสหกรณ์ต่างๆ	5	
Insurance Payment เงินประกัน	6	
Loan sharks การกู้เงินนอกระบบ	7	
Remittances from family working abroad การได้รับเงินจากครอบครัวที่ทำงานอยู่ต่างประเทศ	8	
Loan from family, relatives, and friends in Thailand การกู้เงินจากครอบครัว ญาติ หรือเพื่อนๆ ในประเทศไทย	9	
Others (specify) อื่นๆ ระบุ _____	10	
	TOTAL:	

Q35. How have the floods impacted your ability to obtain financing?
เหตุการณ์น้ำท่วมส่งผลกระทบต่อศักยภาพในการระดมเงินเพื่อการลงทุนของบริษัท/ธุรกิจของท่านอย่างไรบ้าง

How Impacted:
POSITIVELY ผลกระทบเชิงบวก (เนื่องจากได้รับง่ายมากขึ้น)
- Because special post-flood loans available มีเงินกู้เฉพาะกิจรองรับการฟื้นฟูหลังน้ำท่วม
- Because cost of lending has been lowered เนื่องจากค่าใช้จ่ายต่างๆ ในการกู้ยืมถูกลง
- Other: อื่นๆ ระบุ
NEGATIVELY ผลกระทบเชิงลบ (เนื่องจากได้รับยากมากขึ้น)
- Because I now have defaulted loans มีหนี้เสียอยู่แล้ว
- Because my collateral has lost value หลักทรัพย์ค้ำประกันของท่านมีมูลค่าลดลง
- Because banks now don't want to lend in my geographical area ธนาคารไม่ต้องการปล่อยเงินกู้ในพื้นที่โรงงานของท่าน
- Because banks now don't want to lend to my sector ธนาคารไม่ต้องการปล่อยเงินกู้ในประเภทธุรกิจของท่าน
- Other: อื่นๆ ระบุ
NO CHANGE ไม่เปลี่ยนแปลง/ไม่ได้รับผลกระทบใดๆ

Q36. Is your firm publicly listed?
บริษัทหรือธุรกิจของท่านได้มีการทำการจดทะเบียนในตลาดหลักทรัพย์หรือไม่

ใช่	1	ทำต่อข้อ 37
ไม่ใช่	2	ข้ามไปข้อ 38

Q37. If your firm is publicly listed, what is the percentage change in the value of your shares, compared to June 30th 2011?
ท่านคิดว่ามูลค่าราคาหุ้นของบริษัทของท่านมีการเปลี่ยนแปลงหรือไม่ จากวันที่ 30 มิถุนายน 2554
(เพิ่มขึ้นหรือลดลงกี่เปอร์เซ็นต์)

	%

IMPACT ON SUPPLY CHAIN, MARKET AND FINANCIAL SUPPORT

Now let us talk about the effect of Flooding in your customers, suppliers, and financers

Q38. Have your clients/customers been affected by Flooding?
ลูกค้าของท่านได้รับผลกระทบจากเหตุการณ์น้ำท่วมหรือไม่

YES	1	CONTINUE TO Q39
NO	2	GO TO Q40
ได้รับผลกระทบ	1	ตอบต่อที่ข้อ 39
ไม่ได้รับผลกระทบ	2	ข้ามไปข้อ 40

Q39. If yes, in what ways have they been affected by Flooding? You may choose more than one answer.
ลูกค้าของท่านได้รับผลกระทบอย่างไรบ้าง (ตอบได้มากกว่า 1 ข้อ)

MULTIPLE ANSWERS

	MA
Deliveries/services have been delayed เลื่อนการขนส่งหรือการให้บริการ	1
Delivery cannot be made ไม่สามารถส่งสินค้าได้	2
Cancelled orders/bookings ยกเลิกการสั่งจองสินค้า	3
Reduced orders/purchase ลดปริมาณการสั่ง/ซื้อสินค้า	4
Customer payments have been delayed ขยายเวลาการชำระเงินของลูกค้า	5
Other (specify) อื่นๆ ระบุ_____	( )

Q40. Have you been experiencing difficulties in bringing your goods/services to the market?
ท่านเคยประสบปัญหาในการจำหน่ายสินค้า/บริการ

ประสบ	1	ตอบต่อที่ข้อ 41
ไม่ประสบ	2	ข้ามไปตอบข้อ 42

Q41. If yes, what sort of difficulties are you experiencing in bringing your goods/services to the market? You may choose more than one answer.
ปัญหาที่ท่านประสบในการจำหน่ายสินค้า/บริการมีอะไรบ้าง (ตอบได้มากกว่า 1 ข้อ)

MULTIPLE ANSWERS

	MA
Lack of transport ไม่สามารถขนส่งได้	1
Increased cost of transporting goods/services ค่าขนส่งสินค้า/บริการมีราคาสูงขึ้น	2
Lack of staff to deliver/operate ขาดพนักงานในการขนส่ง/ให้บริการ	3
Lack /insufficiency of working capital ขาดเงินทุนในการดำเนินงาน	4
Client/market closed down การปิดตัวลงของลูกค้า/ตลาด	5
Other (specify) อื่นๆ ระบุ_____	( )

Q42. Have your suppliers been affected by Flooding?
ผู้จัดหาวัตถุดิบ (Supplier) ของท่านได้รับผลกระทบจากเหตุการณ์น้ำท่วมหรือไม่

ได้รับ	1	ตอบต่อข้อ 43
ไม่ได้รับ	2	ข้ามไปตอบข้อ 44

Q43. If yes, in what ways have they been affected by Flooding? You may choose more than one answer.
ผู้จัดหาวัตถุดิบ (Supplier) ของท่านได้รับผลกระทบอย่างไร (ตอบได้มากกว่า 1 ข้อ)

MULTIPLE ANSWER

	MA
Inability to source their own raw materials and other inputs resulting to decline in their production ไม่สามารถจัดหาวัตถุดิบให้กับบริษัททำให้กำลังการผลิตลดลง	1
Higher price/cost for raw materials and other inputs วัตถุดิบมีราคาสูง	2
Difficulty in transporting/delivering supplies to our firm การขนส่งวัตถุดิบมาให้เป็นไปได้ยาก	3
Damaged facilities, structures, and equipment อุปกรณ์ ส่วนประกอบ และเครื่องมือได้รับความเสียหาย	4
Damaged stocks/inventory โกดังสินค้าได้รับความเสียหาย	5
Stopped operations/closed down การปิดตัวลงหรือหยุดดำเนินกิจการ	6
Other (specify) อื่นๆ ระบุ _____	( )

NUMBER OF EMPLOYEES

Now let's talk about the effect of Flooding to your employees. May I know the…

Q44. Total number of employees in the business you are able to keep post-flood
โปรดระบุจำนวนพนักงานทั้งหมดของท่านที่ยังสามารถปฏิบัติงานได้ภายหลังจากเหตุการณ์น้ำท่วม..... คน

44a. Total number of regular/full-time employees in the business you can continue to employ post-flood โปรดระบุจำนวนพนักงานประจำที่ยังสามารถปฏิบัติงานได้ภายหลังจากเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

44b. Total number of part-time/contractual employees in the business you can continue to employ post-flood โปรดระบุจำนวนพนักงานชั่วคราวที่ยังสามารถปฏิบัติงานได้ภายหลังจากเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

Q45. Total number of employees in the business before Flooding
โปรดระบุจำนวนพนักงานทั้งหมดของบริษัทท่านก่อนเกิดเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

45a. Total number of regular/full-time employees before Flooding
โปรดระบุจำนวนพนักงานประจำของบริษัทท่านก่อนเกิดเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

45b. Total number of part-time/contractual employees before Flooding
โปรดระบุจำนวนพนักงานชั่วคราวของบริษัทท่านก่อนเกิดเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

Q46. How many of employees have not reported for work after Flooding to attend to their disaster-related familial/home concerns?
โปรดระบุจำนวนพนักงานที่ไม่ได้แจ้งลางานเนื่องจากครอบครัวประสบเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

46a. How many of these employees are on leave?
โปรดระบุจำนวนพนักงานที่ลางาน.....คน

Input actual number ☐

46b. How many of these employees have resigned?
โปรดระบุจำนวนพนักงานที่ลาออก.....คน

Input actual number ☐

Q47. How many of your employees were injured due to Flooding?
โปรดระบุจำนวนพนักงานที่ได้รับบาดเจ็บเนื่องจากเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

47a. How many injured employees have returned to work?
โปรดระบุจำนวนพนักงานที่ได้รับบาดเจ็บและกลับมาทำงานได้.....คน

Input actual number ☐

47b. How many injured employees are still on leave or have not returned to work without an official leave?
โปรดระบุจำนวนพนักงานที่ได้รับบาดเจ็บและยังไม่สามารถกลับมาทำงานได้.....คน

Input actual number ☐

Q48. How many of your employees, if any, died during Flooding?
โปรดระบุจำนวนพนักงานที่เสียชีวิต(ถ้ามี)จากเหตุการณ์น้ำท่วม.....คน

Input actual number ☐

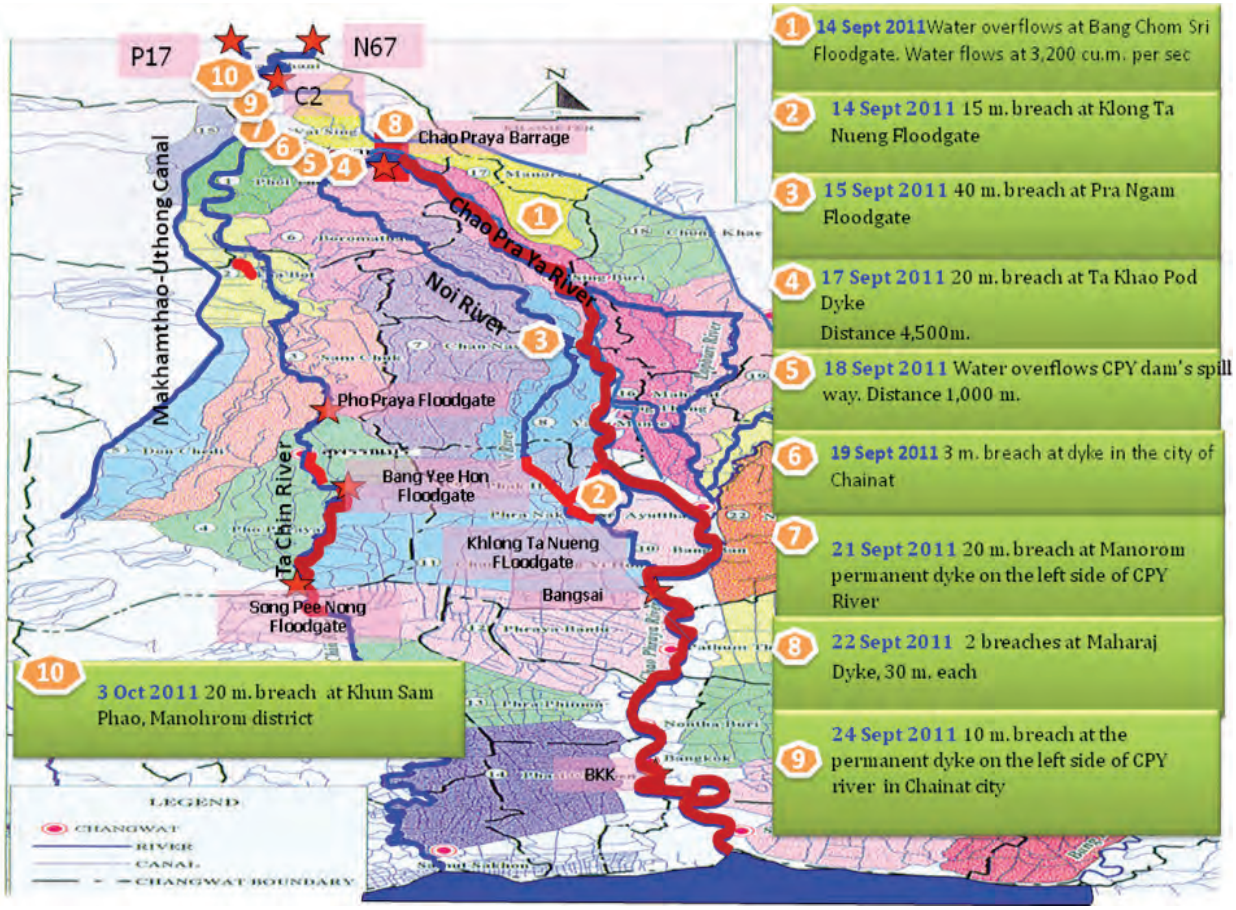
RESPONDENT'S SUGGESTIONS

Q49. What are the most important steps that the government can take to help your business to get back on its feet again? You may give up to 3 suggestions.
ท่านคิดว่ารัฐบาลควรให้ความช่วยเหลืออย่างไรเพื่อให้ธุรกิจของท่านกลับสู่สภาพเดิม (ตอบได้มากกว่า 1 ข้อ)

THANK YOU VERY MUCH!

ANNEX 5:
TIMELINE OF MAJOR DIKE BREACHES AND DAMAGES

Timeline of Major Breaches of Flood Control Infrastructure in Chao Phraya River Basin



Source: RID

ANNEX 6:
PICTURES OF FLOOD DAMAGE IN CHAI NAT PROVINCE

Chao Phraya Barrage - Khan Kra Dee Dike km.12+500

Chai Nat-Ayuthaya Canal km.4+100

Chai Nat-Ayuthaya Canal km.27+800

Chai Nat-Ayuthaya Canal km.26+610

Chao Phraya Barrage - Khan Kra Dee Dike km.12+500

Thamma Moon - Koon Samphao Dike km.2+650

Chai Nat-Ayuthaya Canal km.4+100

Thamma Moon - Koon Samphao Dike km.2+000

ANNEX 7:
ROYAL INITIATIVES ON FLOOD MANAGEMENT BY HIS MAJESTY THE KING

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Royal Initiatives on Flood Management by His Majesty the King

In 2011, Thailand has suffered the worst floods from excessive and continuous rainfalls which was caused by La Nina and trade wind of the northern and southern hemisphere together with the powerful south-west monsoon and Hai Ma and Nock-Ten tropical monsoon. These did not only make the water level in the reservoirs of Bhumibhol and Sirikit Dams reached record high, but also caused the water level in the reservoirs in the northern region, northeast region and eastern region to increase rapidly, almost reaching their maximum capacities. As a result, flash flood and overflowing from canals have been extensively affecting many provinces since July 30, 2011, damaging lives and assets of the people as well as the nation's economy.

Besides having a rehabilitation and recovery plan for those affected by the floods, flood prevention measures is very crucial and urgently required for the future. The Royal Initiatives water resource management can be adopted as nation's flood prevention and solving measures.

1. Rehabilitate Flood Prevention System

The flood prevention system in Bangkok and surrounding areas under Royal Initiatives that was developed in 1983 is currently less effective due to the erosion of some areas and the change in lands utilization. Therefore, it is very crucial to urgently rehabilitate the following structural change:

1.1 Royal Initiatives on Dikes

Under Royal Initiatives, Bangkok Metropolitan Administration (BMA), Department of Highways (DOH), Royal Irrigation Department (RID) and the State Railway of Thailand (SRT) collaboratively construct dikes, which are 2.50 meter from median sea level, to prevent flood in inner Bangkok. The dikes are 1) Eastern Belt from Sai Mai Road to Phra Ya Surain Road to Hatai Ras Road to Nimitr Mai Road to Rom Klao Road to Ging Geaw Road and end in Bang Tumrhu in Samut Prakarn; 2) Western Belt from Southern Railway to Buddha Monton 4 to Phetchsasem Road to Chong Charoen Road and end in Bangkhuntien in Bangkok; and 3) Chao Phraya River Belt from Bangkok Noi Canal to Mahasawasdi Canal. The survey of the Royal Thai Survey Department in 2010 shows that the belt has eroded affecting the efficiency in prevention floods; hence, rehabilitation is immediately required.

1.2 Water Diversion, Drainage and Canals

Water diversion system (in the eastern side of the Chao Phraya River by utilizing Northern and Southern Rangsit Project to drain water through Rangsit North-to-South canals (i.e. Klong Phra-Ongchaochaiyanuchit, Klong Lumpatiew, Klong Ladkrabang, Klong Bang Sao Thong, Klong Bang Chalong) which feed water into the pumping system on the coast of Samut Prakarn, and connect to the East-West Canals System (i.e. Hok Wa Canal, San Saeb Canal, Phra Khanong Canal, Samrong Canal) which feed water into the pumping system of the Chao Phraya River and the Bang Pakong River has been trespassed and the level of the river bed has changed dramatically from the past. This requires improvement and development of river bank, and leveling the river bed to make it deep and steep.

The same applies to the canal system in inner Bangkok (i.e. Ladprao Canal, Bangsue Canal, Bangkhen Canal, Huay Kwang Canal, Prem Prachakorn Canal and Vibhavadi-Rangsit Road Canal). These canals require immediate improvement and development.

For the western canal system of the Chao Phraya River, the current draining system through the Chao Phraya River and Tha Chin River requires development of north-south canals to promote the drainage to the sea through Thawee Watthana Canal, Ratchamontri Canal and Bang Namjued Canal.

1.3 Pumping System to the Sea

Water pumping system in eastern coast of Samutprakarn has both the old system connecting mainly to Chaiyanuchit Canal and the drainage system of Suvarnabhumi Airport connecting to Samrong Canal. It is founded that the level of the canals has decreased especially in the area northern of Bangna-Trad road causing the canals to unable to feed water to the pumping system efficiently. The pumping system can only work at less than 50 percent of its capacity. This requires improvement of the existing pumping system and increase the number of storage pool before feeding to the pumping system.

2. Expansion of the system by following the Royal Initiatives

2.1 Increase the draining capacity of the Raphiphat Canal to Klong Dan and Bangpakong River

Raphiphat canal is an important canal as it diverses water from Pasak River and Lop Buri River from joining the Chao Phraya River at Phra Nakhon Sri Ayuthaya District, Phra Nakhon Sri Ayuthaya Province by using Rama VI Dam and Phra Narai Watergate to separate water to the east side and drain to Raphiphat canal before transmitting to the drainage system of Nakhon Nayok River and Bang Pakong River as well as the Coastal Pumping System. Currently, the draining capacity is at 200 cubic meters/ second. This requires increasing the capacity to 300 – 400 cubic meters/ second. The current capacity of Southern Raphiphat canal is 150 cubic meters/ second and will require capacity increase to 250 – 300 cubic meters/ second.

2.2 Expand the outer ring road to be used as flood way

The Kanchanapisek outer ring road on the east side has side areas that could be developed into flood way for draining water to the pumping system at Klong Da, Suvarnabhumi drainage canal, and the east and west seacoast. It is recommended that the road should be expanded to be used as flood way and for commuting during normal time, or could be further developed by installing drainage pipe underground.

2.3 Rehabilitate and develop “Monkey Cheek” in Bueng Boraphet and Bueng Si Fai

The lower part of the northern region has large swamps and bogs, such as Bueng Boraphet and Bueng Si Fai which are natural “monkey cheek” for water retention. Currently, these areas have been deteriorated (for example, Bueng Boraphet is clogged with about more than 1.5 milion tons of dregs per year). These water retention areas need to be rehabilitated and connected to rivers as well as develop and conserve in a balance way.

2.4 Develop 2 in 1 waterway, that is for transmitting and draining, such as Chai Nat – Pasak canal, Phra Pimon Canal and Phraya Bunlue canal

3. Establish National Knowledge Bank for Cooperative Water Management

“The Water Management Network of Thailand” under Royal Initiatives starts operating since 1999. The network collects data and link network on water resource and Thailand climate together in order for responsible agencies to utilize the data for management decision making during normal time and for monitoring and warn-

ing during crisis. At present, the climate is fluctuating severely; thus, it is essential to establish a National Integrated Water Resource Management Center to collect data on water resource, including areas, statistics, current status, forecast and researches, for the preparation of a warning, monitoring and weather forecasting system to prevent any future disaster that could occur at any time. The center will also have high performance computerized system and network system that can provide effective information service 24 hours.

4. Water Resource Management for drought and flood prevention for communities outside the irrigation zone

At present, there are areas for agriculture at 150 million rai, out of this amount 20 percent is within irrigation zone and 80 percent is out of the irrigation zone. Hydro and Agro Informatics Institute (HAII), a public organization under Ministry of Science and Technology, together with empowered communities have development water resource management for communities outside the irrigation zone by adopting the Royal Initiatives.

There are successful cases of best practice water resource management in 7 communities in the north and northeast (Ban Lim Thong in Buriram, Ban None Kwang in Buriram, Ban None Rang in Nakhon Ratchasrima, Ban Pha Chan in Ubon Ratchathani, Ban Pa Sak in Chiang Mai, Ban Mae La-Up in Chiang Mai, and Ban Huay Pla Lhod in Tak). The best practices have been replicated in other 87 communities, resulting in increase of income in these communities and decrease of floods and drought. Therefore, it is an immediate agenda to replicate the success to other communities. It is being considered to have a measure for the local administration office to allocate 10 percent of its budget for the community management.

ANNEX 8:
OVERVIEW OF WATER RESOURCES MANAGEMENT IN THAILAND

Introduction

Average annual rainfall in the basin ranges from 1,000 to 1,400 mm. The climate is dominated by the Southwest monsoon, which occurs between May and October. About 90 percent of annual rainfall occurs during this period, causing heavy floods. The flows in the Chao Phraya and its tributaries are dependent on the monsoon rains during May to October and are highly seasonal. Variations from year to year, which are responsible for floods and droughts, are key factors in determining the availability of the basin's water resources. About 85 percent of the total runoff occurs in the months of July to December, and natural flows are small in the January to June period. Average annual runoff recorded in the upper Chao Phraya Basin varies from about 250 mm in the sub-basin of the Ping above Bhumibol reservoir to some 450 mm in the sub-basin of the Nan above Sirikit reservoir. Average annual runoff for the Chao Phraya River at Nakhon Sawan is 226 mm.

Annual Average Runoff in Chao Phraya Basin		
Sub-basin	Catchment Area (km^2)	Total Volume (M m^3)
Ping	35,535	9,073
Wang	11,084	1,624
Yom	19,516	3,684
Nan	32,854	11,936
Sakae Krang	5,020	1,096
Pasak	15,647	2,823
Tha Chin	18,105	2,449
Chao Phraya main stream	21,521	4,435
Total for Chao Phraya Basin	159,283	37,120

The Chao Phraya River drains an area of 180,000 sq km while a further 30,000 sq km is drained by the adjacent Mae Klong River. The northern part of the Chao Phraya Basin is drained by four major rivers: the Ping, Wang, Yom and Nan, which join at Nakhon Sawan about 200 km north of Bangkok to form the Chao Phraya. Water for the Northern Chao Phraya area is diverted by the Chai Nat barrage into five major natural or artificial channels: the Makamthao- Uthong Canal, and the Suphan and Noi Rivers on the west bank; and the Chai Nat-Ayuthaya and Chai Nat-Pasak Canals on the east bank. Headworks on the rivers or canals serve independent irrigation and drainage systems or "projects", of which there are eight on the west bank and five on the east bank. The main river system passes through or close to many of the major population centres of the country including the capital, Bangkok, which is situated at its downstream end.

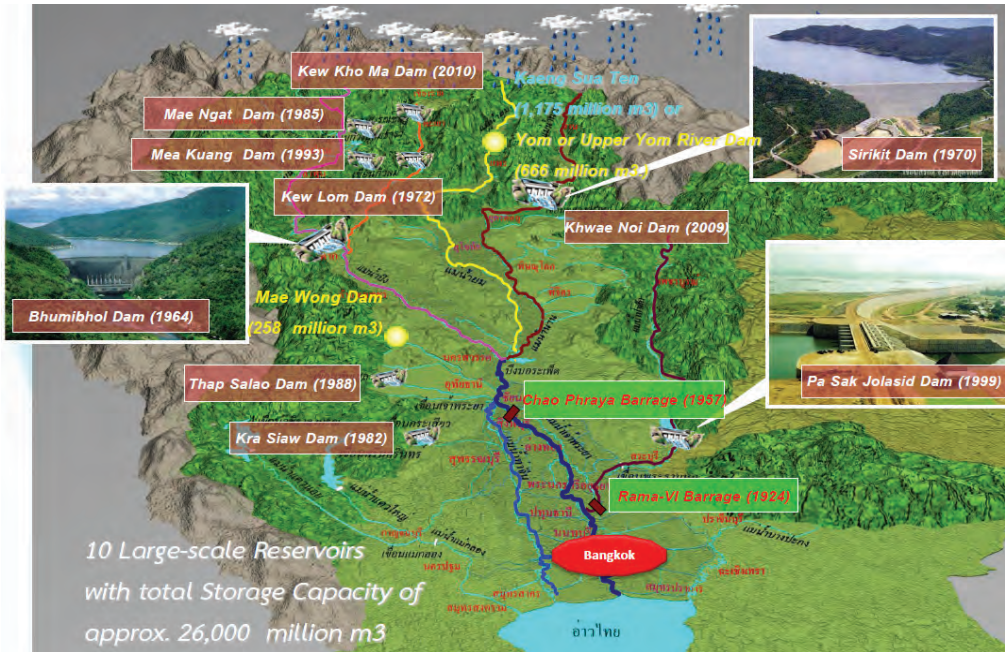
Barrages. There are a number of large barrages in the lower Chao Phraya Basin to control and divert the water in the canal systems that provide irrigation water to some 1.0 million hectares in this area. The most important barrages in the delta area are the Rama VI barrage, which was completed in 1924, and the Chao Phraya (Chai Nat) Diversion Barrage on the Chao Phraya River, which was constructed in 1957. These barrages divert water to a complex system of inter-connect canals serving the lower Chao Phraya Basin irrigation system. These large canals have the dual function of irrigation and drainage – flood control.

Surface Water Storage. The government has constructed over 3,000 dams to store the monsoon flows for release in the dry-season to exploit the Chao Phraya Basin's vast agricultural potential and to meet the growing demands of industrial and urban users. The two largest dams: the Bhumibol and Sirikit Dams supply stored water for electricity generation, irrigation, and domestic and industrial water use. Together these two dams control the runoff from 22 percent of the area of the entire basin. Bhumibol Dam on the Ping River has a live storage capacity of 9.7 billion cubic meters (bm^3), compared to the average annual inflow of 6.6 bm^3 from a drainage basin of 26,400 km^2. The installed hydroelectricity generation capacity is 713 MW. The dam was completed in 1963, and filled for the first time in 1970. Sirikit Dam on the Nan River was completed in 1972 and has a live storage capacity of 6.0 bm^3 compared to the average annual inflow of 5.9 bm^3. The installed hydroelectricity generation capacity is 500 MW. Several other large dams (Pasak, Kiew Lom, Mae Ngat, Mae Kuang, Mae Chang, Thap Salao and Kra Sieo) have also been built during the last 20 years to increase the total surface water storage in the Basin.

Characteristics of Major Reservoirs in Chao Phraya Basin

Reservoir Name	Sub-basin	Maximum Retention (MCM)	Normal Retention (MCM)	Minimum Retention (MCM)	Effective Storage (MCM)
Bhumibol	Ping	13,462	13,462	3,800	9,662
Sirikit	Nan	10,640	9,510	2,850	6,660
Pasak	Pasak	960	785	N/A	785
Mae Ngat	Ping	325	265	10	255
Mae Kuang	Ping	263	263	14	249
Mae Chang	Wang	108	N/A	N/A	N/A
Thap Salao	Sakae Krang	198	160	8	152
Kra Sieo	Tha Chin	363	240	40	201

Dam Safety. The majority of the dams in Thailand are owned by the RID and are below 1 MCM in capacity and are thus classified as small dams, unless they are over 15 meter high. The remaining medium (1-20 MCM) and large (> 20 MCM) dams present potential hazards if they fail. Large dams are also owned by the Electricity Generating Authority of Thailand (EGAT) and Department of Electric Power Development (DEPD). The Dam Safety Department of the Royal Irrigation Department are responsible for the dam safety and developing unified dam safety procedures based on international standards.



There is a concern as to the validity of current estimates for extreme floods and that generally there does not seem to be clear and unambiguous instructions for the operation of the spillway crest gates, which are a major feature of five largest dams. This is considered to be a serious issue because there will always be strong political pressures on the operators to delay opening the gates in order to avoid widespread flooding downstream and to conserve maximum water for the coming dry season. The small height difference between normal water level (NWL) and the maximum water level (MWL) at several of the dams also means that little time may be available for deliberation and reference to higher authority by the operators. At each dam there is a need for a schedule of gate setting versus water level for each month of the year and an understanding that this schedule could be overridden only at the highest level within the owner's organization. The principal recommendation would be to commission a study into the following topics at the five large dams and possibly also at other storage reservoirs with large gated spillways in Thailand:

- Flood hydrology comprising evaluation and routing of the probable maximum flood (PMF) and the flood with a return period of 10,000 years
- Development of detailed gate operation schedules
- Where applicable, advice on use of Catchment-Based Flow Forecasting Systems

The Bangkok Metropolitan Authority has invested heavily in improving its flood defenses and construction of drainage tunnels to bring conveyance capacity in the central part of Bangkok to about 155 m^3/s. The storm runoff from the city area is drains into canals through the collection system by gravity and is eventually pumped into the Chao Phraya River. There are as many as 1,655 canals which comprise a total network length of approximately 2,600 kilometers. The width of the canal ranges from a few meters to 50 meters and 54 meters for some major canals. Because of the low-lying, flat topography, many areas of Bangkok are liable to flooding. The existing drainage system is composed of U-shaped boxes and round drains, underground conduits and canals, pumping stations installed permanently or temporarily, movable pumps and gates.

Monsoon-flooding is Bangkok's most frequent hazard and is generally perceived as the city's biggest threat. Bangkok is at the core of a large metropolitan region of at

least 12 million people covering an area with a radius approximately 75 km out from the city's center. Administratively, the Bangkok Metropolitan Region (BMR) comprises the Bangkok Metropolitan Administration (BMA) and five surrounding provinces. Approximately 37 percent of Thailand's GDP is produced in Bangkok. Bangkok is exposed to multiple hazards: monsoons, typhoons, drought, and earthquake. Climate change is expected to increase the intensity and, in some cases, the frequency of most of the climate-related hazards.

Floods and Droughts

More than three hundred villages face high flood risk. In Thailand flooding results from tropical disturbances and typhoons, or a combination of the two. Many urban areas are regularly flooded. The peak flood period lasts from early June in the North to early December in the South. Prolonged heavy rains on saturated soils often create landslides and casualties. Flash floods in highland areas cause casualties and serious damages due to land or mudslides.

Department of Water Resources (DWR) data suggests that during the past 10 years, floods occurred in about 10,000 villages, of which 312 were classified as high flood risk, where floods occurred 8-10 times a year. All these villages are located in the North-Central or the Northeast. Most of these were backwater floods (overflow of rivers and streams).

Floods and droughts are increasing in frequency and cause real problems in Thailand. Heavy rainfall, limited rainwater and natural runoff, ineffective use of water in the agricultural sector and large areas of degraded forest are the main causes of floods or droughts. This also contributes to increasing water pollution. Having become a real problem in Thailand, the effects and intensity of flood/drought events have been worsening in the last few years.

Droughts also occur annually, and can cause heavy damage in agriculture. Rainfall, water runoff, and water availability are not uniformly distributed, so drought can occur in many different places within a basin, even if it has a good balance between water demand and supply. In agricultural areas, drought can cause serious damage to local production and to farmers' dwellings. Nearly one-third of the country's area is classified at medium or high risk for drought. Nearly 2,000 villages are classified as high-risk for drought. Half of them are in the northeast.

Institutional Aspects and International Experience

The disconnect between integrated water resource management (IWRM) planning (through the RBC mechanism) and budgeting process for local and sector agencies remains an issue: Although IWRM has been incorporated into the national policies to address the aforementioned issues, legislation to implement the program remains inadequate. Institutional fragmentation is one of the key bottlenecks. Ministry of Natural Resources and Environment (MNRE), Department of Water Resources (DWR), Royal Irrigation Department (RID), and the Electricity Generating Authority of Thailand (EGAT) are the key government agencies and state-owned enterprise involving in water resources. Just from the numbers of entities involved, the coordination is often mentioned as a challenge. Many of institutional developments are National Water Resources Committee (NWRC), River Basin Committees (RBCs), and Mekong River Commission (MRC). And in relation to flood and drought, many government agencies have established centers or taskforces to specifically address these issues. The key issue is not so much the will to coordinate among agencies, but the lack of

mechanism to connect the new RBC mechanism with the budgeting process. Lack of political drive and administrative mechanism for the RBCs makes this difficult.

Experience in other countries suggests that effective water legislation should clarify the entitlement and responsibilities of water users and water providers; define roles of the government in relation to other stakeholders; formalize the transfer of water; ensure the sustainable use of water resources and water values; and provide legal status of water management institutions, including government and water user groups. Basin development plans have been established for the 25 basins, but due to the lack of budget and disagreement with communities, most of the plans have not been implemented. Integrated budget planning for water resources is being applied, but the budget on water resources management has been fluctuating. Although local government budgets can be another source of support to integrated water resources management, there have not been substantial initiatives at the local level. It is important to also mention the King's projects, which pre-dates the adoption of IWRM in Thailand and whose experience offers seminal lessons. During the past 40 years, a number of royal projects have been initiated and implemented all over Thailand, with underlying principle very much applicable to IWRM initiatives.

Existing Water Laws

Thailand has many waterrelated laws (Table 1, page 48), administered by over 30 departments overseeing water issues in eight ministries (Table 2). Like water policies, the mass of water laws, codes, and instructions have all been framed for particular and usually singular purposes. There is no umbrella legislation to link these laws and codes, and consequently there is no legislative backing for any organisation to undertake integrated water resource management. In practice, this results in the relationships among all agencies being ad hoc and often erratic. While many of the agencies are involved in managing the delivery of water to water users, there is no single agency that has overall responsibility for managing water resources in an integrated and comprehensive manner. The absence of a modern, comprehensive water resources law is probably the most significant factor inhibiting good integrated water resources management in Thailand.

Draft Water Resources Law

The inadequacies indicated above in the many water related laws in Thailand have led to the drafting of a new more comprehensive and integrated Water Bill. However, the draft Water Bill does not provide a suitable basis for promoting good IWRM, nor a comprehensive approach to river basin management nor an adequate mandate for any agency to be the national water resource manager.

Despite the lack of an overarching water law, there are opportunities to move IWRM forward by building on existing institutional and human capital. In Thailand, there are extensive experiences and lessons learnt from medium - large scale development of water resources storage, infrastructure that is under the responsibility of agencies as well as from small scale structures (mostly in upper watershed areas) that are built through the cooperation of agencies, local communities, the private sector and, most importantly, from the King projects. This institutional and human capital should be treated as a valuable asset for the sector which together with the government decentralization process and water resources management could render the country benefits and minimize adverse impacts to individuals and local communities.

National Government Institutions

A plethora of government agencies are involved in water resource management and use in Thailand. As well, under the Prime Ministers' Office, there are six national boards and committees, which are responsible for policy planning and coordination of water resources at national level. The three dominant ministries and authorities in terms of water management and flood control are Agriculture and Cooperatives (MOAC), Natural Resources and Environment (MNRE), and the Electricity Generating Authority of Thailand (EGAT).

Ministry of Natural Resources and Environment (MNRE)

Ministry of Natural Resources and Environment (MNRE) is responsible for management of natural resources (including surface water, groundwater, forestry, protected area, mineral resources, and coastal resources) and the environment, including pollution control and Environmental Impact Assessment (EIA) review. With such a wide range of responsibilities, effective cooperation among key agencies within MNRE will be critical for forging effective IWRM implementation. MNRE, however, is a relatively new ministry, with more than 50,000 personnel moving there from different ministries and departments in late 2002.

MNRE has general responsibility for water quality and environmental protection, but is also involved in the investment, planning, design and construction of wastewater treatment plants. It entrusts this latter role in Bangkok and the five surrounding provinces to the Wastewater Management Authority, a state enterprise, which also oversees project implementation by the private sector. Elsewhere in the country, the Department of Public Works and Town and Country Planning within the Ministry of the Interior oversees wastewater treatment projects.

With regard to water quality and environmental protection, the key roles in setting stream water quality and effluent standards are held by the Office of Natural Resources and Environmental Policy and Planning (ONEP) and the Pollution Control Department (PCD) of MNRE. These agencies have regional offices throughout Thailand, of which several exist for the Chao Phraya Basin. While the RID regions have been set independently of provincial boundaries, those for other agencies such as MNRE follow provincial boundaries. The setting of stream water quality and effluent standards is an extremely complex task in a country such as Thailand where development pressures are causing severe resource degradation problems.

Department of Water Resources (DWR) is the lead agency under MNRE responsible for integrated water resources planning including fostering IWRM implementation. Established in 2002, DWR is a new agency, with most staff coming from the rural development department of the Ministry of Interior. DWR's mandates include setting policies, formulating plans and measures related to water resources protection, management, development, conservation, rehabilitation, regulation, monitoring and evaluation at the national and basin level. It is also responsible for setting standards for water resources and transferring technology related to water resources. DWR is the main agency responsible for fostering IWRM implementation. Progresses made by DWR on IWRM include establishment of RBCs for the 25 basins in 2004, including setting up guidelines and operating procedures, disseminating knowledge and understanding on IWRM and RBC operations, conducting pilot studies in several sub-basins and developing a strategic map on participatory river basin management (2009).

The supply assessment and regulation of groundwater lies with the Department of Groundwater Resources (DGR) under MNRE. The DGR is responsible for developing, managing and controlling groundwater resources. There has been an internal separation in this division between control responsibilities and the development and management responsibilities. Under the new decentralisation policy of the government, the development responsibility will be devolved over a six-year period to the local government administrations. Since 1977 permits have been required to extract groundwater from deep aquifers, with a price for extraction also being charged. This presently has a ceiling of THB 3.5/cubic metre, but a hefty price increase is currently under consideration. Groundwater permits may be revoked if extraction results in damage to any aquifers, the environment, public health or if it leads to land subsidence.

Ministry of Agriculture and Cooperatives (MOAC)

The MOAC has more than twenty departments or offices, of which the Royal Irrigation Department (RID) is the most important and critical in terms of water provision and management. RID is the major agency involved in water project investment planning, design and construction in Thailand. RID has a large central presence as well as seventeen regional offices throughout Thailand, with three regional offices located in the Chao Phraya Basin. It is usually described as an engineering and construction department principally involved with the provision of water and the maintenance of water delivery systems. RID also has a principal role in flood mitigation issues as its canals and water regulation devices are used for flood protection and drainage during the wet season. It develops its own plan for flood protection in the lower Chao Phraya Basin, including Bangkok and surrounds, consistent with the generic flood mitigation policies set by the ad hoc Commission for Solving Water Problems.

RID, jointly with EGAT, plays a key role in the present system of annual sharing of the available water resources, by determining total water demand requirements by all users (irrigation, major urban and industrial, salinity intrusion, navigation, etc) and relating this to overall seasonal water availability. The operational plan for water allocation in the basin is agreed to by the Joint Chao Phraya Operations Committee. The Water Control & Coordinating Branch, Office of Hydrology and Water Management undertakes close monitoring of water use and issues daily directives on water use.

When considered in total, the functions of RID are greater than simply those of an ‘irrigation department’. While its main role is as a water provider, it also performs a partial role as a water resources manager. Of course, this role of manager can only be incomplete in the absence of modern water legislation that clearly defines a water rights and allocation system for individual and cross-sectoral sharing of water. As well, there is the potential for conflict of roles where the irrigation provider and resource management functions are within the one organization with no attempt to separate accountabilities.

Electricity Generating Authority of Thailand (EGAT)

EGAT was previously a very important developer of storage dams with hydropower potential, but as the most suitable sites have been developed and new sites have become both economically and environmentally unattractive, a shift has occurred to alternative energy sources. EGAT controls the two largest dams in the headwaters of the Chao Phraya Basin. Each year, EGAT and RID allocate the available water to the various ‘users’ throughout the basin, based on water budget planning deliberations.

The prime role of EGAT in this water management cycle is one of resource assessment. It does little to influence the sharing equation, although in terms of optimal revenue generation, the timing of releases could be an issue if short-term water quality or navigation issues are in conflict with power requirements. Clearly, an important task of an apex water resources body, together with a basin organization responsible for managing water resources, is to set up clear policy guidelines and decision-making procedures to allocate water according to a defined set of priorities and needs, based on social and economic criteria.

Hydro and Agro Informatics Institute (HAII)

The Hydro and Agro Informatics Institute is a public organization under the Ministry of Science and Technology with as its main responsibilities are the development and application of science and technology to support better water resources management. HAII is equipped with a team of experienced IT professionals, and excellent scientific researchers.

National Boards and Committees

The principal organizations responsible for developing policies concerning water resource development, management and conservation are the NESDB, the NEB and the NWRC.

National Economic and Social Development Board (NESDB). The NESDB was established by the National Economic and Social Development Act, 1978. In practice, the Board's main task is to prepare the five-year National Economic and Social Development Plan. After the Cabinet approves the Plan, it becomes the national framework or policy to be followed by all government agencies and state enterprises. The strength of the Plan is in its budget allocation. A government agency wishing to receive budget allocation for its projects or activities from the government would have to comply with the Plan.

National Environment Board (NEB). The NEB was created by Section 12 of the Enhancement and Conservation of National Environmental Quality Act, 1992, as a supreme body for environmental protection. The NEB itself has no power to force other government agencies or state enterprises to comply with its environmental policies and plan, but once approved by the Cabinet, the policies and plan have binding force upon the government agencies and state enterprises.

National Water Resources Committee (NWRC). The NWRC was established by Article 6 of the Office of the Prime Minister's Regulation on National Water Resources Management, 1989. While the NWRC has the power to formulate water policies, it seems to limit itself to "development projects." Although certain provisions address the issue of conservation and water quality, they do not spell out how the NWRC would play an important role in this matter.

Regional Offices, Provincial Government and Local Bodies

At the provincial levels, the offices of Provincial Administration and District Administration (and similar agencies at local government level) have an operational role in supplying local domestic and industrial water, but really have little role in water resources planning and management so far as basin wide issues are concerned. RID regional offices perhaps contribute most to water management at the provincial and local levels. These offices work closely with water user groups and conduct training programs in irrigation system maintenance and other related issues.

Water User Organizations

In general, there are very few successful Water User Associations (WUAs) in Thailand. This stems from a number of issues. The precise status of a water user's organization is ambiguous and lacks the necessary legislation for the formation of water user's organization with proper legal status. The successful formation and functioning of WUAs depends on establishing obvious advantages to the water users as well as the water provider. The Draft Water Law encourages the creation of WUAs as Section 32 states that Basin Committees would have to accommodate, advise, and assist water users in forming WUAs for the benefit of conserving, developing and utilizing water resources. The effectiveness of basin committees depends critically on the involvement of representatives of civil society and local water users in drawing up plans for water resources management and use.

Institutional Requirements for Management of National and Basin Water Resources

International experience would suggest that the appropriate institutional arrangement for water resources management in Thailand should be based on an integrated approach that links a peak ministerial policy setting body to basin level and tributary basin level organizations and to individual users through joint irrigation or town water schemes. The functionality of these bodies should be governed by an appropriate level of community participation, based on a more aware community that has been empowered and enlightened by structured education or awareness programs.

National Water Resources Committee (NWRC)

The NWRC is an existing national committee, chaired by a Deputy Prime Minister and its membership consists of ministerial representatives. The NWRC is supported by a Secretariat Office - the ONWRC. The main function of the NWRC is and would continue to develop national goals, objectives and policies for integrated river basin management in accordance with the overall national interest. Some criticisms have suggested that the composition of the NWRC is not sufficiently senior and does not include specific water user representatives to ensure transparency and participatory management of water resources. The appropriateness of the membership of the NWRC should be reconsidered.

National Water Resources Agency/Authority (NWRA)

The establishment and development of a "national water resources management" agency (NWRA) is seen as a critical step in providing an appropriate solution to the lack of an apex water management body in Thailand. Such an agency would need to be supported and empowered by new, comprehensive water resources legislation.

Effective Policy Framework

The Chao Phraya River Basin needs an effective policy framework to guide water resource planning and management. National strategy on water resources development and basin development plans have also been established for the 25 basins by the DWR, but due to the lack of budget and disagreement with local people, most of the plans have not been implemented. It is obvious that there has been considerable thought given to policy development in respect to the water sector. The issue, however, is to put these policies into effect. The goals in the Water Resource Policy need to be translated into key water resources policies and strategies customized for the Chao Phraya Basin and then specified having in mind the particular attributes of the various sub-basins. The sustainable use of the natural resource base of the Chao Phraya Basin can only occur if these policies and strategies exist to guide the planners and

managers to remain within the acceptable stress limits of the basin. In turn, this will only occur if there is a clear institutional framework at peak levels, supported by modern, expansive water legislation.

Administrative versus Basin Boundaries

Thailand, as in most countries, has developed administrative zones that do not coincide with catchment or basin boundaries. However, where water passes freely from zone to zone, its management and use needs to be considered on this broader basis if development and human pressures are to be sustainably managed. Parts of 28 provinces are covered by the natural boundaries of the eight tributary basins (or sub-basins) in the Chao Phraya Basin. Uncoordinated activities of the provinces within a tributary basin may not only affect the sustainability of water use and natural resource health within that tributary basin, but may spill over into the basins further downstream. Adverse impacts upstream are magnified in downstream basins centered on Bangkok City and its surrounds and the rich agricultural areas of the lower plains. These areas register the brunt of uncoordinated management. International “best practice” clearly illustrates that some form of coordinated or integrated water resources management across all basins and between all provinces is essential. This coordination should be driven as a “partnership” between all the key stakeholders - at least between the line agencies and the provinces, with appropriate community/landholder input. The management of water resources is more easily undertaken when considering natural water basin boundaries, although it is acknowledged that links, cooperation and coordination with local government agencies are more difficult. The establishment of Sub-basin Coordinating Committees is essential to the effective operation of Sub-basin Management Offices.

Data and Information

Creating an integrated framework for good water resources management at the national level and at the Chao Phraya River Basin and tributary basin levels is part of the matrix of sustainable management. A critical element in this integrated framework is the availability of data and information, as well as providing the necessary skills and capability to use it. Having basic or supporting data and information is critical to assessing the “health” of the river basin, its ability to withstand development ‘stress’ and to detect emerging trends in resource behavior that could impact on achievement of national or basin goals. In turn, having the skills and knowledge to utilize and interpret the data and a system of models to manipulate the data to stimulate basin behavior under various development or policy scenarios is fundamental to proper integrated water resources management. Adequacy of data and its ready availability to the basin resource manager is a basic requirement, as is an on-going training and skill development program for all levels of involvement from basin-wide to tributary basin levels. Establishing a twinning program with an established and successful basin organization overseas would be an excellent means of utilizing the resources, skills and experience of another organization in establishing an appropriate data and information system needed for the successful establishment of a Chao Phraya River Basin organization.

Regulatory Control of Water Resources

Surface water. The utilization of surface runoff water is regulated by Section 1339 of the Civil and Commercial Code. This section recognizes a natural principle that water always flows to a lower place and that a landowner must accept the natural flow of water across the land. The provision also entitles a landowner to retain surface runoff to meet the needs of farm production and livelihood needs and the surplus water must be allowed to flow naturally. The Code also recognizes the right of the landholder to retain water in a well or pond and to prohibit access of other persons to this water source.

Irrigation water. The use and management of water in irrigation canals is tightly controlled by the Royal Irrigation Act, 1942, which is intended to govern the construction, operation and maintenance of irrigation projects undertaken by RID. Several Acts deal with the protection of waterways. These Acts generally prohibit the dumping of rubbish and other materials, toxic water and toxic chemicals into waterways and establish fines and imprisonment for offenders. Most of these Acts are now very old and the fines and punishment and the scope and nature of pollution covered are no longer in keeping with modern conditions and circumstances.

Groundwater. The Department of Groundwater Resources (DGR) regulates groundwater usage through the issue of permits for water well drilling. The DGR is responsible for reviewing water well drilling requests and issue water well permits within the Bangkok Metropolitan area. The DGR also takes the responsibility for collecting the groundwater fee payment from private sector users in accordance with the reading from water well meters attached to the permitted wells.

Since over-exploitation of groundwater became the major cause of land subsidence and deterioration of groundwater quality in the area of Bangkok, the cabinet regulated a groundwater and land subsidence preventive and mitigation measure for the area in 1983. The main aim of this measure is to set critical groundwater zones, of which three are identified according to the degree of land subsidence. Land subsidence also has a direct effect on increased flooding in local areas where there has been heavy groundwater withdrawal. The precise definition of sustainable groundwater abstraction rates and the regulatory control of sustainable groundwater abstraction levels is critical in avoiding any further land subsidence.

International Experience with Water Resources Management

Principles and Practices

In recent years the key principles and practices of good integrated water resource management have achieved international consensus. These principles are based on the - often poorly appreciated - fact that water is a finite resource, essential for life, yet vulnerable to degradation.

In developing and developed countries where good IWRM is practiced, there are four features that constitute best practice:

1. An institutional framework is developed which is both robust and flexible, and includes modern legislation and an integrated policy framework.
2. Planning and management is knowledge-driven. Strategic assessment of water and related resources receives high priority, and does not stop at mere data management, but actively pursues the generation of strategically focused information and knowledge.

3. Integration is built into institutions, resource management and policy. There is recognition of the holistic nature and sustainable of ecosystems and all policies, decisions and projects are evaluated against this background.
4. Community participation is built into all planning and management and financing processes as a normal practice of doing business in the public sector. It recognises also that the natural resources of a country belong to its people, and they have a right to participate in its management. Not only that, but community participation leads to government efficiency, ownership of policies and actions by the community, and the ready acceptance of principles of cost sharing.

Institutional Options

A modern, successful River Basin Organization (RBO) must reflect the concepts of good IWRM. The roles of regulator/standard setter, resource manager and operator at a basin level should preferably be separated in the same way as is suggested above for national water sector institutions. International experience suggests that successful RBO's are more likely to be quality "resource managers" (perhaps with only a small operating/development role), usually have a clearly defined policy role and have agreed links down to the operator. This ensures accountability and performance in accordance with an 'operating agreement'. Upward links are also needed by an RBO to ensure accountability with the government or ministers through some form of legal agreement that establishes the scope and role of the RBO. There are broadly three international "best practice" options - and numerous variations of each - for achieving a strong, stable institutional arrangement for RBOs. The preferred RBO model depends very much on local conditions and cultures, but is usually one of the following types:

River Basin Commission. The establishment of a River Basin Commission is an approach that is usually followed when significant development options are still an issue in the river basin, where conflicting uses are significant and where information and policies are either non-existent or confused because of different levels of development within the river basin. It is common to use this approach where water planning and management options need considerable work, and where the simulation models, systems and the underlying data and information are not readily available or where existing organizations are not sufficiently skilled to undertake the necessary work. Such a "Basin Commission" would comprise water planning and management experts, often drawn from existing water–related agencies. It would not interfere in river, irrigation or hydropower operations (normally left to the existing operating agencies) unless this was specifically included in its charter. It would normally not intrude in general water management functions, such as water extraction licensing or waste permits, as the resource manager would handle these if such a role had been delegated to a particular body. In those cases where, by agreement, operation functions are part of the charter, it is likely that after basin management issues have "matured or stabilized", the operation functions covering irrigation and power may be privatized or separated and the Basin Commission would then concentrate on management of the rivers and catchments.

High level coordination. All countries that are successfully undertaking 'good flood management and water resources management' have in place some form of on-going coordination at ministerial and senior official level that brings together all the water and related resources (or impacts) to ensure integrated policy and strategy development. The Netherlands, Spain and France have done it for almost a century, but more recently have concentrated on issues of climate change, financial and water

quality sustainability, assuming that sustainable management across all aspects of the resource will then follow. Australia had a water ministerial level council, supported by a 'Standing Committee' of high-level officials during its 'water development' phase, and has expanded the council to embrace all aspects of natural resource management now that it is in a management rather than a development phase.

Separating bulk water supply from resource management. Separating bulk water services from resource management responsibilities is almost a universal prerequisite for achieving efficiencies and accountability within the water sector. The UK, France, Spain, USA and Australia have very strong separation. In Thailand, much of this separation has already occurred but it is not underpinned with a strong accountability or an adequate, integrated legislative framework or comprehensive water law. In the case of surface water supply, for example, metropolitan Bangkok is supplied water by the Bangkok Metropolitan Authority (BMA), but the supply needs of the BMA is determined independently of the needs of other consumptive users. The Royal Irrigation Department (RID) fulfills an irrigation development, supply and management function, but also undertakes some roles of the 'resource manager'. However, there is no abstraction license issued to the BMA (as RID does not have the role for this) and hence the BMA does not have to be legally accountable in how it takes and uses water. It does however, work within the overall water allocation plan developed in association between RID and the Electricity Generating Authority of Thailand (EGAT).

Separating policy from resource management. Thailand has a host of policies concerning water resources, natural resources, and the environment that have been adopted at various levels of government (Prime Minister's Office, parliament, ministries and departments). Furthermore, the policy-making process is independent of the law and regulation making-process, which is separated from the process of forming annual work and budget programs by the implementing agencies. In theory, Thailand has a reasonable set of general water and related resource policies that are directed toward integrated water resources management, strategic planning, sustainable development and environmental protection. However, there is no systematic and uniform means of either establishing or implementing policies, in relation to the legal and organizational frameworks and the annual work programs and budgets of the implementing agencies. Thus in theory the mechanism for policy, law and action program development seems well entrenched, but in reality it lacks a sufficient process to correlate and co-ordinate the implementation of policy, law and action plan, as well as a clear distinction between authority, responsibility and accountability. This being is the situation in Thailand generally, and in the Chao Phraya River Basin specifically, policy should be developed and its implementation monitored by a separate unit to that which undertakes a broader resource management function. A policy unit should develop water-planning guidelines that reflect national goals and aspirations, and then the resource manager should do the planning to comply with these guidelines.

The separation of standard setting from resources management is evident in most developed countries. For example, an environmental agency can develop the water quality objectives and standards while the resource manager follows a variety of strategies to manage those standards. The most important issue in standard setting is for water quantity and quality monitoring and the issuing of water extraction licenses and pollution permits to be carried out in the one agency. In this way, a whole range of integrated strategies covering quantity and quality can be developed to attempt to meet standards. Separating the issuing of extraction licenses and pollution permits into two agencies inhibits the development of these integrated strategies. If the water quality standard setting and the pollution permitting functions are together, there will be criticism that a 'soft' standard is set by the environmental agency to allow a high level of performance in meeting the standard while issuing permits.

Separation of Roles in River Basin Organisations (RBOs)

Organisation	Standard Setter/Regulator	Resource Manager	Operator/Service Provider/ Developer
Rhine Commission	μ	44	μ
Murray Darling	μ	44	ν
Jordan V. Authority	ν	4	4
Ebro	μ	4	4
JTP Corp.	μ	4	4
Senegal	μ	4	4
Volta	ν	44	4
Niger	ν	4	μ
Lesotho	μ	4	4
TVA	μ	44	44

Legend : 44 - Major role, 4 - Significant role, ν - Minor role, μ - No role.
Rhine Commission - International Commission for Protection of the River Rhine
Murray Darling - Murray Darling Basin Commission, Australia
Jordan V. Authority - Jordan Valley Authority
Ebro - Hydrographic Confederation of the Ebro Basin, Spain
JTP Corp. - Jasa Tirta Public Corp. (Brantas River Basin, Indonesia)
Senegal - OMVS (Senegal Basin Authority)
Niger - Niger Basin Authority
Lesotho - Joint Permanent Technical Commission of the Lesotho Highland Water Project
TVA - Tennessee Valley Authority

The implication of the above analysis is that a lack of clear separation of roles and functions occurs in many RBO's, particularly between the roles of resource manager and the operator/service provider. The more mature organizations such as the Rhine, Murray Darling Basin Commission (MDBC), and Delaware River Basin Commission have a strong role in resource management and any operational function is quite minor and is 'ring-fenced' within the organization to ensure no confusion in account-abilities. However, the Tennessee Valley Authority (TVA) has a strong role in both, but is generally considered to have performed well in both areas. It very much reflects the situation when it was established in the 1930's, but this dual role is now being questioned.

The strong water resources development pressures in many of the basin organizations reviewed have demanded them to exercise a strong presence in the development/ operator field. It is presumed that this situation has arisen, due largely to the fact that existing line agencies operating within the basins have not been able to drive new development in a coordinated way. However, as most overseas basin organizations have a significant resource management role, the challenge is to make management and provider roles and processes separate and as transparent as possible to ensure that the management function is able to properly influence good decisions regarding major development proposals.

High level stakeholder/community input. The Netherland, France, Spain, Mexico, Australia, USA and the UK all recognize the need for some form of high level stakeholder forum that gives the stakeholder close access to the minister or authority responsible for water management or oversight of the management of a river basin. As well, such mechanisms provide links out into the general community that act both

ways – promoting awareness of water issues to schools, villages, etc., and in return obtaining greater input from the community on major issues.

Table 1: Classification of Legislative Enactments Relating to Water in Thailand

Water Quantity	Water Quality
Canal Maintenance Act, 1903	Canal Maintenance Act, 1903
Water Hyacinth Elimination Act, 1913	Water Hyacinth Elimination Act, 1913
Private Irrigation Act, 1942	Navigation in Thai Waters Act, 1913
Royal Irrigation Act, 1942	Royal Irrigation Act, 1942
Dikes and Ditches Act, 1962	Fishery Act, 1947
Minerals Act, 1967	Minerals Act, 1967
Metropolitan Waterworks Authority Act, 1967	Revolutionary Council Announcement No.286, 1972
Electricity Generating Authority of Thailand Act, 1968	Groundwater Act, 1977
Groundwater Act, 1977	Provincial Waterworks Authority Act, 1979
Provincial Waterworks Authority Act, 1979	Building Control Act, 1979
Waterworks Canal Maintenance Act, 1983	Factory Act, 1992
Civil and Commercial Code	Public Health Act, 1992
	City Cleanliness and Tidiness Act, 1992
	The Enhancement and Conservation of National Environmental Quality Act, 1992
	Penal Code

Table 2: Agencies Involved in Water Resources Activities

Primary functions	Ministries	Agencies	Regulations
National plan	Prime Minister's Office	NESDB	
Hydropower development and operations	Ministry of Energy (MOE)	EGAT, Department of Energy Promotion	EGAT (B.E.2511)
Irrigation development	Ministry of Agriculture and Cooperatives (MOAC)	Royal Irrigation Department (RID), Department of Land Development (DLD), Department of Agriculture (DOA), Royal Fisheries Department (RFD), and Office of Land Reform	Irrigation Canals (B.E.2483) and related regulations
Agriculture development and land use, and land reform			Land Reform (B.E.2517)
Fisheries			Fishery (B.E.2490)

Primary functions	Ministries	Agencies	Regulations
Permanent Secretary Office	Ministry of Natural Resources and Environment (MNRE)	Including 76 provincial offices on natural resources and environment and 10 environmental regions	
Natural resource policy and plan, EIA		Office of Natural Resources and Environmental Policy and Planning (ONEP)	National Environmental Quality Act (NEQA) (B.E.2535)
Surface water resources management		Department of Water Resources (DWR)	
Groundwater management		Department of Groundwater Resources (DGR)	Groundwater (B.E.2520)
Marine and coastal resources management		Department of Marine and Coastal Resources (DMCR)	
Forest management		Royal Forestry Department (RFD)	
National protected areas		Department of National Parks, Wildlife and Plant Conservation (DNP)	National Forest Reserves (B.E.2504); Wildlife (B.E.2505)
Mineral resources management		Department of Mineral Resources (DMR)	
Water management and pollution control		Pollution Control Department (PCD)	NEQA (B.E. 2535)
Public education and outreach		Department of Environmental Quality Promotion (DEQP)	NEQA (B.E.2535)
Pollution control from industries	Ministry of Industry		Industrial act (B.E.2535)
Pollution control from industrial estate			Industrial Estate Act (B.E.2522)
Public health	Ministry of Public health (MOPH)	Department of Public Health, etc	Public Health (B.E.2535)
Local administration and people wellbeing	Ministry of Interior (MOI)	BMA, Pattaya, DOLA, etc.	BMA Act, Pattaya Act, Local Government Act
Water supply		MWA, PWA, Tambon, etc.	Metropolitan Water Supply (B.E.2510); Provincial Water Supply (B.E.2522); Water Supply Canals (B.E.2526)
Disaster prevention and mitigation		Department of Disaster Prevention and Mitigation	
Meteorology	Ministry of Information and Communication Technology (MICT)	Thai Meteorological Department	
Water transport	Ministry of Transport (MOT)	Marine Department	River Traffic (B.E.2456); Pier (B.E.2494)

ANNEX 9:
WATER SUPPLY AND SANITATION SECTOR - ASSUMPTIONS FOR DAMAGE AND LOSSES CALCULATIONS

1. Damage:

a. Urban Water Supply

For urban water supply systems, damage figures provided by MWA were used for Bangkok and PWA for the remaining provinces. **No assumptions.**

b. Rural Water Supply

Data of damage and losses for four provinces were provided by the Ministry of Natural Resources and Environment (MNRE). The average damage from two of the four (Nakhon Sawan and Chai Nat) provinces were used to extrapolate average damage to systems in other provinces.

Assumption: *On average, 1 in 3 systems (0.37) in rural areas of affected provinces (except Bangkok) were assumed to have incurred some damages.*

Assumption: *On average, affected rural water supply systems were assumed to have endured damage of THB 180,649 each.*

c. Urban Sanitation

Most households in urban areas are connected to piped sewerage systems. There are 31 wastewater treatment plants in the 26 affected provinces. Out of these 31 systems, estimations of damages were provided from the Wastewater Management Authority on nine (9) systems from Nakhon Sawan, Chai Nat, Lop Buri, Singburi, Suphan Buri and Ang Thong. These estimations assumed damages at **20 percent of the replacement cost of each system.** These assumptions were corrected slightly for aerated lagoon systems, which are expected to have endured lower damages, since they are relatively low-technology.

Assumption: *Aerated lagoons in flooded areas were expected to have endured damage 10 percent of replacement cost.*

Assumption: *Other technologies (oxidation ditch, stabilization pond, sequencing batch reactors) were assumed to have endured 20 percent of replacement cost.*

Assumption: *For Bangkok wastewater treatment plants, information was received that the damages were not high at all since plants had largely escaped heavy flooding and only needed to shut down for a few days. The damage was estimated at 1 percent of replacement cost.*

d. Rural Sanitation (covered by Housing chapter, since mostly household septic tanks)

2. Losses:

a. Urban Water Supply

For urban water supply systems, losses figures provided by MWA were used for Bangkok and PWA for the remaining Provinces. **No assumptions.**

In terms of revenues for water supply utilities **(urban & rural),** an increase in water consumption was predicted, as people start cleaning their houses from mud and garbage using water. Based on field interviews, people are using the equivalent of a month's water bill within 1 or 2 days to clean up.

Assumption: *Average domestic consumption per capita in Thailand is 42 cm/ capita/ year. Average household size is 3.5 people. Additional 30 days worth of water will be consumed for cleaning. These will be additional revenues for utilities in the next 2-3 months*

b. Rural Water Supply

Data for losses for 4 provinces were provided by the Ministry of Natural Resources and Environment (MNRE). The average losses from 2 of the 4 (Nakhon Sawan and Chai Nat) provinces were used to extrapolate average losses to systems in other provinces.

Assumption: *It was estimated that damaged water supply systems will lose revenues for approximately 12 operating hours per day over 15 days (after this they will be repaired and back to normal.*

Assumption: *The cost of water in rural areas is THB 6 per cubic meter.*

c. Urban Sanitation

Most wastewater treatment systems rely on air and micro-organisms. If flooded away or damaged, these micro-organisms will have to be reproduced by pumping air into the lagoon, pond or ditch. This assumes higher electricity costs. The Pollution Control Department of MNRE provided estimates that electricity costs are usually about 40 percent of operating costs. Depending on the type of system, operating costs range between THB 1.03 per m^3 for stabilization pond, THB 1.65 per m^3 for aerated lagoon and THB 2 per m^3 for sequencing batch reactor.

Assumption: *Wastewater treatment plants will have to use more electricity for a period of 30 days*

Assumption: *Depending on the technology, the additional electricity costs were estimated at THB 0.13 or THB 0.16 per cubic meter treated. This extra cost was multiplied by the actual capacity of the plant (or design capacity, if information on actual capacity was not available) to estimate the additional losses for the period of 30 days.*

d. Rural Sanitation (covered by Housing chapter)

3. Needs:

a. Reconstruction Needs

Reconstruction needs were derived from the information provided by PWA, MWA and rural provincial water supply providers (MNRE), as well as information on damages. These reconstruction needs are a combination of needs to reach the pre-disaster status quo as well as future needs to improve disaster resilience in the sector.

Assumption: *70 percent of the costs for repairing damages do not include a resilience component (for example replacing a damaged electrical system)*

b. Recovery Needs

Recovery needs were deducted from the losses information provided by government counterparts (e.g. increased treatment of water with chemicals, cleaning of wells, and protection of facilities). However, savings in operating costs were not included. Also, losses from lower revenues were not included in recovery needs.

c. Resilience Component

As mentioned under point 3a, reconstruction needs for infrastructure as received by the government include components of resilience, such as relocating facilities to less riskier areas, building a flood barrier, or exchanging vertical turbine pumps with submersible pumps.

Further action aimed at increasing resilience includes the elaboration of local disaster resilience plans that revise the entire system and outline ways to improve the resilience.

Assumption: *30 percent of the costs of repairing infrastructure will be devoted to Building Back Better (e.g. raising the replaced electrical system above ground).*

Assumption: *A Disaster Resiliency plan at the provincial level requires capacity building activities. It was assumed that THB 15,000,000 per province is needed to produce these plans, get experts and train people. This amount was split 70:30 between the Water Supply and the Sanitation sub-sectors, reflecting the general break-down between damage and losses among the two sectors.*

ANNEX 10:
FINANCIAL AND INSURANCE SECTOR - FIELD SURVEY FORMAT

INTRODUCTION: Good morning/afternoon. We are from _____ and, on behalf of the Government of Thailand and the World Bank, we are currently conducting a survey assessing the damages and needs arising from the recent flooding that has affect our country. We would like to seek your assistance by answering the questions below to the best of your knowledge. Rest assured that all information gathered from you will be treated with the utmost confidentiality.

<table>
<tr><td>1. Date of interview:[day/month/year]</td><td colspan="3">2. Name of Financial Institution</td></tr>
<tr><td colspan="4">3. Address
Street Subdivision Province/City/Municipality</td></tr>
<tr><td colspan="4">4. Principal Classification (Commercial Bank, SFI, Life Ins Com, Non-Life Ins Com, MFI, Co-Op, Associations, others</td></tr>
<tr><td colspan="2">5. Name of Respondent</td><td colspan="2">6. Contact phone number
Landline:
Mobile Phone (If any):</td></tr>
<tr><td colspan="2">7. Position in the company

President/CEO.....1
GM/COO.....2
AVP/CFO.....3
Owner/Proprietor.....4
More Junior (to be avoided)...5</td><td colspan="2">8. Business Size

Million THB | 31 Dec 10 | 31 Nov 11
Total Asset
Loan O/S*
Deposit
% CAR
% NPL
Note
* Sum Insure Outstanding for Insurance Related Company and Total Guarantee for Credit Guarantee Corporation</td></tr>
<tr><td colspan="4">9. List of Top 5 Shareholders (and/or Group) and their % share
1..... .....%
2..... .....%
3..... .....%
4..... .....%
5..... .....%</td></tr>
</table>

10. Do you have Annual Report and Audited Financial Statement as of Dec 31, 2010?
Y / N
If yes, can we have a copy of the report?

11. Do you have Financial Statement (Audited or Un-Audited) as of June 30, 2011?
Y / N
If yes, can we have a copy of the report?

12. Your definition of MSMEs

	Primary Determining Factor		Secondary Determining Factor	
Circle one:	Assets? Loan size?	Revenues? Staff?	Assets? Loan size?	Revenues? Staff?
Micro Enterprise				
Small Enterprise				
Medium Enterprise				
Large Enterprise				

13. Please provide the following information on your loan portfolio, as of June 30, 2011:

All figs. in mill. THB	Total Outstanding	Current	NPL>1-29	NPL> 30-89	NPL> 90-180	Write-offs in previous 12 mths
(a) S-T Loans to microenterprises (<12 mths)						
(b) S-T Loans to small businesses (<12 mths)						
(c) S-T Loans to medium businesses (<12 mths)						
(d) S-T Loans to large businesses (<12 mths)						
(e) L-T Loans to microenterprises (>12 mths)						
(f) L-T Loans to small businesses (>12 mths)						
(g) L-T Loans to medium businesses (>12 mths)						
(h) L-T Loans to large businesses (>12 mths)						
(i) S-T Loans to individuals (<12 mths)						

All figs. in mill. THB	Total Outstanding	Current	NPL>1-29	NPL> 30-89	NPL> 90-180	Write-offs in previous 12 mths
(j) L-T Loans to individuals (>12 mths)						
(k) Credit Cards						
(l) Mortgages						
(m) Letters of Credit / Trade Financing						
(n) other guarantees or underwriting						
(o) Others (Please list):						
TOTAL:						

MAIN QUESTIONNAIRE

Encircle/Write answers in the grids provided. All number in Million THB, otherwise please specify in detail.

BUSINESS OPERATION

Q1. Has the business been affected by Flooding?

YES	1	
NO	2	

Q2. Had the business stopped due to Flooding?

YES	1	
NO	2	

Q3. How many Branches does your bank have in total? …….. branches
How many ATMs does your bank have in total?..... ATMs
Have any of your Branches / ATMs stopped business due to flooding?
Y / N ……If yes,

	Number (units)	For how many days	Resulting loss of revenue (in K THB)	
			Interest Income	Other
# of Branches completely closed				
# of Branches operating partially				
# of Branches moved to temporary site				
# of ATMs stopped completely				

Q4. Estimation of flooding damage to your bank (HQ & Branches & ATMs) per provinces / city (Top 5)

Province	Estimate of Damage to ..... (in THB – million)						Total Damage
	Real Estate	IT (HW/SW)	ATM/ equipment	Furniture	Cash/ Securities	Other	
1							
2							
3							
4							
5							

LOSSES DUE TO FLOODING

Q5. Losses by Location

Please list best estimate of damage and losses per province/area:

Degree of Confidence with these forecasts (100% = total certainty, 0% = total random) _____%

	Total damage to your property here	Total Portfolio O/S (Million THB)	% of Portfolio expected to be: (total of 100%)				No. of borrowers in this Province	No. of borrowers contacted re. ability to repay
			Performing	Overdue but no action needed	Overdue and need restructuring	Overdue and likely to be written off		
Bangkok								
Ang Thong								
Chacheongsao								
Chai Nat								
Kalasin								
Khon Kaen								
Kam Phaeng Phet								
Lop Buri								
Maha Sarakham								
Nakhon Nayok								
Nakhon Sawan								
Nakhon Pathom								
Nonthaburi								
Pathum Thani								
Phichit								
Phitsanulok								
Phra Nakhon Si Ayuttha								
Prachinburi								
Roi Et								
Samut Sakhon								
Saraburi								
Singburi								
Si Sa Ket								
Sukothai								

	Total damage to your property here	Total Portfolio O/S (Million THB)	% of Portfolio expected to be: (total of 100%)				No. of borrowers in this Province	No. of borrowers contacted re. ability to repay
			Performing	Overdue but no action needed	Overdue and need restructuring	Overdue and likely to be written off		
Suphan Buri								
Surin								
Tak								
Ubon Ratchathani								
Uthai Thani								
Other:								

Q6. Losses by Sector

Degree of Confidence with these forecasts (100% = total certainty, 0%= total random)

.....%

Sector	Total Portfolio O/S (Million THB)	% of Portfolio expected to be: (total of 100%)				% of borrowers who have been contacted in order to make this assessment
		Performing	Overdue but no action needed	Overdue and needing to be Restructured	Overdue, likely to be Written off	
1 Agri + Fishing + Mining						
2 Production/Processing						
3 Wholesale & Retails						
4 Services						
5 Personal Consumption						
6 Others						
7 TOTAL						

Q7. Losses by Product

Degree of Confidence with these forecasts (100% = total certainty, 0%= total random)

.....%

Products	Portfolio O/S (Million THB)	% of Portfolio expected to be: (total of 100%)				% of borrowers of this product who have been contacted in order to make this assessment
		Performing	Overdue but no action needed	Overdue, likely to need Restructuring	Overdue, likely to be written off	
(a) S-T Loans to micro-enterprises (<12 mths)						
(b) S-T Loans to small businesses (<12 mths)						
(c) S-T Loans to medium businesses (<12 mths)						

Products	Portfolio O/S (Million THB)	% of Portfolio expected to be: (total of 100%)				% of borrowers of this product who have been contacted in order to make this assessment
		Performing	Overdue but no action needed	Overdue, likely to need Restructuring	Overdue, likely to be written off	
(d) S-T Loans to large businesses (<12 mths)						
(e) L-T Loans to micro-enterprises (>12 mths)						
(f) L-T Loans to small businesses (>12 mths)						
(g) L-T Loans to medium businesses (>12 mths)						
(h) L-T Loans to large businesses (>12 mths)						
(i) S-T Loans to indivi-duals (<12 mths)						
(j) L-T Loans to indivi-duals (>12 mths)						
(k) Credit Cards						
(l) Mortgages						
(m) Letters of Credit / Trade Financing						
(n) Other guarantees or underwriting						
(o) Others (Please list)						
TOTAL:						

GOVERNMENT ASSISTANCE

Q8. What assistance is the government providing to cope with the losses?

	% of total portfolio outstanding impacted by this action:
(a) Ability to offer grace periods on repayments with-out being penalized by BOT	
(b) Ability to otherwise restructure loans without being penalized by the BOT	
(c) Being allowed to keep provisions as they were, despite increased NPLs in flooded areas	
(d) Tax rebates to your organization	
(e) Grants to your organization to compensate for losses	

(f) Subdized loans from Bank of Thailand or Gov	
(g) Faster / easier loan conditions (e.g. less collateral or documentation)	
(h) Relief directly to your customers	
(i) Special guarantee facility for loans to flood victims	
(j) Others (please specify)	

Q9. What type of Gov assistance would be most useful to you in terms of financing after this flooding?

Order in Priority (1 to 6)

(a) Ability to offer grace periods on repayments without being penalized by BOT	
(b) Ability to otherwise restructure loans without being penalized by the BOT	
(c) Being allowed to keep provisions as they were, despite increased NPLs in flooded areas	
(d) Tax rebates to your organization	
(e) Grants to your organization to compensate for losses	
(f) Subdized loans from Bank of Thailand or Government	
(g) Faster / easier loan conditions (e.g. less collateral or documentation)	
(h) Relief directly to your customers	
(i) Special guarantee facility for loans to flood victims	
(j) Others (please specify)	

Q10. How will the flooding impact the future of your business (in order of greatest relevance)?

Cease or significantly reduce lending to following sectors:	
Abandon plans to expand into the following products:	
Reduce forecasted growth (by how much?):	
Reduction on the forecasted number of customers in 2012 (by what %?):	
Reduction in the planned increase in loan/credit portfolio outstanding for 2012 (% decrease compared to initial forecast):	
Reduction in the planned net profits for 2012 (% decrease compared to initial forecast):	

RESPONDENT'S SUGGESTIONS

Q11. Any other comments, or suggestions, on what could be done to deal with this crisis?

_____

_____

THANK YOU VERY MUCH!

ANNEX 11:
HEALTH SECTOR - ASSUMPTIONS FOR DAMAGE AND LOSSES CALCULATIONS

Damage

Public sector provincial damage data came from the Ministry of Public Health, Bureau of Budget, Provincial Health Offices, District Health Offices, University hospital[1]

Private hospital damage data came from:

- Nakhon Sawan province: an estimate by private hospitals in the province
- It is assumed that most private hospitals are located in urban areas
- Other provinces: Use the average estimate for damage of private hospitals in Nakhon Sawan, and apply to other provinces, taking into consideration the number of private hospitals in the province and the percentage of urban area which have been flooded (per table below)

Private medical and dental clinics damage data came from:

- The estimated cost of damage of a private medical and dental clinics came from Pathum Thani province
- It is assumed that most private medical and dental clinics are located in urban areas
- This estimated cost is applied to other provinces, taking into consideration the number of private clinics in the province and the percentage of urban area which have been flooded (per table below)

Province	Urban Area (Ha)	Total Flood Area in Urban (%)	Damage	Flood (Ha)	Flood (%)
BANGKOK	90999.88	47.05	1 Month	32320.05	35.52
			2 Months	9478.02	10.42
			3 Months or more	1007.94	1.11
ANG THONG	10879.59	62.15	1 Month	867.79	7.98
			2 Months	5326.84	48.96
			3 Months or more	566.96	5.21
CHACHOENGSAO	29569.31	32.48	1 Month	2583.47	8.74
			2 Months	5912.30	19.99
			3 Months or more	1109.10	3.75
CHAI NAT	18818.84	20.93	1 Month	2311.37	12.28
			2 Months	938.84	4.99
			3 Months or more	688.46	3.66
KALASIN	33578.93	1.77	1 Month	582.21	1.73
			2 Months	13.30	0.04

[1] The government agencies admitted that the government data is incomplete and the number is an estimate, as floodwater has not fully receded in several provinces during the time that we requested for data.

Province	Urban Area (Ha)	Total Flood Area in Urban (%)	Damage	Flood (Ha)	Flood (%)
KAM PAENG PHET	33050.00	2.29	1 Month	650.60	1.97
			2 Months	98.33	0.3
			3 Months or more	5.76	0.02
KHON KAEN	63981.73	1.72	1 Month	1001.21	1.56
			2 Months	102.79	0.16
LOP BURI	34961.45	15.45	1 Month	1542.19	4.41
			2 Months	3251.54	9.3
			3 Months or more	608.33	1.74
MAHA SARAKHAM	31948.13	2.54	1 Month	777.40	2.43
			2 Months	35.27	0.11
NAKHON NAYOK	6955.72	27.82	1 Month	392.12	5.64
			2 Months	728.80	10.48
			3 Months or more	813.63	11.7
NAKHON PRATHOM	35433.12	37.12	1 Month	6237.36	17.6
			2 Months	6026.48	17.01
			3 Months or more	888.52	2.51
NAKHON SAWAN	50521.75	16.89	1 Month	3821.95	7.56
			2 Months	2054.15	4.07
			3 Months or more	2655.99	5.26
NONTHABURI	20291.06	67.97	1 Month	5995.06	29.55
			2 Months	7718.51	38.04
			3 Months or more	76.14	0.38
PATHUM THANI	35531.95	89.3	1 Month	4132.86	11.63
			2 Months	26017.70	73.22
			3 Months or more	1582.08	4.45
PHICHIT	26043.23	9.38	1 Month	1644.86	6.32
			2 Months	504.10	1.94
			3 Months or more	291.89	1.12
PHITSANULOK	48828.37	4.54	1 Month	1443.85	2.96
			2 Months	539.61	1.11
			3 Months or more	227.36	0.47
AYUTHAYA	32093.25	89.88	1 Month	514.00	1.6
			2 Months	23875.69	74.39
			3 Months or more	4458.64	13.89
PRACHINBURI	39058.24	13.22	1 Month	476.41	1.22
			2 Months	4291.71	10.99
			3 Months or more	395.35	1.01
ROI ET	47723.26	2.22	1 Month	835.68	1.75
			2 Months	210.63	0.44
			3 Months or more	15.65	0.03
SAMUT SAKHON	11247.27	14.23	1 Month	1564.22	13.91
			2 Months	36.23	0.32

Province	Urban Area (Ha)	Total Flood Area in Urban (%)	Damage	Flood (Ha)	Flood (%)
SARABURI	21691.68	13.48	1 Month	397.43	1.83
			2 Months	1692.26	7.8
			3 Months or more	835.86	3.85
SINGBURI	9987.84	34.23	1 Month	1720.72	17.23
			2 Months	1374.61	13.76
			3 Months or more	323.37	3.24
SI SA KET	33411.10	0.49	1 Month	120.11	0.36
			2 Months	29.70	0.09
			3 Months or more	12.38	0.04
SUKOTHAI	30379.65	5.5	1 Month	817.47	2.69
			2 Months	765.76	2.52
			3 Months or more	88.49	0.29
SUPHAN BURI	38026.76	35.17	1 Month	3501.12	9.21
			2 Months	8664.69	22.79
			3 Months or more	1203.71	3.17
SURIN	63407.56	0.2	1 Month	110.08	0.17
			2 Months	20.02	0.03
UBON RATCHATHANI	69768.52	0.23	1 Month	137.74	0.2
			2 Months	20.69	0.03
UTHAI THANI	16875.09	4.74	1 Month	489.03	2.9
			2 Months	175.46	1.04
			3 Months or more	134.16	0.8

*** Flood Data from Satellite Image (1 August - 16 November 2011)

Losses

Overtime payment to staff

- data came from reports from provincial health offices, public and private health facilities
- It is assumed that this type of losses is primarily borne by the public sector

Above-normal use of medical supplies

- data came from reports from provincial health offices, public and private health facilities
- It is assumed that this type of losses is primarily borne by the public sector

Above-normal treatment and care cost

- data came from reports from provincial health offices, public and private health facilities
- It is assumed that this type of losses is primarily borne by the public sector

Transport of patients to other hospitals/health centers

- data came from reports from provincial health offices, public and private health facilities
- It is assumed that this type of losses is primarily borne by the public sector

Temporary health facilities cost

- data came from reports from provincial health offices, public and private health facilities
- It is assumed that this type of losses is primarily borne by the public sector

Disease prevention, monitoring of morbidity increases, public awareness campaigns, control of possible outbreak costs

- data came from reports from provincial health offices, public and private health facilities
- It is assumed that this type of losses is primarily borne by the public sector

Revenue losses in hospitals/health centers

Public sector - data came from reports from provincial health offices, public and private health facilities

Private hospital

- Nakhon Sawan province: an estimate by private hospitals in the province
- It is assumed that most private hospitals are located in urban areas
- Other provinces: Use the average estimate for losses of private hospitals in Nakhon Sawan, and apply to other provinces, taking into consideration the number of private hospitals in the province and the percentage of urban area which have been flooded

Private clinic

- The estimated cost of damage of a private medical and a dental clinics came from Pathum Thani province
- It is assumed that most private medical and dental clinics are located in urban areas
- This estimated cost is applied to other provinces, taking into consideration the number of private clinics in the province and the percentage of urban area which have been flooded

Flood prevention

- data came from reports from provincial health offices, public and private health facilities

ANNEX 12:
HEALTH SECTOR - QUESTIONNAIRE FOR HEALTH ADMINISTRATIVE OFFICE

แบบสอบถามเพื่อประเมินความเสียหาย และความสูญเสีย จากอุทกภัยใน ๒๖ จังหวัดในปี ๒๕๕๔
โดย ภาควิชาเวชศาสตร์ป้องกัน คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ร่วมกับ ธนาคารโลก และ กระทรวงการคลัง

ส่วนที่ ๑ ข้อมูลพื้นฐาน

ก. ชื่อของหน่วยงาน	
ข. วันที่ตอบแบบสอบถาม:.....	วันที่ พฤศจิกายน ๒๕๕๔
ค. ชื่อผู้ให้ข้อมูล	
ง. หมายเลขโทรศัพท์ (มือถือ) ที่ติดต่อได้:	
จ. อีเมล์ที่ติดต่อได้	

ส่วนที่ ๒ ข้อมูลทั่วไปเกี่ยวกับค่าใช้จ่าย และ ความสูญเสียที่เกิดจากอุทกภัย ๒๕๕๔

คำถามที่	คำถาม	คำตอบ	ตัวเลือกคำตอบ
0	ในสถานการณ์อุทกภัยที่ผ่านมาจนถึงปัจจุบัน มีสถานบริการภายใต้สังกัดหน่วยงานของท่าน ถูกน้ำท่วม จำนวนกี่แห่ง	☐	จำนวน
1	มีบุคลากรในหน่วยงานของท่าน ได้รับบาดเจ็บ หรือเสียชีวิต จากเหตุอุทกภัยครั้งนี้ หรือไม่ [ตอบได้มากกว่าหนึ่งข้อ]	☐ ☐ ☐	มีบุคลากรเสียชีวิต.....1 มีบุคลากรได้รับบาดเจ็บ.....2 ไม่มี.....3
2	หน่วยงานของท่าน มีค่าใช้จ่ายในด้าน สิ่งก่อสร้าง ครุภัณฑ์ และวัสดุใช้สอย (ดำเนินการก่อนและระหว่างน้ำท่วม) เพื่อป้องกันสถานบริการจากอุทกภัย เป็นมูลค่าเท่าใด	☐	บาท
3	หน่วยงานของท่าน จะต้องมีค่าใช้จ่ายในด้าน สิ่งก่อสร้าง ครุภัณฑ์ และวัสดุใช้สอยเพิ่มเติม เพื่อป้องกันสถานบริการจากอุทกภัย (ดำเนินการในอนาคต) เป็นมูลค่าเท่าใด[2]	☐	บาท

[2] หากไม่ทราบมูลค่า กรุณาประมาณการค่าใช้จ่ายเบื้องต้น

4. กรุณาระบุงบรายจ่ายเพื่อจัดกิจกรรมเพิ่มเติม อันเนื่องมาจากอุทกภัย ๒๕๕๔ เพื่อให้บริการส่งเสริม ป้องกัน ควบคุมโรค

กิจกรรม/โครงการ	รายจ่าย (บาท) ก่อน/ระหว่างน้ำท่วม	งบประมาณ (บาท) สำหรับกิจกรรมหลังจากน้ำลด (ประมาณการ)	หมายเหตุ
เฝ้าระวังโรค			
กำจัดพาหะนำโรค			
อนามัยสิ่งแวดล้อม และสุขาภิบาล			
น้ำสะอาด			
อาหารสะอาด			
ส่งต่อผู้ป่วย			
ออกหน่วยแพทย์เคลื่อนที่			
ยา เวชภัณฑ์ เพิ่มเติม (ไม่รวมส่วนของสถานบริการ)			
ค่าล่วงเวลาให้กับบุคลากร			
อื่นๆ (ระบุ)			

5. ค่าใช้จ่ายในการจัดตั้งสถานพยาบาล/หน่วยบริการทางการแพทย์ชั่วคราว (ในกรณีที่มีสถานพยาบาลในสังกัดหยุดให้บริการ)

ชนิดของหน่วยบริการ	รายละเอียดบริการ และ สถานที่	งบประมาณ (บาท)

6. วัสดุและอุปกรณ์ทางการแพทย์ที่ต้องนำเข้าจากต่างประเทศ เพื่อใช้ในการซ่อมแซมและฟื้นฟู

รายการวัสดุอุปกรณ์ที่ต้องนำเข้าจากต่างประเทศ	จำนวน	งบประมาณ (บาท)

ANNEX 13:
HEALTH SECTOR - QUESTIONNAIRE FOR HEALTH FACILITIES

แบบสอบถามความเสียหาย และความสูญเสีย จากอุทกภัยใน ๒๖ จังหวัดในประเทศไทย ปี ๒๕๕๔
โดย ภาควิชาเวชศาสตร์ป้องกัน คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ร่วมกับ ธนาคารโลก และ กระทรวงการคลัง

ส่วนที่ ๑ ข้อมูลพื้นฐาน

ก. ชื่อของสถานบริการ:	
ข. ที่ตั้งของสถานบริการ:	อำเภอ/เขต จังหวัด
ค. วันที่ตอบแบบสอบถาม:	วันที่ พฤศจิกายน ๒๕๕๔
ง. ชื่อผู้ให้ข้อมูล	
จ. หมายเลขโทรศัพท์ (มือถือ) ที่ติดต่อได้:	
ฉ. อีเมล์ที่ติดต่อได้	

ส่วนที่ ๒ ข้อมูลทั่วไปเกี่ยวกับความเสียหายและความสูญเสียที่เกิดจากอุทกภัย ๒๕๕๔

คำถามที่	คำถาม	คำตอบ	ตัวเลือกคำตอบ
0	ในสถานการณ์อุทกภัยที่ผ่านมาจนถึงปัจจุบัน สถานบริการของท่าน ถูกน้ำท่วมหรือไม่ [ตอบได้มากกว่าหนึ่งข้อ]	☐ ☐ ☐ ☐ ☐ ☐	อาคารบริการผู้ป่วยถูกน้ำท่วม..... 1 อาคารสนับสนุนถูกน้ำท่วม..... 2 อาณาบริเวณภายในโรงพยาบาลถูกน้ำท่วม..... 3 อาณาบริเวณรอบโรงพยาบาลถูกน้ำท่วม..... 4 ถนนทางเข้าโรงพยาบาลมีน้ำท่วม ..... 5 ไม่โดนน้ำท่วม..... 6
1	สถานบริการของท่าน มีค่าใช้จ่ายในด้าน สิ่งก่อสร้าง ครุภัณฑ์ และวัสดุใช้สอย (ดำเนินการก่อนและระหว่างน้ำท่วม) เพื่อป้องกันสถานบริการจากอุทกภัย เป็นมูลค่าเท่าใด	☐	บาท
2	สถานบริการของท่าน จะต้องมีค่าใช้จ่ายในด้าน สิ่งก่อสร้าง ครุภัณฑ์ และวัสดุใช้สอยเพิ่มเติม เพื่อป้องกันสถานบริการจากอุทกภัย (ดำเนินการในอนาคต) เป็นมูลค่าเท่าใด[3]	☐	บาท
3	สถานบริการของท่านได้รับ**ผลกระทบ**จากอุทกภัยครั้งนี้หรือไม่	☐	ใช่.....1 ไม่ใช่.....2 ให้ข้ามไปคำถามที่ 5

[3] หากไม่ทราบมูลค่า กรุณาประมาณการค่าใช้จ่ายเบื้องต้น

คำถามที่	คำถาม	คำตอบ	ตัวเลือกคำตอบ
4	ถ้าใช่ ได้รับผลกระทบในรูปแบบใดบ้าง [ตอบได้มากกว่าหนึ่งข้อ]		สิ่งก่อสร้าง อาคาร สถานที่เสียหาย..... 1 เฟอร์นิเจอร์และ ครุภัณฑ์ทั่วไปเสียหาย ..... 2 ครุภัณฑ์และเครื่องมือทางการแพทย์เสียหาย..... 3 ยา เวชภัณฑ์ และวัสดุใช้สอยเสียหาย..... 4 ขาดแคลนบุคลากรมาปฏิบัติงาน ..... 5 ขาดแคลนหรือถูกตัดไฟฟ้า ..... 6 ขาดแคลนหรือถูกตัดน้ำประปา..... 7 ขาดแคลนยา เวชภัณฑ์ และวัสดุใช้สอย ..... 8 ผลผลิตของหน่วยงานลดลง..... 9 ต้องหยุดให้บริการ .....10 ผู้รับบริการลดลง .....11 อื่น ๆ (ระบุ) 12
5	มีบุคลากรในสถานบริการของท่าน ได้รับบาดเจ็บ หรือเสียชีวิต จากเหตุอุทกภัยครั้งนี้ หรือไม่ [ตอบได้มากกว่าหนึ่งข้อ]		มีบุคลากรเสียชีวิต..... 1 มีบุคลากรได้รับบาดเจ็บ..... 2 ไม่มี 3
	ความเสียหายจากอุทกภัย		
6	โรงพยาบาลมี **สิ่งก่อสร้าง อาคาร สถานที่** ได้รับความเสียหายจากอุทกภัยครั้งนี้หรือไม่		มี.....1 ไม่มี.....2 ให้ข้ามไปคำถามที่ 8
7	ค่าใช้จ่ายในการบูรณะ **สิ่งก่อสร้าง อาคาร สถานที่** ให้กลับสู่สภาพเดิมก่อนเกิดอุทกภัย ประมาณเท่าไร		บาท (กรุณากรอกรายละเอียดในส่วนที่ ๓ ด้วย)
8	โรงพยาบาลมี **เฟอร์นิเจอร์และ ครุภัณฑ์ทั่วไป** ได้รับความเสียหายจากอุทกภัยครั้งนี้หรือไม่		มี.....1 ไม่มี.....2 ให้ข้ามไปคำถามที่ 10
9	ค่าใช้จ่ายในการบูรณะ **เฟอร์นิเจอร์และ ครุภัณฑ์ทั่วไป** ให้กลับสู่สภาพเดิมก่อนเกิดอุทกภัย ประมาณเท่าไร		บาท (กรุณากรอกรายละเอียดในส่วนที่ ๓ ด้วย)
10	โรงพยาบาลมี **ครุภัณฑ์และเครื่องมือทางการแพทย์** ได้รับความเสียหายจากอุทกภัยครั้งนี้หรือไม่		มี.....1 ไม่มี.....2 ให้ข้ามไปคำถามที่ 12
11	ค่าใช้จ่ายในการบูรณะ **ครุภัณฑ์และเครื่องมือทางการแพทย์** ให้กลับสู่สภาพเดิมก่อนเกิดอุทกภัย รวมประมาณเท่าไร		บาท (กรุณากรอกรายละเอียดในส่วนที่ ๓ ด้วย)
12	โรงพยาบาลมี **ยา เวชภัณฑ์ และวัสดุใช้สอย**ได้รับความเสียหายจากอุทกภัยครั้งนี้หรือไม่		มี.....1 ไม่มี.....2 ให้ข้ามไปคำถามที่ 14
13	มูลค่า ยา เวชภัณฑ์ และ วัสดุสิ้นเปลือง ถ้าต้องซื้อชดเชยส่วนที่เสียหาย ให้เท่ากับระดับก่อนเกิดอุทกภัย มีค่าประมาณเท่าไร		บาท (กรุณากรอกรายละเอียดในส่วนที่ ๓ ด้วย)
	ความสูญเสียจากอุทกภัย		
14	ที่ผ่านมา สถานบริการของท่านต้องหยุดให้บริการเนื่องจากอุทกภัยครั้งนี้หรือไม่		ใช่.....1 ไม่ใช่.....2 ให้ข้ามไปคำถามที่ 16
15	จำนวนวันที่ได้หยุดให้บริการไปแล้วเนื่องจากอุทกภัยครั้งนี้		จำนวนวัน

คำถามที่	คำถาม	คำตอบ	ตัวเลือกคำตอบ
16	จำนวนวันคาดการณ์ที่อาจจะต้องหยุดให้บริการในอนาคต		จำนวนวัน
17	สถานบริการของท่าน มี**จำนวนผู้รับบริการผู้ป่วยนอก**เปลี่ยนไป เนื่องจากอุทกภัยครั้งนี้หรือไม่		เพิ่มขึ้น.....1 ลดลง.....2 ไม่เปลี่ยนแปลง.....3 ให้ข้ามไปคำถามที่ 19 ไม่ทราบ.....4 ให้ข้ามไปคำถามที่ 19
18	ถ้าเปลี่ยนแปลง จำนวนผู้รับบริการผู้ป่วยนอกเฉลี่ยต่อวันเปลี่ยนแปลง (เพิ่มขึ้น หรือ ลดลง) ไปร้อยละเท่าใด		ร้อยละ
19	สถานบริการของท่าน มี**จำนวนผู้รับบริการผู้ป่วยใน**เปลี่ยนไป เนื่องจากอุทกภัยครั้งนี้หรือไม		เพิ่มขึ้น.....1 ลดลง.....2 ไม่เปลี่ยนแปลง.....3 ให้ข้ามไปคำถามที่ 21 ไม่ทราบ.....4 ให้ข้ามไปคำถามที่ 21
20	ถ้าเปลี่ยนแปลง อัตราครองเตียงเฉลี่ยต่อวัน เปลี่ยนแปลง (เพิ่มขึ้น หรือ ลดลง) ร้อยละเท่าใด		ร้อยละ
21	ในกรณีที่จำนวนผู้รับบริการยังคงอยู่ในระดับที่ไม่เหมือนเดิม คุณคิดว่าจำนวนผู้รับบริการทั้งผู้ป่วยนอกและผู้ป่วยใน จะ**กลับเข้าสู่ระดับปกติ**ภายในระยะเวลาเท่าไร		ภายในหนึ่งสัปดาห์ ..... 1 ภายในสองสัปดาห์..... 2 ภายในหนึ่งเดือน..... 3 ภายในสามเดือน..... 4 ไม่ทราบ..... 5
22	อุทกภัยครั้งนี้ ทำให้รายได้ของสถานบริการ เปลี่ยนแปลงไปหรือไม่ เมื่อเทียบกับสถานการณ์ปกติ		เพิ่มขึ้น.....1 ลดลง.....2 ไม่เปลี่ยนแปลง.....3 ให้ข้ามไปคำถามที่ 25 ไม่ทราบ.....4 ให้ข้ามไปคำถามที่ 25
23	ถ้าเปลี่ยน รายได้เฉลี่ยต่อวันเปลี่ยนแปลง (เพิ่มขึ้น หรือ ลดลง) ร้อยละเท่าใด เมื่อเทียบจากรายได้ที่ควรจะเป็นถ้าไม่มีอุทกภัย		ร้อยละ
24	ถ้าเปลี่ยน รายได้รวมเปลี่ยนแปลง (เพิ่มขึ้น หรือ ลดลง) เท่าใดเมื่อเทียบจากรายได้ที่ควรจะเป็นถ้าไม่มีอุทกภัย		บาท (กรุณากรอกรายละเอียดในส่วนที่ ๔ ด้วย)
25	ใน**สถานบริการของรัฐ** อุทกภัยครั้งนี้ทำให้มี **ค่าใช้จ่ายที่ต้องใช้ในการจัดการรักษาผู้ป่วย (ทั้งทางกายและจิตใจ)** และส่งเสริม ป้องกัน และเฝ้าระวังโรค ที่เกี่ยวข้องกับอุทกภัย ที่เพิ่มขึ้นมากกว่าค่าใช้จ่ายในภาวะปกติหรือไม่		เพิ่มขึ้น.....1 ไม่เปลี่ยนแปลงหรือลดลง...2 ให้ข้ามไปส่วนที่ ๓ ไม่ทราบ.....3 ให้ข้ามไปส่วนที่ ๓
26	ถ้าเปลี่ยน ค่าใช้จ่ายเหล่านี้เพิ่มขึ้นเท่าใด เมื่อเทียบค่าใช้จ่ายในภาวะปกติ		บาท (กรุณากรอกรายละเอียดในส่วนที่ ๔ ด้วย)

ส่วนที่ ๓ ข้อมูลรายละเอียดเกี่ยวกับความเสียหายที่เกิดจากอุทกภัย ๒๕๕๔

กรุณาตอบเท่าที่มีข้อมูล หรือสามารถตอบได้

27. แบบฟอร์มสำรวจความเสียหายของโครงสร้างพื้นฐาน อาคาร สิ่งปลูกสร้าง เนื่องจากอุทกภัย

ลำดับที่	รายการโครงสร้างพื้นฐาน อาคาร สิ่งปลูกสร้าง	ปีที่ได้มา	มูลค่าเมื่อได้มา (บาท)	มูลค่าความเสียหายเบื้องต้น (บาท)	แนวทางการฟื้นฟู (บูรณะ/สร้างใหม่/อื่นๆ)	ประมาณการค่าใช้จ่ายเพื่อซ่อมแซม/ สร้างทดแทน (บาท)

หมายเหตุ เขียนเพิ่มเติมในกระดาษได้

28. แบบฟอร์มสำรวจ เครื่องมือแพทย์ และครุภัณฑ์ทางการแพทย์ ที่เสียหายเนื่องจากอุทกภัย

ลำดับที่	รายการโครงสร้างพื้นฐาน อาคาร สิ่งปลูกสร้าง	ปีที่ได้มา	มูลค่าเมื่อได้มา (บาท)	มูลค่าความเสียหายเบื้องต้น (บาท)	แนวทางการฟื้นฟู (บูรณะ/สร้างใหม่/อื่นๆ)	ประมาณการค่าใช้จ่ายเพื่อซ่อมแซม/ สร้างทดแทน (บาท)

หมายเหตุ เขียนเพิ่มเติมในกระดาษได้

29. แบบฟอร์มสำรวจ เฟอร์นิเจอร์และ ครุภัณฑ์ทั่วไปอื่น ๆ ที่เสียหายเนื่องจากอุทกภัย

ลำดับที่	รายการโครงสร้างพื้นฐาน อาคาร สิ่งปลูกสร้าง	ปีที่ได้มา	มูลค่าเมื่อได้มา (บาท)	มูลค่าความเสียหายเบื้องต้น (บาท)	แนวทางการฟื้นฟู (บูรณะ/สร้างใหม่/อื่นๆ)	ประมาณการค่าใช้จ่ายเพื่อซ่อมแซม/ สร้างทดแทน (บาท)

หมายเหตุ เขียนเพิ่มเติมในกระดาษได้

30. แบบฟอร์มสำรวจยา เวชภัณฑ์ และวัสดุใช้สอย ที่เสียหายเนื่องจากอุทกภัย

ลำดับที่	รายการยา เวชภัณฑ์ และวัสดุใช้สอย	มูลค่าความเสียหายเบื้องต้น (บาท)	ประมาณการค่าใช้จ่ายเพื่อซื้อทดแทน (บาท)

หมายเหตุ เขียนเพิ่มเติมในกระดาษได้

ส่วนที่ ๔ ข้อมูลรายละเอียดเกี่ยวกับความสูญเสียที่เกิดจากอุทกภัย ๒๕๕๔

กรุณาตอบเท่าที่มีข้อมูล และสามารถตอบได้

31. รายละเอียดช่วงเวลา และจำนวนวันที่หยุดให้บริการรักษาพยาบาลผู้ป่วย (ถ้ามี)

ประเภทของบริการ	ช่วงระยะเวลาที่หยุดให้บริการ (ระบุวันที่)	รวมจำนวนวันที่หยุด
ผู้ป่วยนอก		
ผู้ป่วยใน		
ผู้ป่วยฉุกเฉิน		
การผ่าตัด Elective		
อื่น ๆ (ระบุ)		

32. ประมาณการผู้รับบริการ (ราย) และ รายได้ของสถานบริการ (บาท) ที่เปลี่ยนแปลงรายเดือน ทั้งในอดีตที่ผ่านมาและ ประมาณการในอนาคต

รายการ	ปี ๒๕๕๔									ปี ๒๕๕๕		
	เม.ย.	พ.ค.	มิ.ย.	ก.ค.	ส.ค.	ก.ย.	ต.ค.	พ.ย.	ธ.ค.	ม.ค.	ก.พ.	มี.ค.
จำนวนผู้ป่วยนอก (ราย)												
ประมาณการผู้ป่วยนอกที่ลดลงเนื่องจากอุทกภัย (ราย)												
อัตราครองเตียงผู้ป่วยใน (ร้อยละ)												
ประมาณการอัตราครองเตียงที่ลดลงเนื่องจากอุทกภัย (ร้อยละ)												
รายได้ของสถานบริการ (บาท)												
ประมาณการรายได้ที่ลดลงเนื่องจากอุทกภัย (บาท)												

33. ค่าใช้จ่ายในสถานบริการของรัฐเพื่อจัดการรักษาผู้ป่วย (ทั้งทางกายและจิตใจ) ที่เพิ่มขึ้นมากกว่าค่าใช้จ่ายจากการปฏิบัติงานในภาวะปกติ

รายการ	ค่าใช้จ่ายที่เกิดขึ้นจริง (บาท)	ค่าใช้จ่ายเพิ่มเติม คาดการณ์ในอนาคต(บาท)
ค่าล่วงเวลาให้กับบุคลากร		
ค่ายาและอุปกรณ์ทางการแพทย์		
รายจ่ายอื่น ๆ เพื่อจัดการรักษาพยาบาล ผู้ป่วยทางกายและจิตใจ เพิ่มเติม (ไม่รวมค่าล่วงเวลา และค่ายาและอุปกรณ์ทางการแพทย์)		
รายจ่ายอื่น ๆ เพื่อกิจกรรมส่งเสริม ป้องกัน และเฝ้าระวังโรค ที่เกี่ยวข้องกับอุทกภัย		
ค่าใช้จ่ายในการเดินทาง เพื่อส่งต่อผู้ป่วยไปใช้บริการไปยังสถานบริการอื่น (ถ้ามี)		
ค่าใช้จ่ายในการจัดตั้ง หน่วยบริการทางการแพทย์ชั่วคราว (ในกรณีเปิดบริการทดแทนสถานพยาบาลที่ปิดให้บริการ)		
อื่น ๆ (ระบุ)		

34. วัสดุและอุปกรณ์ทางการแพทย์ที่ต้องนำเข้าจากต่างประเทศ เพื่อใช้ในการซ่อมแซมและฟื้นฟู

รายการวัสดุอุปกรณ์ที่ต้องนำเข้าจากต่างประเทศ	จำนวน	งบประมาณ (บาท)

ขอขอบคุณที่กรุณาตอบแบบสอบถามเร่งด่วนนี้

ข้อมูลที่ได้จะถูกนำไปประมวลผลเพื่อพัฒนาเป็นข้อเสนอแนะเชิงนโยบายระดับประเทศต่อไป

กรุณาส่งแบบสอบถามที่ตอบแล้ว กลับมายัง โทรสาร หมายเลข หรือ อีเมล์

ภายในวันที่

หากมีข้อสงสัย กรุณาติดต่อ

ANNEX 14:
HOUSING SECTOR - ASSUMPTIONS FOR DAMAGE, LOSSES AND NEEDS CALCULATIONS

Background of assumptions: The extent of damage was derived from a GIS analysis of satellite images of the affected regions, showing flooded areas. The maps could distinguish between built-up areas (commercial areas, residential, industry, government offices, etc.) and non built-up areas (agriculture, lakes and waterways, etc.), but did not yet identify accurately buildings from non-buildings like open space or paving, as well as the depth of water. In effect, if the percentage of inundated areas in the built-up areas is predominantly other landuses than residential (for instance industrial or warehouses), then the percentage of flooded houses may be too high when the other landuses tend to lie in lower areas. The percentage of inundated built-up areas was calculated for during 4 months, producing 3 periods: 1 month or less, 2-3 months, and more than 3 months, respectively estimated as light, medium and heavy damage, which was considered to be proportional to the depth of the water and the period when part or all parts of the house could not be watched over. In absence of a housing census, population data was used to estimate the number of households. Number of population was divided by the average number of household members to arrive at the number of households (avg. number of households taken from nationmaster.com which uses data from OECD and UN monthly bulletin of statistics, as NSO data was considered too high according to resource persons). House types: A classification of several house types was done to approximate the cost of damage, as the costs of each house would be different from the other depending on the size (including number of floors), quality and material used. A standard classification of housing types was not found, but based on examples from several agencies, an estimate of distribution of several house types was made.

The main assumptions used to extrapolate other data in the estimates are as follows:

a) *One household, one house.* The provincial population data is divided by the average households size to arrive at the number of households; with this assumption, these also become the number of houses. Actually there are about 34.5 percent of extended families according to the Socio-Economic Survey of 2009, so that the number of families might exceed the number of households. However, noting the tendency that each family acquires or builds a new house for their own though often connected to the parent house and in the same plot of land, this assumption is maintained.

b) *Distribution of housing types are more or less uniform across provinces.* Here, four main types are applied: single storey timber or bamboo construction (usually of small dimensions typical of low income families, not including the traditional high quality timber houses), single storey mixed masonry + concrete & wood construction, mixed two floors, and three floors or more concrete & masonry. Into the latter, also multistory housing in urban areas are added. The estimated percentages of each type were very similar to the data that was provided by the PPDM of Nakhon Sawan.

c) *The area of inundation in urban areas is proportional to the number of households affected by the flooding* (GISTDA analysis of satellite vs maps differentiating between built-up and open areas). This would be even more accurate if the inundation areas by satellite image could be overlaid on the landuse map.

d) *The poorest section of communities include the highest proportion of totally damaged houses* (estimate: 80 percent of all totally damaged houses) and the highest number of neighborhoods that are flood-prone.

e) *Grants are provided for all totally damaged houses (proposed,* THB 50,000 per affected household, not THB 30,000) and medium damaged houses (THB 10,000, THB 20,000 per household following the government's criteria).

f) *Apart from the THB 5,000 grants already distributed, lightly damaged houses will not get any further grants.* The remaining cost of repairs will be borne by the families themselves. Though relatively small per family, this becomes a large amount nationally because of the sheer number of affected families - about 2 million families.

g) *The government decides to expand the on-going cooperation with CODI into rehabilitation and reconstruction of housing and neighborhoods,* in particular to help the lower income households.

h) Part of the flood prone-neighborhoods are motivated to redevelop their neighborhood by improving housing structures and local infrastructure, land readjustment, or even relocation to safer sites. For neighborhood redevelopment, the following components are considered:

Issue	note
• Rebuilding houses (all totally destroyed houses and 10% of the medium damaged houses)	Reconstruction needs
• Technical assistance for the poorer families, 12% of housing construction costs	Reconstruction needs
Some other needs are not considered part of reconstruction needs (below):	
• Infrastructure for re-planned neighborhoods should be considered as part of normal situation	NOT reconstruction needs
• Land acquisition (in case of resettlement) should be considered as expenses for normal situations	NOT reconstruction needs
• Facilitation for land acquisition, neighborhood planning, infrastructure etc.	NOT reconstruction needs

i) Household goods recovery is done by each family along with their earning and savings capacity. This is here considered as part of normal situation (instead of reconstruction) although a few families have to start almost from scratch. No grants are proposed, as a sudden surge of consumption would distort the market even more. In addition, there are already various producers of electrical appliances that provide free and discounted services and spare part replacement.

The proxies from above are supported by sample field visits and secondary data on costs of transport, shelter, survival bags during evacuation (community, DDPM). Price of household goods came from community group discussions, interviews, price lists.

The results will still be rough, as the proportion of various housing types in Bangkok and other regions is still kept similar.

ANNEX 15:
HOUSING SECTOR - RECONSTRUCTION PROGRAM SUGGESTIONS

(1) Grants are only for:

1. Making the house livable again. It should be made clear that this is *not a compensation for lost or damaged assets* and not related to the value of those assets, but instead an incentive to be able to recover to normal life. Therefore luxury houses will get the same amount with modest houses.
2. Improving stability and durability of the initial structure, including change from timber to reinforced concrete. *Components, technical information, and group training provided (local government recruits facilitators with technical background).*
    - medium damage THB 20,000
    - total damage (need to rebuild from foundation up) THB 50,000. Estimated, not more than 19,000 units all over the 26 provinces.

(2) Loans. The family and community may decide to:

- Improve the design of the house: taller columns, 1 floor to 2 floors, or even from 2 to 3 floors.
- Find a better location for a group of houses in the same area/village or relocate. *In this case, assistance in planning and neighborhood design will be provided. Local government services (base-maps, landuse maps, information on spatial plans and building regulations), technical guidance and facilitation in finding alternative locations. Very soft loans through mechanisms that have been implemented by the government with CODI.*

Allocation of loans:

- On top of the repair grants. For instance a family may take a THB 10,000 repair + THB 90,000 loan = THB 100,000 total construction of new house.
- Poor families (about 10 percent of the population): max. THB 90,000 loans by CODI scheme or similar.
- Medium – higher income families: commercial loans from NHA.

Grants & Loans Management :

- Disbursed in tranches, by local bank directly to beneficiaries, conditional on facilitator approval. Example: for grants between THB 20,000-30,000, 70-30 percent. The 2nd tranche can be disbursed after construction is inspected by facilitator, indicating that the 1st tranche is at least 80 percent completed and according to specifications. For over THB 30,000, three tranches.
- Facilitation by young engineers with relevant technical background. Seek at least 30 percent of female facilitators in each region to be able to well communicate with every community group.

ANNEX 16:
EDUCATION SECTOR - ASSUMPTIONS FOR DAMAGE AND LOSSES CALCULATIONS

Damage

Damage data for schools

Provincial damage data came from the Ministry of Education (the Office of Basic Education Commission, the Office of Private Education, the Office of Non-Formal Education Commission, and the Office of Vocational Education)

Damage data for higher education institutions

- We received actual damage data from 18 universities out of 51 affected universities.
- For those institutions without data (especially in Bangkok, Nakhon Pathom, Nonthaburi, Pathum Thani, and Suphan Buri) we based our cost calculation under on damage per student. Seven categories were set based on actual figures and extrapolated for those institutions without data.

University group	Average damage per students (THB)
Comprehensive National Universities	25,000
Public Technical Universities	25,000
Public Pedagogical Universities	12,000
Private Universities (science/technology)	20,000
Private Universities (social science)	12,000
Buddhist Universities	actual figure
Community Colleges	200,000 per college

Losses

- Major losses for the education is associated with the cost of running shelters
    - We are using actual figures reported from each MOE Commissions
    - Assume that all shelters will provide support to victim on an average of 120 days.
- Cost for site cleaning is assumed at 6 percent of total physical damage for schools under basic education, private education and non-formal education. For higher education and vocational institutions, the cost is site cleaning cost and is estimated at 1 percent of total physical damage.

Needs

- Recovery measures (textbooks replacement, disaster prevention class materials development, and cleaning sites) will be implemented within six months, while reconstruction measures (renovation of buildings, replace/repair of equipments) will be implemented until the end of 2012.
- Disaster prevention class materials cost THB 5 per booklet for all students at primary and secondary levels in the country (8.9million students).

Resilience

- Dikes = 5 percent of physical damage (based on the severely damaged Nakhon Sawan Agricultural College). We apply this cost to 20 percent of all the affected universities.
- Hydro pumps = 3 percent of physical damage (based on Thammasart University data). We apply this cost to 20 percent of all affected universities.
- Construction of new schools - we assume that 10 percent will be constructed over the next 2 years. The schools should be located on higher elevations and new school building code should be applied (OBEC school building code #104 - schools on stilts has the unit cost of THB 1,717,100).

ANNEX 17:
CULTURAL HERITAGE SECTOR - ASSUMPTIONS FOR DAMAGE AND LOSSES CALCULATIONS

Damage

Damage data for heritage sites and structures

With GIS, determination of FAD assets in flood zones, assuming all sites and structures would be affected to some extent.

Assuming that with the selection of 16 different types of cases found in and around Ayuthaya, a baseline could be determined. A square meter value for restoration work at the compound level as well as one for the constructions/building was determined, allowing an extrapolation to other sites where damage evaluation was not yet conducted.

This assumption was verified by comparing data from sites where damage estimates were already provided by FAD, and on the overall this assumption holds, our numbers being on the conservative side compare to FAD. However it is not a precise way to determine the value of damages on a site by site basis and should not be use for this purpose.

For community temples, we could not extrapolate from the numbers we received. There was too much variation between them, as they were self-provided by communities and religious organizations.

Damage data for the Repository of Heritage

A square meter value for restoration work of structures and another one for the compound were determined by analyzing Chantharakasem National Museum, and extrapolated to the museums with the relevant information (building size, compound size).

Losses due to the lack of visitors

With 3 years of visitor data from the FAD and the Ministry of Natural Resources and Environment, a baseline for the number of Thai/foreign visitor per quarter was calculated.

We assumed that for the flood quarter (in our tables referred to as Q0 - the last Thai quarter from July to September) the visitors would only be 5 percent of the regular traffic of a regular quarter. We then assume that Thai visitors would be slower to return to the sites compared to foreigners, with a recovery completed by the end of the third quarter. (20%-20%, 30%-40%, 50%-70% of reference quarter visitors, respectively for Thai/foreigners, for each of the three quarters)

Losses due to the lack of participation

We made case by case assumptions, assuming festivals with a religious content would maintain a stronger participation than other festival (jazz and film festival), assuming again a recovery over a one year period. It was not possible to determine a province by province because of the nature of some festivals, who have changed locations due to the floods.

Needs and resilience

- Were calculated on the base of the tangible heritage damage and losses (since the majority of losses are structural). We assume that the total of rehabilitation needs would correspond to 120 percent of the impact of the floods.
- Training needs were calculated as 1 percent of the total impact of the floods.

ANNEX 18:
CULTURAL HERITAGE SECTOR - CASE STUDY SITES

Heritage Structures and Sites Sub-Sector – Ayuthaya Case Study Sites Location

Heritage Structures and Sites Sub-Sector – Ayuthaya Case Study Sites Description

No.	Asset name	Pre-Disaster	Post-Disaster	Year of Construction	Significance	Damage sustained
1	Vihara Pra Monkol Bopit			1538 A.D.	Grand Buddha statue more than 16 meters height, with many smaller Buddha statues inside his chest. The temple was renovated from donation from Myanmar president as a sign of reconciliation between the two former countries.	Very limited damage to the building because of its high foundation. Most of the damages are on landscaping. On going damages due to humidity might affect lime mortar on wall, stucco and other wooden decoration.
2	Wat Pra Sri San Petch			Before 1347 A.D.	Once the Grand Palace of King U-Thong. The palace was relocated further north following a fire and the old palace structure was devoted as temple.	Partial damages. Main concerns are the foundation of each structure, which remain weakened by the length of stay in water. Could collapse after water drains, possibly causing unequal subsidence. Need extensive structural strengthening of foundations.
3	Ancient Palace			1347 A.D.	New location of the old palace following the fire. On the northern side of old palace within the same compound.	Slight damages to the historic site. Most of the damages are on the signage and lighting equipment, as well on a recent tourist pavilion.

No.	Asset name	Pre-Disaster	Post-Disaster	Year of Construction	Significance	Damage sustained
4	Wat Singharam			1611-1628 A.D. or later	Lanka style temple. Three pagodas on the same foundation. Built for the King's father, mother and brother who passed away within university compound.	Besides the conflicting land uses and lack of preservation efforts from the university (East pagoda was destroy to make space for new construction) this temple got greatly damaged by the floods because it was never renovated properly. One of the pagoda totally collapsed.
5	Wat Suan Luang Khangkhao	no photo	no photo	no record	Garden in Royal Palace during the Reign of King Pra Petraja (28th King of Ayuthaya). Similar in style as Wat Singharam.	The temple was greatly damaged by the floods because it has never renovated properly.
6	Wat Chaiwattanaram			1630 A.D.	Build on the west bank of Chao Praya river, facing the south-west side of the island. A cluster of large Cambodian style pagodas keeping the remains of the royal family.	Ongoing damages and surrounded by more than 2 meters of water at reporting time. The main concern is related to hygrometric issues linked to the temple's plinth inner chambers filled with clay, which is expanding due to the absorption of water, threatening collapse of the main structure. In addition, if when drying the clay will shrink back and might cause damage to the walls.

No.	Asset name	Pre-Disaster	Post-Disaster	Year of Construction	Significance	Damage sustained
7	Pompetch			1350 A.D.	Fortress located on the junction of 3 rivers. Important stronghold protected Ayuthaya from foreign fleet for centuries.	Most of damages are on the surrounding of the structure. Needs are to build appropriate flood protection system to prevent future hazard.
8	Wat Thammikarat			1320 A.D	Large Buddha statue (now preserved in Chao Sam Praya Museum), Cambodian style Singha sculptures around the grand pagoda's foundation.	Floods caused decay in bricks and concerns about humidity that might cause damages to stucco.
9	Wat Panancheong			1324 A.D	Located off the island, at the confluence of the Chao Praya and the Pa Sak rivers. Chinese influence style. Large Buddha statue renown as a great oracle. Receives large donations from the community.	Was very well protected by an important dike of sandbags and pumping system. No damages, except a concern about underground water.

No.	Asset name	Pre-Disaster	Post-Disaster	Year of Construction	Significance	Damage sustained
10	Wat Kudi Dao			1499-1711 A.D.	Renown for its delicate craftmanship. The temple was build around the same period as Wat Maheyong on the opposite side, like brother to each other.	The temple located on Ayothaya area, outside the Ayuthaya city island. At the time of survey, one meter of water was still surrounding the plinth of the structures. The morphology of the area makes it difficult to protect from flood. FAD suggests reinforcing their structures to their capacity to endure water for few months in water season.
11	Wat Maheyong			1438 A.D.	Lanka Style Architecture. Used to be Myanmar's military camp to attack the capital city Ayuthaya. Some studies state that the temple was built by the queen of the 8th King of Ayuthaya, King Dharmmaraja and the King built Wat Kudi Dao on the opposite side	The temple located on Ayothaya area, outside the Ayuthaya city island. At the time of survey, the entire complex of temples was under very high levels of water. The morphology of the area makes it difficult to protect from flood. FAD suggests reinforcing their structures to their capacity to endure water for few months in water season.
12	Wat Mae Nang Pleum			late 21st century B.E.	Located outside the city island. This temple was occupied by Myanmar army in the last war of Ayuthaya.	Located in Klong Sa Bua Area (lotus lake), a good example of a site located outside the city wall on the flood plain yet having good protection and only sustaining slight damages from flood. Suggestion is to make water trap (sloping land) easier to drain water out.

No.	Asset name	Pre-Disaster	Post-Disaster	Year of Construction	Significance	Damage sustained
13	Pa Niad Klong Chang			no record	The fortress used to select, catch and train wild elephants. Now adays elephant riding is a major tourist activity in the city.	Many poles gone with waters, remaining ones suffer decay after extended stay under water. Replacement is difficult because of rarity of similar wood type and size.
14	Wat Pra Ram			1369 A.D.	Was built on the 1st King of Ayuthaya's crematorium by his son. Cambodian style pagoda.	High plinth kept the building off water but there is concern about unequal subsidence of the ground after it dries, possibly causing the building to crack or even collapse.
15	Wat Suwan Dararam			1350-1767 A.D.	Small late Ayuthaya style temple. Unique style mural painting recalling the story of King Naraesuan Maharaja.	Main concerns are damages due to the humidity, damaging the mural painting, with cracks, mold and efflorescence.
16	Historical Park Office Building			recent	Office building of the Historical Park Management. Holds surveillance equipment, records of assets, administrative equipment.	Lost many equipments and documents.

ANNEX 19:
CULTURAL HERITAGE SECTOR - REPOSITORY OF ASSETS

Repository of Heritage Sub-Sector – Detailed Calculations

Name of asset	Location (City, Province)	Ownership		Building Size (m^2)	Compound Size (m^2)	Number of entry per month	Ticket cost	Category of Damage *	Estimated value of damages, THB	Temporary measures	Cost of temp. measures, THB
		Public	Private								
Chantharakasem National Museum	Ayuthaya	x		4,200	25,600	6,000-14,000	20=Thai, 100=Frg	B, E	18,000,000	sand bags, plastic sheet and pump	50,000
Chao Sam Praya National Museum	Ayuthaya	x				4,000-12,000	30=Thai, 150=Frg				
Thai Boat Museum	Ayuthaya		x				Free				
Bangkok National Museum	Bangkok	x			27,200		30=Thai, 200=Frg	D (site)	21,600,000		
National Art Museum	Bangkok	x		4,130.5	7,824		30=Thai, 200=Frg	D (bldg+site)	10,200,000		
Royal Barges Museum	Bangkok	x					20=Thai, 100=Frg	D (bldg)			
Air Force Museum	Bangkok	x					Free	D (bldg+site)			
National Monument	Bangkok	x			27,200		Free	D (bldg+site)	21,200,00		400,000
Sirindhorn Anthropology Centre	Bangkok		x				Free				
House of Museums	Bangkok		x		232		30=Adult, 10=Children	D (bldg+coll)			
Thai Country Music Museum	Bangkok		x				Free	D (coll)			
Kanchanaphisek National Museum	Pathum Thani	x					Free	D (bldg+coll)	8,500,000		
The National Science Museum	Pathum Thani		x				70=Adult	D (bldg)			
Folk Museum	Pathum Thani		x					D (bldg)			
Royal Agricultural Museum	Pathum Thani		x				Free	D (site)			
Ko Kret Pottery Museum	Nonthaburi		x				Free	D (bldg)			
Samrong Temple Museum	Nakhon Pathom		x				Free				
Local Boat Museum	Lop Buri		x				Free	D (coll)			
Wat Tum Ta Ko Museum	Lop Buri		x				Free				
Wat Kok Mhor Museum	Lop Buri		x				Free				

Name of asset	Location (City, Province)	Ownership		Building Size (m^2)	Compound Size (m^2)	Number of entry per month	Ticket cost	Category of Damage *	Estimated value of damages, THB	Temporary measures	Cost of temp. measures, THB
		Public	Private								
In-Buri National Museum	Singburi	x					10=Thai, 50=Frg	D (bldg+coll)	800,000		
Prachinburi National Museum	Prachinburi	x			8,000		30=Thai, 150=Frg	E			
Chao Praya Apaipubet Museum	Prachinburi		x	2,800			Free	E			
Wat Kaew Pichitr Museum	Prachinburi		x				Free	E			
Wat Bang Kra Bao Museum	Prachinburi		x				Free	D (bldg)			
Wat Bang Tan Museum	Prachinburi		x				Free	D (bldg)			
National Museum Prapatom Chadi	Nakhon Pathom	x		3,200	12,412		20=Thai 100= Frg		190,000		
Ladkrabang National Library	Lakabang District, Bangkok Province	x		3,455	8,000	300-2,000	Free	E			
Rama9 National Archive	Pathum Thani Province	x		120,000	20,000	500-3,000	Free	C	17,500,000		
								Total Damages	**97,990,000**	**Total Structural Losses**	**50,000**

Construction type

C	Concrete/Concrete block
M	Stone work/Masonry
B	Brick
E	Earth Construction
S	Straw/Bamboo/Reed
W	Wood

ANNEX 20:
CULTURAL HERITAGE SECTOR - LOSSES DUE TO DECLINE OF VISITATION

Tangible Heritage – Detailed Calculations of Losses Due to Declines of Visitors

Ayuthaya Historical Park

3 year trends - Visitors

	Y1		Y2		Y3		Average		
	foreign	local	foreign	local	foreign	local	foreign	local	Average Total
Q1	143,905	144,733	179,076	177,515	111,223	121,752	144,735	148,000	292,735
Q2	154,031	187,348	226,988	184,454	175,706	179,731	185,575	183,844	369,419
Q3	96,060	115,868	59,368	86,469	95,685	106,550	83,704	102,962	186,667
Q4	167,903	202,042	93,697	205,705	179,750	180,665	147,117	196,137	343,254

Sukothai Historical Park

3 year trends - Visitors

	Y1		Y2		Y3		Average		
	foreign	local	foreign	local	foreign	local	foreign	local	Average Total
Q1	58,233	65,163	56,363	77,989	45,364	64,980	53,320	69,377	122,697
Q2	57,768	71,913	68,675	90,274	65,779	79,460	64,074	80,549	144,623
Q3	28,450	36,224	24,542	37,448	28,974	33,616	27,322	35,763	63,085
Q4	40,688	69,856	36,532	61,576	54,431	33,980	43,884	55,137	99,021

Chao Sam Phraya National Museum

3 year trends - Visitors

	Y1		Y2		Y3		Average		
	foreign	local	foreign	local	foreign	local	foreign	local	Average Total
Q1	1,906	27,559	1,340	45,786	1,325	23,621	1,524	32,322	33,846
Q2	2,000	26,985	1,620	47,377	1,558	36,860	1,726	37,074	38,800
Q3	640	12,188	630	13,972	892	11,933	721	12,698	13,418
Q4	1,200	52,181	954	65,018	890	23,516	1,015	46,905	47,920

Chantharakasem National Museum

3 year trends - Visitors

	Y1		Y2		Y3		Average		
	foreign	local	foreign	local	foreign	local	foreign	local	Average Total
Q1	294	3,195	279	5,519	191	5,604	255	4,773	5,027
Q2	321	7,583	286	3,187	251	7,594	286	6,121	6,407
Q3	152	2,762	117	2,334	110	4,416	126	3,171	3,297
Q4	236	5,319	164	8,167	148	4,169	183	5,885	6,068

Losses due to loss in ticket sales, in THB

Post Flood Estimate

Site	Q0		Q1		Q2		Q3		Q4	
Recovery factor	5%		20%	20%	40%	30%	70%	50%	100%	100%
	foreign	local	foreign	local	foreign	local	foreign	local	foreign	local
Ayuthaya Historical Park	7,356	9,807	28,947	29,600	74,230	55,153	58,593	51,481	147,117	196,137
Sukothai Historical Park	2,194	2,757	10,664	13,875	25,630	24,165	19,125	17,881	43,884	55,137
Chao Sam Phraya National Museum	51	2,345	305	6,464	690	11,122	504	6,349	1,015	46,905
Chantharakasem National Museum	9	294	51	955	114	1,836	88	1,585	183	5,885

Repository of Heritage Sub-Sector: Summary of Losses per province for Cultural-Related Facilites, in THB

No.	Province Name	Structural Losses	Entry Losses	Total Losses
1	Ang Thong	-	-	-
2	Bangkok Metropolis	-	-	-
3	Chachoengsao	-	-	-
4	Chai Nat	-	-	-
5	Kalasin	-	-	-
6	Khon Kaen	-	-	-
7	Lop Buri	-	-	-
8	Maha Sarakham	-	-	-
9	Nakhon Nayok	-	-	-
10	Nakhon Pathom	-	-	-
11	Nakhon Sawan	-	-	-
12	Nonthaburi	-	-	-
13	Pathum Thani	-	-	-
14	Phichit	-	-	-
15	Phitsanulok	-	-	-
16	Phra Nakhon Si Ayuthaya	0.05	0.40	0.45
17	Prachinburi	-	-	-
18	Roi Et	-	-	-
19	Samut Sakhon	-	-	-
20	Saraburi	-	-	-
21	Si Sa Ket	-	-	-
22	Sing Buri	-	-	-
23	Suphan Buri	-	-	-
24	Surin	-	-	-
25	Ubon Ratchathani	-	-	-
26	Uthai Thani	-	-	-
	TOTAL	**0.05**	**0.40**	**0.45**

All Sub-Sector: Summary of Losses per province, in THB, Million

Province Name	Heritage structures and sites		Repository of Heritage		Natural Heritage		Intan-gible Heri-tage
	Structural losses	Ticket sale losses	Structural losses	Ticket sale losses	Structural losses	Ticket sale losses	
Ang Thong	2.20	-	-	-		0	n/a
Bangkok Metropolis	57.11	-	0.40	-		0	n/a
Chachoengsao	5.53	-	-	-		0	n/a
Chai Nat	0.04	-	-	-		0	n/a
Kalasin	-	-	-	-		0	n/a
Khon Kaen	0.28	-	-	-		0.82	n/a
Lop Buri	9.48	-	-	-		0	n/a
Maha Sarakham	0.11	-	-	-		0	n/a
Nakhon Nayok	-	-	-	-		0	n/a
Nakhon Pathom	0.08	-	0.01	-		0	n/a
Nakhon Sawan	0.61	-	-	-		0	n/a
Nonthaburi	7.73	-	-	-		0	n/a
Pathum Thani	4.95	-	-	-		0	n/a
Phichit	0.50	-	-	-		0	n/a
Phitsanulok	3.48	-	-	-		8.02	n/a
Ayuthaya	359.25	109.60	0.05	3.96		0	n/a
Prachinburi	1.12	-	-	-		0.56	n/a
Roi Et	1.36	-	-	-		0	n/a
Samut Sakhon	0.20	-	-	-		0	n/a
Saraburi	0.01	-	-	-		0	n/a
Si Sa Ket	-	-	-	-		0	n/a
Singburi	16.35	-	-	-		0	n/a
Suphan Buri	25.22	-	-	-		0	n/a
Surin	3.12	-	-	-		0	n/a
Ubon Ratchathani	0.10	-	-	-		6.94	n/a
Uthai Thani	1.54	-	-	-		0	n/a
Subtotal	500.38	109.60	0.46	3.96			
Total	**609.98**			**4.42**		**16.34**	**2,445.74**

ANNEX 21: CULTURAL HERITAGE SECTOR - INTANGIBLE HERITAGE LOSSES DUE TO LACK OF PARTICIPATION

Intangible Sub-Sector: Losses for 2011 and 2012

Thai Festivals and Events	Year	The number of participants (persons)		Total revenue generated from each event (Million Baht)	2011		2012		Loss of revenue (Million Baht)*		Total loss of revenue (Million Baht)
		Thai	Foreigners		Estimated percentage of participation	Loss of revenue (Million Baht)*	Estimated percentage of participation	Loss of revenue (Million Baht)*	Thai	Foreign	
		Number Persons	Number Persons								
1. Yasothon Bun Bangfai (Rocket) Festival (Yasothon)	2006	61,024	1,831	47.3	100%	0	100%	0	0	0	0
Dec	2009	n/a	n/a	63.95							
2. Ubon Ratchathani Candle Festival & International Candle Carving Competition (Ubon Ratchathani) - July	2006	125,616	1,555	177.5	100%	0	100%	0	0	0	0
3. Thailand International Balloon Festival (Ayuthaya) - dec this year in Chiang Mai	2009	n/a	n/a	n/a	100%	0	100%	0	0	0	0
4. Chinese New Year Festival (Bangkok, Nakhon Sawan, Chiang Mai,	2005	1,875,023	189,713	982.18	100%	0	100%	0	0	0	0
Nakhon Ratchasima, SongKhla, Phuket, Chon Buri, Chiang Rai) 23 Jan 2012	2006	1,022,229	39,896	490.4							
5. Songkran Festival (Bangkok, Ayuthaya, Samut Prakarn, Chon Buri,	2006	2,756,689	263,880	1,976							
Chiang Mai, Nong Khai, Khon Kaen, Nakhon Phanom, SongKhla, Phuket	2007	2,874,022	205,010	n/a	100%	0	100%	0	0	0	0
Nakhon Si Thammarat) 13-15 April 2012	2010	822,511	126,469	1,711.5							
6. Loi Krathong Festival (Bangkok, Sukothai, Chiang Mai, Tak, Ayuthaya) 24-28 Nov 2011 - (Bangkok, Ayuthaya cancelled).	2006	711,673	50,537	416.4	60%	166.56	100%	0	155.52	11.04	166.56
7. Pattaya International Music Festival (Chon Buri) 16-18 March 2012	2006	418,936	63,774	467.5	100%	0	100%	0	0	0	0
	2007	126,825	776	n/a							
8. Bangkok International Film Festival (Bangkok)	2003	n/a	n/a	43.92							
usually end of Oct/early Nov. Postponed Jan 2012.	2004	n/a	n/a	1,827.8							
	2005	19,000	17,000	2,189							
	2006	16,195	17,279	745.4	0%	1,587.4	60%	635.0	1,256.8	965.60	2,222.4
	2007	15,657	7,202	n/a							
	2008	n/a	n/a	n/a							
	2009	n/a	n/a								
9. Thailand Countdown (Bangkok, SongKhla, Phuket, Chon Buri, Mukdahan, Ubon Ratchathani, Chiang Mai) 31 Dec 2011	2006	247,413	51,131	274.8	85%	41.22	100%	0	34.16	7.06	41.22
10. Jazz Royale Festival (Bangkok, Chon Buri, Chiang Mai, Phuket) Aug-Sept.	2006	19,856	3,101	31.2	50%	15.6	100%	0	13.49	2.11	15.6
11. Amazing Thailand Grand Sales (Bangkok, SongKhla, Phuket, Chon Buri, Chiang Mai, Nakhon Ratchasima) June-Aug 2011	2006	623,746	242,154	3,308.8	100%	0	100%	0	0	0	0
Total Losses						**1,810.78**		**635.0**	**1,459.93**	**985.81**	**2,445.74**

** The loss of revenue is calculated using the average revenue of the last 3 years (if data available) and the estimated percentage of participation*

ANNEX 22:
CULTURAL HERITAGE SECTOR - LIST OF TRADITIONAL COMMUNITIES

North Region

No. ลำดับ	Community's Name/ Province ชื่อชุมชน/ จังหวัด	Type of Community* ประเภทชุมชน*					Type of Administration ลักษณะเขตการปกครอง	Level of Conservation ระดับการดำเนินการอนุรักษ์**				
		1	2	3	4	5		0	1	2	3	4
1	Wat Kat-Ka-Ram Community, A. Muang, Chiang Mai ชุมชนวัดเกตุการาม อ.เมือง จ.เชียงใหม่				●		Chiang Mai Municipality เทศบาลนครเชียงใหม่		●	●		
2	Chiang Mai Train Station, A. Muang, Chiang Mai ย่านสถานีรถไฟเชียงใหม่ อ.เมือง จ.เชียงใหม่				●		State Railways of Thailand การรถไฟแห่งประเทศไทย	●				
3	Ton Haen Noi Village, A. San Pa Tong, Chiang Mai หมู่บ้านต้นแหนน้อย อ.สันป่าตอง จ.เชียงใหม่				●		San Pa Tong Sub-District Municipality เทศบาลตำบลสันป่าตอง		●	●		
4	Ruam Jai Road, A. Ta Phan Hin, Phichit ถนนร่วมใจ อ.ตะพานหิน จ.พิจิตร			●			Muang Ta Phan Hin Municipality เทศบาลเมืองตะพานหิน	●				
5	Bang Moon Nak Market, A. Bang Moon Nak, Phichit ตลาดบางมูลนาก อ.บางมูลนาก จ.พิจิตร					●	Bang Moon Nak Municipality เทศบาลเมืองบางมูลนาก	●				
6	Wang Krot Market, A. Muang, Phichit ตลาดวังกรด อ.เมือง จ.พิจิตร					●	Wang Krot Sub-District Municipality เทศบาลตำบลวังกรด		●			
7	Ta Lad Tai Community, A. Muang, Tak ชุมชนตลาดใต้ อ.เมือง จ.ตาก			●			Tha Lho Sub-District Municipality เทศบาลตำบลท่าพ่อ		●			
8	Trok Baan Jean, A. Muang, Tak ตรอกบ้านจีน อ.เมือง จ.ตาก				●		Muang Tak Municipality เทศบาลเมืองตาก		●	●		
9	Baan Tak Village (East sade), A. Baan Tak (East side), Tak บ้านตากฝั่งตะวันออก อ.บ้านตาก จ.ตาก				●		Baan Tak Sub-District Municipality เทศบาลตำบลบ้านตาก	●				
10	Ruam Mitr Rd., and Prasarn Mitr Rd., A. Muang, Kam Phang Phet ถนนร่วมมิตรและถนนประสานมิตร อ.เมือง จ.กำแพงเพชร			●			Kam Phang Phet Municipality เทศบาลเมืองกำแพงเพชร	●				
11	Nakorn Chum Community, A. Muang, Kam Phang Phet ชุมชนนครชุม อ.เมือง จ.กำแพงเพชร				●		Kam Phang Phet Municipality เทศบาลเมืองกำแพงเพชร	●				
12	Kard Kong Ta, A. Muang, Lampang กาดกองต้า อ.เมือง จ.ลำปาง			●			Lampang Municipality เทศบาลนครลำปาง		●	●	●	●
13	Lampang Train Station, A. Lampang, Lampang ย่านสถานีรถไฟลำปาง อ.เมือง จ. ลำปาง				●		State Railways Authority of Thailand การรถไฟแห่งประเทศไทย	●				
14	Tha Ma O, A. Muang, Lampang ท่ามะโอ อ.เมือง จ.ลำปาง				●		Lampang Municipality เทศบาลนครลำปาง		●			
15	Prasan Maitree Rd., A. Muang, Lampang ถนนประสานไมตรี อ.เมือง จ.ลำปาง			●			Lampang Municipality เทศบาลนครลำปาง		●			
16	Tern Buri Rd., A. Tern, Lampang ถนนเถินบุรี อ.เถิน จ.ลำปาง				●		Lom Rad Sub-District Municipality เทศบาลตำบลล้อมแรด	●				
17	Sri Panommard Rd., A. Lablae, Uttaradit ถนนศรีพนมมาศ อ.ลับแล จ.อุตรดิตถ์			●			Sri Panommard Sub-District Municipality เทศบาลตำบลศรีพนมมาศ		●			
18	Ta Sak Market, A. Pichai, Uttaradit ตลาดท่าสัก อ.พิชัย จ.อุตรดิตถ์					●	Ta Sak Sub-District Municipality เทศบาลตำบลท่าสัก	●				

19	Nan River Floating House, A. Muang, Phitsanulok เรือนแพแม่น้ำน่าน อ.เมือง จ.พิษณุโลก	●					Phitsanulok Municipality เทศบาลนครพิษณุโลก		●			
20	Tha Kra Bue, A. Pha Yu Ha Keree, Nakhon Sawan ท่ากระบือ อ.พยุหะคีระ จ.นครสวรรค์					●	Pha Yu Ha Sub-District Municipality เทศบาลตำบลพยุหะ	●				
21	Hua Dong Tai Market, A. Kao Leaw, Nakhon Sawan ตลาดหัวดงใต้ อ.เก้าเลี้ยว จ.นครสวรรค์					●	Kao Leaw Sub-District Municipality เทศบาลตำบลเก้าเลี้ยว	●				
22	Tub Krit Tai Market, A. Chumsaeng, Nakhorn Sawan ตลาดทับกฤชใต้ อ.ชุมแสง จ.นครสวรรค์					●	Tub Krit Sub-District Municipality เทศบาลตำบลทับกฤช	●				
23	Chumsaeng Market, A. Chumsaeng, Nakhon Sawan ตลาดชุมแสง อ.ชุมแสง จ.นครสวรรค์					●	Chumsaeng Sub-District เทศบาลตำบลชุมแสง	●				
24	Ra Nu Kul Kit Road, A. Kong Krai Raj, Sukothai ถนนรานุกูลกิจ อ.กงไกรลาส จ.สุโขทัย			●			King Krai Raj Sub-District Municipality เทศบาลตำบลกงไกรลาศ		●	●		
25	Sri Nakorn Market, A. Sri Nakorn, Sukothai ตลาดศรีนคร อ.ศรีนคร จ.สุโขทัย					●	Sri Nakorn Municipality เทศบาลเมืองศรีนคร	●				
26	Sawan Kalok Train Station, A. Muang, Sukothai ย่านสถานีรถไฟสวรรคโลก อ.เมือง จ.สุโขทัย			●			Sawan Kalok Municipality เทศบาลเมืองสวรรคโลก	●				

Central and East Regions

No. ลำดับ	Community's Name/ Province ชื่อชุมชน/ จังหวัด	Type of Community* ประเภทชุมชน*					Type of Administration ลักษณะเขตการปกครอง	Level of Conservation ระดับการดำเนินการอนุรักษ์**				
		1	2	3	4	5		0	1	2	3	4
1	Yom Jin Da Rd., A. Muang, Rayong ถนนยมจินดา อ.เมือง จ.ระยอง			●			Rayong Municipality เทศบาลนครระยอง		●	●	●	
2	Trat-Lamngob Rd., A. Lamngob, Trat ถนนตราด-แหลมงอบ อ.แหลมงอบ จ.ตราด			●			Na Chiew Sub-District Municipality เทศบาลตำบลน้ำเชี่ยว	●				
3	Thanacharoen Rd., A. Muang, Trat ถนนธนเจริญ อ.เมือง จ.ตราด			●			Trat Municipality เทศบาลเมืองตราด	●				
4	Wachiraprakarn Rd., A. Muang, Chonburi ถนนวชิรปราการ อ.เมือง จ.ชลบุรี			●			Chonburi Municipality เทศบาลเมืองชลบุรี		●			
5	Chantaboon River Community, A. Muang, Chanthaburi ชุมชนริมน้ำจันทบูร อ.เมือง จ.จันทบุรี			●			Chanthaburi Municipality เทศบาลเมืองจันทบุรี		●	●		
6	Kao Hong Market, A. Bang Pla Ma, Suphan Buri ตลาดเก้าห้อง อ.บางปลาม้า จ.สุพรรณบุรี					●	Bang Pla Ma Sub-District Municipality เทศบาลตำบลบางปลาม้า		●	●		
7	Sri Prachan Market, A. Sri Prachan, Suphan Buri ตลาดศรีประจันต์ อ.ศรีประจันต์ จ.สุพรรณบุรี					●	Sri Prachan Sub-District เทศบาลตำบลศรีประจันต์		●	●		
8	Sam Chuk Market, A. Sam Chuk, Suphan Buri ตลาดสามชุก อ.สามชุก จ.สุพรรณบุรี					●	Sam Chuk Sub-District เทศบาลตำบลสามชุก		●	●	●	●
9	Baan Bang Mae Mai, A. Bang Mae Mai, Suphan Buri บ้านบางแม่หม้าย อ.บางแม่หม้าย จ.สุพรรณบุรี				●		Bang Yai Tambon Administration Office อบต. บางใหญ่		●			
10	Baan Sud Market, A. Bang Pla Ma, Suphan Buri ตลาดบ้านสุด อ.บางปลาม้า จ.สุพรรณบุรี					●	Pai Kong Din Sub-District Municipality เทศบาลตำบลไผ่กองดิน		●	●		
11	Pho Praya Market, A. Muang, Suphan Buri ตลาดโพธิ์พระยา อ.เมือง จ.สุพรรณบุรี					●	Pho Praya Sub-District Municipality เทศบาลตำบลโพธิ์พระยา		●			
12	Panich Rd., A. Muang, Chachoengsao ถนนพานิช อ.เมือง จ.ฉะเชิงเทรา			●			Chachoengsao Municipality เทศบาลเมืองฉะเชิงเทรา		●			
13	Baan Mai Market, A. Muang, Chachoengsao ตลาดบ้านใหม่ อ.เมือง จ.ฉะเชิงเทรา		●				Chachoengsao Municipality เทศบาลเมืองฉะเชิงเทรา		●	●	●	●

14	Klong Suan Market, A. Baan Pho, Chachoengsao and A. Bang Bo, Samut Prakan ตลาดคลองสวน อ.บ้านโพธิ์ จ.ฉะเชิงเทรา และ อ.บางบ่อ จ.สมุทรปราการ		●				Klong Suan Sub-District Municipality เทศบาลตำบลคลองสวน		●	●	●	●
15	Tha Na Market, A. Nakhonchaisri, Nakhon Pathom ตลาดท่านา อ.นครชัยศรี จ.นครปฐม					●	Nakhonchaisri Sub-District Municipality เทศบาลตำบลนครชัยศรี		●	●		
16	Bang Luang Market, A. Bang Lane, Nakhon Pathom ตลาดบางหลวง อ.บางเลน จ.นครปฐม					●	Bang Luang Sub-District Municipality เทศบาลตำบลบางหลวง		●	●		
17	Ton Son Market, A. Nakhonchaisri, Nakhon Pathom ตลาดต้นสน อ.นครชัยศรี จ.นครปฐม		●				Nakhonchaisri Sub-District Municipality เทศบาลตำบลนครชัยศรี	●				
18	Bang Plee Market, A. Bang Plee, Samut Prakan ตลาดบางพลี อ.บางพลี จ.สมุทรปราการ		●				Bang Plee Sub-District Municipality เทศบาลตำบลบางพลี		●			
19	Baan Paew Market, A. Baan Paew, Samut Sakhon ตลาดบ้านแพ้ว อ.บ้านแพ้ว จ.สมุทรสาคร		●				Baan Paew Sub-District Municipality เทศบาลตำบลบ้านแพ้ว	●				
20	Bang Noi Nok, A. Bangkontee, Samut Songkhram บางน้อยนอก อ.บางคนที จ.สมุทรสงคราม		●				Kra Dang Nga Sub-District Municipality เทศบาลตำบลกระดังงา		●			
21	Ampawa Market, A. Amphawa, Samut Songkhram ตลาดอัมพวา อ.อัมพวา จ.สมุทรสงคราม		●				Amphawa Sub-District Municipality เทศบาลตำบลอัมพวา		●	●	●	●
22	Pak Praek Road, A. Muang, Kanchanaburi ถนนปากแพรก อ.เมือง จ.กาญจนบุรี			●			Kanchanaburi Municipality เทศบาลเมืองกาญจนบุรี		●	●		
23	Lad Cha Do Market, A. Pak Hai, Pra Nakorn Sri Ayuthaya ตลาดลาดชะโด อ.ผักไห่ จ.พระนครศรีอยุธยา		●				Lad Cha Do Sub-District Municipality เทศบาลตำบลลาดชะโด		●	●		
24	Klong Ra Haeng, A. Lard Lum Kaew, Pathum Thani คลองระแหง อ.ลาดหลุมแก้ว จ.ปทุมธานี		●				Klong Pra Udom Sub-District Municipality เทศบาลตำบลคลองพระอุดม		●	●		
25	Klong Om Non, A. Muang, Nonthaburi คลองอ้อมนนท์ อ.เมือง จ.นนทบุรี		●				Pakkred Municipality เทศบาลนครปากเกร็ด		●	●	●	
26	Sakaekrung River Rafting Community, A. Muang, Uthai Thani เรือนแพแม่น้ำสะแกกรัง อ.เมือง จ.อุทัยธานี	●					Uthai Thani Municipality เทศบาลเมืองอุทัยธานี		●	●	●	
27	Municipal Fresh Market 2, A. Muang, Uthai Thani ตลาดสดเทศบาล อ.เมือง จ.อุทัยธานี					●	Uthai Thani Municipality เทศบาลเมืองอุทัยธานี		●	●	●	
28	Photharam Market, A. Photharam, Ratchaburi ตลาดโพธาราม อ.โพธาราม จ.ราชบุรี					●	Photharam Municipality เทศบาลเมืองโพธาราม		●	●		
29	Chetsamien Market, A. Photharam, Ratchaburi ตลาดเจ็ดเสมียน อ.โพธาราม จ.ราชบุรี					●	Chetsamien Sub-District Municipality เทศบาลตำบลเจ็ดเสมียน	●				
30	Pra Ram Road, A. Muang, Lop Buri ถนนพระราม อ.เมือง จ.ลพบุรี			●			Muang Lop Buri Municipality เทศบาลเมืองลพบุรี		●			
31	Wat Sing Market, A. Wat Sing, Chai Nat ตลาดวัดสิงห์ อ.วัดสิงห์ จ.ชัยนาท					●	Wat Sing Sub-District Municipality เทศบาลตำบลวัดสิงห์	●				
32	Kum Market, A. Kabinburi, Prachinburi ตลาดกุม อ.กบินทร์บุรี จ.ปราจีนบุรี					●	Muang Kao Sub-District Municipality เทศบาลตำบลเมืองเก่า	●				

North-east Region

No. ลำดับ	Community's Name/ Province ชื่อชุมชน/ จังหวัด	Type of Community* ประเภทชุมชน*					Type of Administration ลักษณะเขตการปกครอง	Level of Conservation ระดับการดำเนินการอนุรักษ์**				
		1	2	3	4	5		0	1	2	3	4
1	Ubonratchathani Train Station, A. Warincham-rab, Ubon Ratchathani ย่านสถานีรถไฟอุบลราชธานี อ.วารินชำราบ จ.อุบลราชธานี				●		State Railways Authority of Thailand การรถไฟแห่งประเทศไทย	●				
2	Luang Road, A. Muang, Ubon Ratchathani ถนนหลวง อ.เมือง จ.อุบลราชธานี			●			Ubon Ratchathani Municipality เทศบาลนครอุบลราชธานี		●			
3	Luang Road, A. Pibunmangsaharn, Ubon Ratchathani ถนนหลวง อ.พิบูลมังสาหาร จ.อุบลราชธานี			●			Muang Pibunmangsaharn Municipality เทศบาลเมืองพิบูลมังสาหาร	●				
4	Visetsri Road, A. Kemaraj, Ubon Ratchathani ถนนวิศิษฐ์ศรี อ.เขมราฐ จ.อุบลราชธานี			●			Kemaraj Sub-District Municipality เทศบาลตำบลเขมราฐ	●				
5	5th Municipal Road and 17th Municiapl Road, A. Pak Chong, Nakhon Ratchasima ถนนเทศบาล 5 และ 17 อ.ปากช่อง จ.นครราชสีมา			●			Muang Pak Chong Municipality เทศบาลเมืองปากช่อง	●				
6	Pak Thong Chai Market, A. Pak Thong Chai, Nakhon Ratchasima ตลาดปักธงชัย อ.ปักธงชัย จ.นครราชสีมา					●	Pak Thong Chai Sub-District Municipality เทศบาลตำบลปักธงชัย	●				
7	Chok Chai Market, A. Chok Chai, Nakhon Ratchasima ตลาดโชคชัย อ.โชคชัย จ.นครราชสีมา					●	Chok Chai Sub-District Municipality เทศบาลตำบลโชคชัย	●				
8	5th Municiapal Road, A. Muang, Nakhon Ratchasima ถนนเทศบาล 5 อ.เมือง จ.นครราชสีมา			●			Kok Kruad Sub-District Municipality เทศบาลตำบลโคกกรวด	●				
9	Si Kew Road, A. Si Kew, Nakhon Ratchasima ถนนสีคิ้ว อ.สีคิ้ว จ.นครราชสีมา			●			Muang Si Kew Municipality เทศบาลเมืองสีคิ้ว	●				
10	Prachacheun Rd., A. Huay Thalaeng, Nakhon Ratchasima ถนนประชาชื่น อ.ห้วยแถลง จ.นครราชสีมา			●			Huay Thalaeng Sub-District Municipality เทศบาลตำบลห้วยแถลง	●				
11	Rod Fai Road 1, A. Bua Yai, Nakhon Ratchasima ถนนรถไฟ 1 อ.บัวใหญ่ จ.นครราชสีมา			●			Muang Bua Yai Municipality เทศบาลเมืองบัวใหญ่	●				
12	Mee Chai Road, A. Muang, Nong Khai ถนนมีชัย อ.เมือง จ.หนองคาย			●			Muang Nong Khai Municipality เทศบาลเมืองหนองคาย	●				
13	Panich Bamrung Road, A. Tha Bo, Nong Khai ถนนพานิชบำรุง อ.ท่าบ่อ จ.หนองคาย			●			Muang Tha Bo Municipality เทศบาลเมืองท่าบ่อ	●				
14	Prachasantisuk Rd., A. Nang Rong, Burirum ถนนประชาสันติสุข อ.นางรอง จ.บุรีรัมย์			●			Muang Nang Rong Municipality เทศบาลเมืองนางรอง	●				
15	Chai Khong Road, A. Chiang Kan, Loei ถนนชายโขง อ.เชียงคาน จ.เลย			●			Chiang Kan Sub-District Municipality เทศบาลตำบลเชียงคาน		●	●		
16	Baan Na Or, A. Muang, Loei บ้านนาอ้อ อ.เมือง จ.เลย				●		Na Or Sub-District เทศบาลตำบลนาอ้อ		●			
17	Bumrungpattana Rd., A. Samrongtab, Surin ถนนบำรุงพัฒนา อ.สำโรงทาบ จ.สุรินทร์			●			Samrongtab Sub-District Municipality เทศบาลตำบลสำโรงทาบ	●				
18	Thep Nimitr Rd., and Sareethipat Rd., A. Srikarabhumi, Surin ถนนเทพนิมิตและถนนเสรีธิปัตย์ อ.ศรีขรภูมิ จ.สุรินทร์			●			Ra Ngang Sub-District Municipality เทศบาลตำบลระแงง	●				
19	Wat Prathadcherngchum Community, A. Muang, Sakon Nakhon ชุมชนวัดพระธาตุเชิงชุม อ.เมือง จ.สกลนคร			●			Muang Sakon Nakhon Municipality เทศบาลเมืองสกลนคร		●			
20	Catholic Tha Rae Community, A. Muang, Sakon Nakhon ชุมชนคาทอลิกท่าแร่ อ.เมือง จ.สกลนคร				●		Muang Sakon Nakhon Municipality เทศบาลเมืองสกลนคร	●				
21	Thad Na Noi Neua Rd., A. Raenunakorn, Nakhon Phanom ถนนธาตุนาน้อยเหนือ อ.เรณูนคร จ.นครพนม			●			Raenunakorn Sub-District Municipality เทศบาลตำบลเรณูนคร	●				

22	Pratoo Khong Community, A. Thad Panom, Nakhon Phanom ชุมชนหน้าประตูโขง อ.ธาตุพนม จ.นครพนม			●			Thad Phanom Sub-District Municipality เทศบาลตำบลธาตุพนม	●				
23	Soonthornvichit Rd., A. Muang, Nakhon Phanom ถนนสุนทรวิจิตร อ.เมือง จ.นครพนม			●			Muang Nakhon Phanom Municipality เทศบาลเมืองนครพนม	●				
24	Baan Sing Tha, A. Muang, Yasothon บ้านสิงห์ท่า อ.เมือง จ.ยโสธร				●		Muang Yasothon Municipality เทศบาลเมืองยโสธร	●				
25	Khon Kaen Train Station, A. Muang, Khon Kaen ย่านสถานีรถไฟขอนแก่น อ.เมือง จ.ขอนแก่น				●		State Railways Authority of Thailand การรถไฟแห่งประเทศไทย	●				
26	Nam Pong Market, A. Nam Pong, Khon Kaen ตลาดน้ำพอง อ.น้ำพอง จ.ขอนแกน					●	Nam Pong Sub-District เทศบาลตำบลน้ำพอง	●				
27	Chalermphol Rd., A. Phol, Khon Kaen ถนนเฉลิมพล อ.พล จ.ขอนแก่น			●			Muang Phol Municipality เทศบาลเมืองเมืองพล	●				
28	Chae Lae Rd., A. Kumpawapee, Udon Thani ถนนแชแล อ.กุมภวาปี จ.อุดรธานี			●			Kumpawapee Sub-District Municipality เทศบาลตำบลกุมภวาปี	●				
29	Pisarnsarakij Rd., A. Kumpawapee, Udon Thani ถนนพิศาลสารกิจ อ.กุมภวาปี จ.อุดรธานี			●			Pan Don Sub-District Municipality เทศบาลตำบลพันดอน	●				
30	Saelabhumi Market, A. Saelabhumi, Roi Et ตลาดเสลภูมิ อ.เสลภูมิ จ.ร้อยเอ็ด					●	Saelabhumi Sub-District Municipality เทศบาลตำบลเสลภูมิ	●				

South Region

No. *ลำดับ*	*Community's Name/ Province* *ชื่อชุมชน/ จังหวัด*	*Type of Community** *ประเภทชุมชน**					*Type of Administration* *ลักษณะเขตการปกครอง*	*Level of Conservation* *ระดับการดำเนินการอนุรักษ์***				
		1	*2*	*3*	*4*	*5*		*0*	*1*	*2*	*3*	*4*
1	Old Town Songkla, Amphur Muang Songkhla ย่านเมืองเก่าสงขลา อ.เมือง จ.สงขลา			●			Songk hla Municipality เทศบาลนครสงขลา		●	●		
2	Thanon Nipatu-thit 1, Amphur Hadyai, Songkhla ถนนนิพัทธ์อุทิศ 1 อ.หาดใหญ่ จ.สงขลา			●			Had Yai Muninicpality เทศบาลนครหาดใหญ่	●				
3	Talad Klang (Central Market) Community, Amphur Ranod, Songkhla ชุมชนตลาดกลาง อ.ระโนด จ.สงขลา		●				Tambon Ranod Municipality เทศบาลตำบลระโนด	●				
4	Chai Wari Road, Amphur Ranod, Songkhla ถนนชายวารี อ.ระโนด จ.สงขลา			●			Tambon Ranod Municipality เทศบาลตำบลระโนด	●				
5	Klong Dan Community, Amphur Ranod, Songkhla ชุมชนคลองแดน อ.ระโนด จ.สงขลา		●				Tambon Klong Dan Administration Office อบต.คลองแดน		●	●	●	●
6	Talad Bang Kaew, Amphur Bang Kaew, Phattalung ตลาดบางแก้ว อ.บางแก้ว จ.พัทลุง					●	Tambon Bang Kaew Municipality เทศบาลตำบลบางแก้ว	●				
7	Kuan Kha-nun – Talay Noy, Amphur Kuan Kha-un, Phattalung ถนนควนขนุน-ทะเลน้อย อ.ควนขนุน จ.พัทลุง			●			Tambon Ma-Kor Nua Municipality เทศบาลตำบลมะกอเหนือ	●				
8	Lam Pa Community, Amphur Muang, Phattalung ชุมชนลำป่า อ.เมือง จ.พัทลุง		●				Phattalung Municipality เทศบาลเมืองพัทลุง		●			
9	Municipality 9 Road, Amphur Pak Payoon, Phattalung ถนนเทศบาล 9 อ.ปากพะยูน จ.พัทลุง			●			Tambon Payoon Municipality เทศบาลตำบลอ่าวพะยูน	●				
10	Ratchadamneon Road, Amphur Muang, Nakhon Si Thammarat ถนนราชดำเนิน อ.เมือง จ.นครศรีธรรมราช			●			Nakhon Si Thammarat Municipality เทศบาลนครนครศรีธรรมราช	●				
11	Pak Panang, Amphur Pak Panung, Nakhon Si Thammarat ตลาดปากพนัง อ.ปากพนัง จ.นครศรีธรรมราช					●	Pak Panang Municipality เทศบาลเมืองปากพนัง	●				
12	Tung Song Railway Station Area, Amphur Tung Song, Nakhon Si Thammarat ย่านสถานีรถไฟทุ่งสง อ.ทุ่งสง จ.นครศรีธรรมราช				●		Tung Song Municipality เทศบาลเมืองทุ่งสง	●				

13	Pak Chien Road, Amphur Chien Yai, Nakhon Si Thammarat ถนนปากเขียร อ.เชียรใหญ่ จ.นครศรีธรรมราช			●			Tambon Chien Yai Municipality เทศบาลตำบลเชียรใหญ่	●				
14	Petchkasem Road, Huay Yod, Trang ถนนเพชรเกษม อ.ห้วยยอด จ.ตรัง			●			Tambon Huay Yod Municipality เทศบาลตำบลห้วยยอด		●			
15	Trang Historic Town, Amphur Muang, Trang ย่านเมืองเก่าตรัง อ.เมือง จ.ตรัง			●			Trang Municipality เทศบาลนครตรัง		●	●		
16	Kan Tang Road, Amphur Kan Tang, Trang ถนนกันตัง อ.กันตัง จ.ตรัง			●			Kan Tang Municipality เทศบาลเมืองกันตัง		●			
17	Phuket Historic Town, Amphur Muang, Phuket ย่านเมืองเก่าภูเก็ต อ.เมือง จ.ภูเก็ต			●			Phuket Municipality เทศบาลนครภูเก็ต		●	●	●	●
18	Ban Don Road, Sri Chaya Road, Chon Kasem Road, Amphur Muang, Surat Thani ถนนบ้านดอน ถนนศรีไชยา ถนนชนเกษม อ.เมือง จ.สุราษฎร์ธานี			●			Surat Thani Municipality เทศบาลนครสุราษฎร์ธานี	●				
19	Lang Suan Road, Amphur Lang Suan, Chumphon ถนนหลังสวน อ.หลังสวน จ.ชุมพร			●			Muang Langsuan Municipality เทศบาลเมืองหลังสวน		●			
20	Chumporn Railway Station, Amphur Muang, Chumphon ย่านสถานีรถไฟชุมพร อ.เมือง จ.ชุมพร				●		State Railway of Thailand การรถไฟแห่งประเทศไทย	●				
21	Swe Railway Station, Amphur Swe, Chumphon ย่านสถานีรถไฟสวี อ.สวี จ.ชุมพร			●			Tambon Na Pho Municipality เทศบาลตำบลนาโพธิ์	●				
22	Tub Sakae, Tub Sakae, Prachuap Khiri Khan ตลาดทับสะแก อ.ทับสะแก จ.ประจวบคีรีขันธ์					●	Tambon Tub Sakae Municipality เทศบาลตำบลทับสะแก	●				
23	Udomtara Road, Sri Takua Pa Road, Amphur Takuapa, Phangnga ถนนอุดมธารา ถนนศรีตะกั่วป่า อ.ตะกั่วป่า จ.พังงา			●			Muang Takua Pa Municipality เทศบาลเมืองตะกั่วป่า		●	●		
24	Ar Noh Ru Road, Amphur Muang, Pattani ถนนอาเนาะรู อ.เมือง จ.ปัตตานี			●			Muang Pattani Municipality เทศบาลเมืองปัตตานี		●			
25	Ruang Ras Road, Amphur Muang, Ranong ถนนเรืองราษฎร์ อ.เมือง จ.ระนอง			●			Muang Ranong Municipality เทศบาลเมืองระนอง		●			
26	Buri Wanich Road, Amphur Muang, Satun ถนนบุรีวานิช อ.เมือง จ.สตูล			●			Muang Satun Municipality เทศบาลเมืองสตูล	●				
27	King's Property Market, Amphur Muang, Petchaburi ตลาดทรัพย์สินส่วนพระมหากษัตริย์ อ.เมือง จ.เพชรบุรี					●	Petchaburi Municipality เทศบาลเมืองเพชรบุรี		●			

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No. *ลำดับ*	*Community's Name/ Province* *ชื่อชุมชน/ จังหวัด*	*Type of Community** *ประเภทชุมชน**					*Type of Administration* *ลักษณะเขตการปกครอง*	*Level of Conservation* *ระดับการดำเนินการอนุรักษ์***				
		1	*2*	*3*	*4*	*5*		*0*	*1*	*2*	*3*	*4*
1	Sam Praeng สามแพร่ง					●	Phra Nakorn District เขตพระนคร		●	●	●	
2	Hua Ta Kay Market ตลาดหัวตะเข้		●				Lad Kra Bang District เขตลาดกระบัง		●			
3	Nang Lerng Market ตลาดนางเลิ้ง					●	Dusit District เขตดุสิต		●	●	●	●
4	Man Si Intersection แยกแม้นศรี			●			Pom Prab Sattru Pai District เขตป้อมปราบศัตรูพ่าย		●			
5	Soi Phra Ya Sri ซอยพระยาศรี				●		Phra Nakorn District เขตพระนคร		●			
6	Tha Tien Community ชุมชนท่าเตียน					●	Phra Nakorn District เขตพระนคร		●	●	●	●
7	Ban Krua Community ชุมชนบ้านครัว				●		Pathumwan District เขตปทุมวัน		●	●		
8	Phra Arthit Road ถนนพระอาทิตย์			●			Phra Nakorn District เขตพระนคร		●	●		

9	Ku Dee Jeen Community ชุมชนกุฏีจีน				●		Thonburi District เขตธนบุรี		●	●		
10	Baworn Rangsee Community ชุมชนบวรรังษี			●			Phra Nakorn District เขตพระนคร		●	●		
11	Tha Chang – Wang Lang ท่าช้างวังหลวง			●			Phra Nakorn District เขตพระนคร		●	●		
12	Assadang ถนนอัษฎางค์			●			Phra Nakorn District เขตพระนคร		●			
13	Sao Ching Cha Commercial Buildings ตึกแถวเสาชิงช้า			●			Phra Nakorn District เขตพระนคร		●	●		
14	Ban Mor Commercial Buildings ตึกแถวบ้านหม้อ			●			Phra Nakorn District เขตพระนคร		●			
15	Song Wad Road ถนนทรงวาด			●			Sampanthawong District เขตสัมพันธวงศ์		●			
16	Mon Bang Kadi Community ชุมชนมอญบางกระดี่		●				Bang Khun Tien District เขตบางขุนเทียน		●	●	●	●
17	Na Phra Larn Commercial Buildings กลุ่มตึกแถวหน้าพระลาน			●			Phra Nakorn District เขตพระนคร		●	●	●	
18	Soi Luen Rit ซอยเลื่อนฤทธิ์				●		Sampanthawong District เขตสัมพันธวงศ์		●	●		
19	Wang Dang Community ชุมชนวังแดง				●		Pom Prab Sattru Pai District เขตป้อมปราบศัตรูพ่าย		●			
20	Ta Nao Road Commercial Buildings กลุ่มตึกแถวถนนตะนาว			●			Phra Nakorn District เขตพระนคร		●			
21	Bum Rung Muang Commercial Buildings กลุ่มตึกแถวถนนบำรุงเมือง			●			Phra Nakorn District เขตพระนคร		●			
22	Fuang Nakorn Road Commercial Buildings กลุ่มตึกแถวถนนเฟื่องนคร			●			Phra Nakorn District เขตพระนคร	●				
23	Klong Bang Luang คลองบางหลวง		●				Pasi Charoen District เขตภาษีเจริญ		●			
24	Chitrlada Triangle Railway Community ชุมชนรถไฟสามเหลี่ยมจิตรลดา				●		Ratchthewi District เขตราชเทวี	●				
25	Makkasan Railway Community ชุมชนรถไฟมักกะสัน				●		Ratchthewi District เขตราชเทวี	●				

Remarks

*Community type:

1. Raft Community;
2. Riverside Community;
3. Commercial District Community;
4. Village; and
5. Marketplace.

** Levels of Conservation:

0. None;
1. Research and Documentation;
2. Establishment of Conservation Organization and Involvement of the Community;
3. Preparation of Architecture and Living-Norm Conservation Plan; and
4. Implement the Conservation Plan.

May have been affected from short period of flooding.

Affected from short period flood with water level up to 0.40m. Water level height concerned Chao Phraya water tide level.

Affected for 1-2 weeks flood with water level between 1.0-1.20m height.

Affected for more than 2 weeks flood with water level more than 1.20m height.

Source: ICOMOS

ANNEX 23:
ENVIRONMENT SECTOR - METHODOLOGY AND ASSUMPTIONS FOR DAMAGE AND LOSSES CALCULATIONS

Municipal Solid Waste (All Public)

The amount of daily waste generation is based on historical provincial data. Damage is calculated based on the level of flood impact: Low (25%), Medium (50%), and High (100%) and applying these percentages to daily budget and the number of days (assumed 60 days) the facility is affected, as the total investment costs for each facility were not readily available. Losses are calculated from the number of days the facility is affected multiply by amount of daily waste generation diverted (based on the affected capacity level of the facility) to other facility and multiply by the average cost of collection and treatment/disposal using THB 1,000 per ton of waste (from discussion with BMA staff). The additional transportation and handling costs to transfer the waste to other facilities were not included.

Short-term needs comprise of the repair and recovery costs to bring the facilities back to full capacity and the additional collection and treatment/disposal costs to deal with disaster waste that is generated by households and businesses. The amount of disaster waste is assumed to be 500 kilogram per capita (based on discussion with PCD staff).

Medium-term needs include the preparation of master plan to modernize and provide flood proof measures to the MSW treatment facilities as more than half of the total MSW treatment facilities are open dump facilities assuming that the cost of each plan (including consultation) is around THB 2 million for each of the 25 affected provinces and THB 3 million for each site managed by BMA.

Long-term needs focus on necessary investment to implement the provincial master plan assuming that the capital cost (excluding land cost) of a sanitary landfill (with landfill gas capture and utilization as well as proper Leachate treatment) is THB 450 per ton of waste for 10 years capacity. Assuming that the per capita waste generation is 1 kilogram per day and collection rate if 95 percent.

Protected Area, River, and Bay (All Public)

Losses are calculated based on reduced environmental services from mangrove forest. Daily value is taken from Sathirathai (1998). The services provided by mangrove forest are assumed to be lost for 60 days. Mangrove forest data are from DMCR web site.

Short-term needs include installation of 10 additional continuous water quality monitoring stations per province and 30 stations in the Gulf of Thailand to monitor water quality in major rivers and streams as well as the Gulf of Thailand especially around the mouths of the three affected rivers for the next six months. The cost of the equip-

ment/installation is THB 3 million per unit (OECD 2006). Additionally, mangrove afforestation is needed to increase the mangrove forest coverage by 10 percent.

Medium-term needs include O&M cost of running the new water quality monitoring stations at the cost of THB 1000/unit/day and maintenance cost of mangrove forest as well as additional afforestation of 10 percent per year for two years.

Long-term needs include O&M cost of running the new water quality monitoring stations and maintenance cost of mangrove forest.

Industrial Waste (All Private)

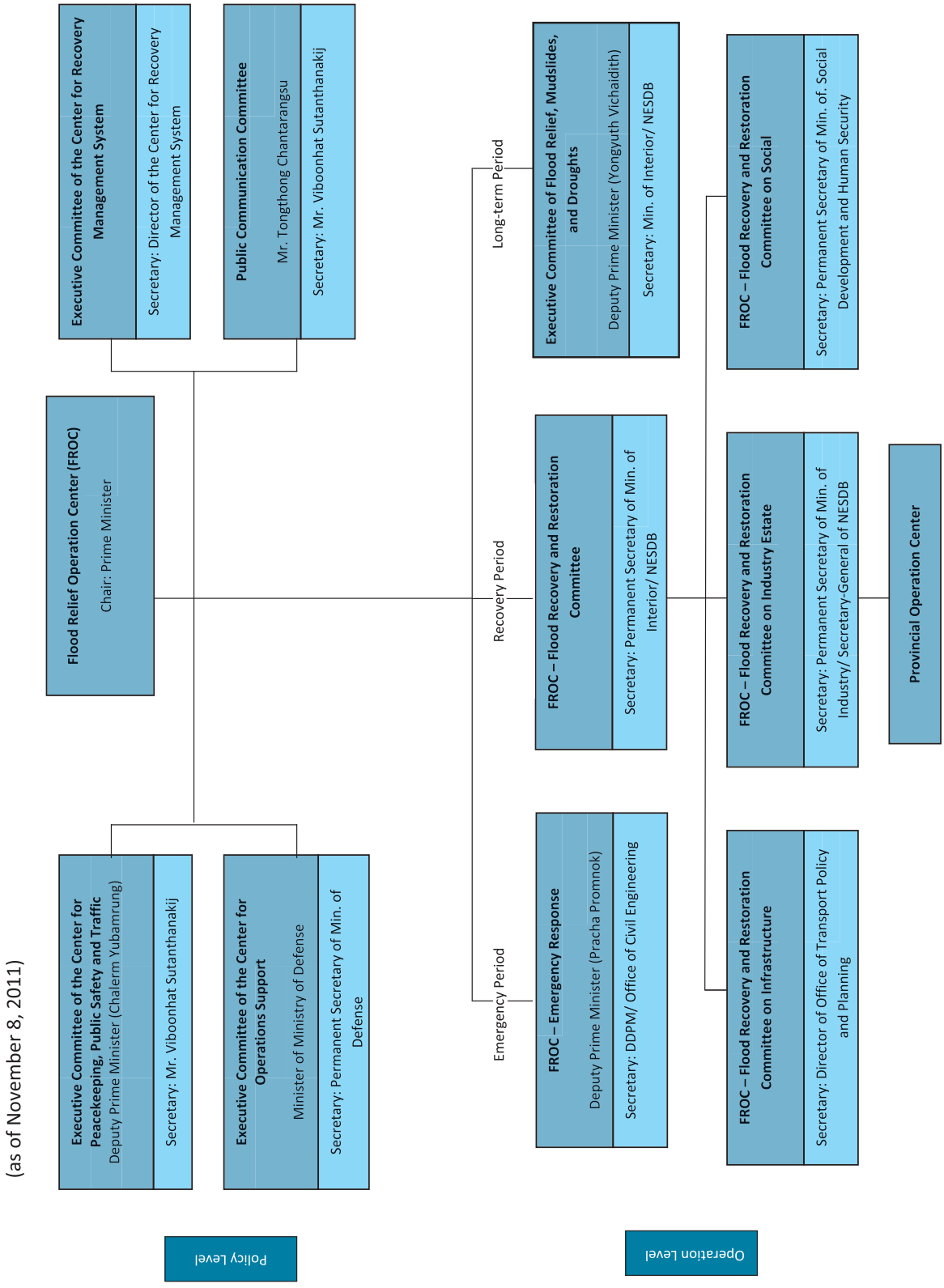
Damage is calculated based on the level of impact (low 25%, medium 50%, and high 100%) as a percentage of equipment costs, as the flood has mostly affected the equipment and not the physical structure of the facility. Losses are calculated based on the services that were not provided as the waste especially wastewater is still left in the facilities as a percentage of daily O&M costs (assume 20% of the capital costs) times the number of day the facilities are out of service (assume 60 days).

Short-term needs are based on the repair and recovery costs (assume 1.2 time of the damage) to allow the facilities to be fully operational when the plants are re-commissioned.

Medium-term needs are based on upgrading and climate proofing costs which are assumed to be 1.5 times of the original capital costs (excluding land costs) as cleaner technology and more resilient material are now available.

Long-term needs are mostly O&M costs of the newly upgraded facilities (assume 20% of the capital costs).

ANNEX 24:
ORGANIZATIONAL CHART OF FROC



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