



SUDAN RAPID POST DISASTER **NEEDS** **AND RECOVERY** **ASSESSMENT** (RAPID PDNRA)

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March 2021

Disclaimer

This report was developed based on the inputs received during numerous consultative sessions, state visits, individual interviews, and literature reviews by the Sudan RPDNRA team. Any discrepancies are unintended.

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OPENING REMARKS

During the past weeks and months Sudan experienced some of the worst flooding in decades. Over 875,000 people were affected, 120 people were left dead, and flood-related damages amounted to over USD 3.34 billion. The magnitude and impacts of this year's seasonal flooding are unprecedented. The floods affected all eighteen States of the country. The Nile States and the capital Khartoum, located at the confluence of the White and the Blue Nile, were particularly affected by the overflow of rivers in the Nile basin. Heavy rains and flash flooding also affected non-Nile States, especially North Darfur, where the floods compounded the already dire humanitarian situation. The floods impacted virtually every sector of Sudan. The destruction of thousands of buildings left people homeless and disrupted manufacturing and commercial activities across the country. With a large share of the Sudanese living in rural areas and relying on agriculture, animal husbandry and pastoralism, the destruction of crops and livestock severely impacted the livelihoods of the people living in flood-affected areas.

On September 4th Sudan's Security and Defence Council declared a three-month, nation-wide state of emergency and designated the country a natural disaster zone. The Sovereignty Council established a Higher Committee for Flood Mitigation to address the impact of the floods of 2020. The committee is headed by the Ministry of Labour and Social Development and includes all relevant federal ministries, the states' local governments, and coordinating authorities as well as local, regional, and international response organizations. On October 1st, after flood waters had subsided and the full extent of the flood damage became visible, the Ministry of Labour and Social Development issued a request to the World Bank Country Director, seeking assistance from the World Bank and the United Nations to carry out an

assessment of the resultant damage and impacts by the floods.

It was a huge learning experience for our people as this was the first ever exercise of this nature to take place in Sudan. The process of assessing the damages, quantifying the losses, and identifying the recovery needs was a valuable component of building the capacity of key sectors to assist in developing a more effective disaster management mechanism for the country.

This report summarizes the main findings of the assessment and outlines the key actions needed for the immediate and longer-term recovery from the flood disaster. Covering in total sixteen sector assessments, the report documents the immense scale and damage of the floods. It also highlights the importance of preparedness to reduce the impacts and damages of future floods. As such, the assessment provides an important resource for all government agencies involved in the flood response. In the process of conducting the assessment, government agencies came together in a great effort to generate a common understanding of the flood impacts and recovery needs. In close coordination with the development partners in Sudan, the assessment provided a valuable experience for the Government of Sudan. It made evident the strengths and areas for improvement of the overall governance structure for disaster management as the country transitions towards building better institutions.

The main task now for us as decision makers is to ensure that the recommended recovery processes enable us to implant resilience measures that will mitigate the impact of future disasters. We constructed a disaster recovery framework for building back better and to keep Sudan on track to fulfil its national growth and development goals. We are

pushing very hard to institutionalise our approach to managing disaster and solid steps towards establishing a national authority for disaster management is already taken.

On behalf of the Government of Sudan, I would like to express my sincere appreciation to all partners who have assisted in the process and helped in preparing this report under challenging

political and economic circumstances, especially the World Bank and the United Nations Development Programme in Sudan. We look forward to working closely with all partners and stakeholders to carry out the recovery tasks that are aiming to strengthen the country's resilience to disasters.

Lena Elsheikh, Head of the Higher Committee for Flood Mitigation

FOREWORD

During late summer and autumn of 2020, Sudan has been affected by devastating floods in the Nile river basin, accompanied by heavy rain and flash flooding in non-Nile States. The scale and extent of last year's seasonal flooding – reportedly the worst in over three decades – is immense: with over 875,000 people affected across all 18 States of the country, the floods impacted almost every sector of the economy while disrupting the lives and livelihoods of the Sudanese people in both rural and urban areas.

The floods affected Sudan at a time of economic crisis and political transition. They made evident that Sudan is highly vulnerable to hydro-climatic extremes and underline the importance to strengthen the country's capacities to prepare for, cope with and respond to disasters. In a time of multiple crises and economic hardship, exacerbated by the Covid-19 pandemic and an increasing number of forcibly displaced populations, the recovery needs however go well beyond the immediate flood impacts.

Upon request by the Government of Sudan, the World Bank and the United Nations are supporting Sudan in its recovery efforts. This Rapid Post Disaster Needs and Recovery Assessment (RPDNRA) marks an important step towards strengthening the country's disaster resilience based on the principles of building back better. The RPDNRA sets out to assess the extent of the flood impacts on Sudan and, on the basis of these findings, to produce an actionable and sustainable recovery strategy for leveraging targeted flood response and recovery planning, including mobilizing support and technical resources. The RPDNRA provides the basis for an integrated flood recovery response. In alignment with other crises responses currently underway by the Government of Sudan and its development partners, it aims to address not only the immediate needs of those affected by flooding but support a development-oriented recovery

process and strengthen the country's disaster resilience.

As such, the devastating floods are also an opportunity to conduct and build capacity on damage assessment using the internationally recognized PDNA methodology for the first time in Sudan. This being a government-led exercise, the assessment moreover provides an opportunity for the transitional government of Sudan under the leadership of the Higher Committee on Floods to come together across the different sectors and levels of administration in a whole-of-government approach and to engage with international partners and civil society to support the wider development agenda of the country.

Developed under challenging social, economic, and political circumstances, the RPDNRA marks a formidable achievement of the Government of Sudan and the Ministry of Labour and Social Development as the designated lead institution of the assessment. The recently established Emergency Coordination Operation Centre (EOC) must be commended in particular for its focal role in coordinating the data collection efforts and bringing together the different stakeholders for the assessment.

Building on a long-lasting partnership with the Government of Sudan, the World Bank and the United Nations in Sudan are mobilizing to support the government to effectively plan, coordinate and implement the recovery efforts. Together with the Government of Sudan and in coordination with other key stakeholders, we will expand this partnership to address the needs of those most affected, to support the recovery process and to strengthen the disaster resilience of Sudan.

Yuri Afanasiev, UN Resident Coordinator a.i.

Milena Petrova Stefanova, World Bank
Country Manager, Sudan

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The Rapid Post Disaster Needs and Recovery Assessment (RPDNRA) of the Sudan Floods 2020 was prepared by the Transitional Government of Sudan (TGoS) under the overall leadership of Lena Elsheikh (former Minister of Labour and Social Development) in collaboration with Jos De La Haye (Deputy Resident Representative in Sudan of the United Nations Development Programme) and Milena Petrova Stefanova (World Bank Country Manager for Sudan).

The Emergency Coordination Operation Centre (EOC), as the focal agency of the RPDNRA, led the assessment in coordination with technical advisory provided by the World Bank and the United Nations Development Programme (UNDP). The coordination team, headed by Magin Abusin of the EOC, comprised Rwan Mohamed Mamoun (EOC) and Hiba Omer Elfaroug Ahmed Bani (EOC), Ko Takeuchi (World Bank) and Tariro Tserayi (World Bank), and Asha Rambon (UNDP), Osama Tageldin (UNDP), Joana Sampainho (UNDP) and Samuel Akera (UNDP).

The RPDNA was a collaborative effort by the TGoS involving the following government entities (with names of the ministries at the time of the assessment): Ministry of Interior, Ministry of Federal Government, Ministry of Agriculture, Ministry of Industry & Trade, Ministry of Energy & Mining, Ministry of Irrigation & Water Resource Management, Ministry of Animal Resources, Ministry of Infrastructure & Transport, Ministry of Higher Education, Ministry of Education, Ministry of Health, Ministry of Labour & Social Development (Lead), Ministry of Religious Affairs, Ministry of Culture & Information, Ministry of Youth & Sports, as well as Humanitarian Aid Commission (HAC), Higher Council for Environment & Natural Resources, National Council for Civil Defence (NCCD), Telecommunication and Post Regulatory Authority (TEPRA), National Urban Planning Council, and

the Sudan Meteorological Authority. Government agencies from all eighteen States as well as local governments from flood-affected areas were closely involved in the data collection.

The following development partners and agencies in Sudan provided valuable input and support to the RPDNRA: Food and Agriculture Organization of the United Nations (FAO), International Labour Organization (ILO), International Organization for Migration (IOM), United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Human Settlements Programme (UN-Habitat), United Nations Children's Fund (UNICEF), United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), United Nations Entity for Gender Equality and the Empowerment of Women (UN Women), Sudanese Red Crescent Society (SRCS), and World Health Organization (WHO).

In total, sixteen sector teams with experts from the Government of Sudan and development agencies collaborated in data collection, data analysis and compilation of the sector reports:

Social Sectors

- Housing Sector was led by Fedaa El-Dosougi (National Urban Planning Council), Maha El Tahir (Khartoum State), Gyongshim An (World Bank) and Abdelrahman Moustafa (UN-Habitat).
- Health & Nutrition Sector was led by Ragan Abdullah (Ministry of Health) and Betigel W. Habtewold (WHO).
- Education Sector was led by Lawahiz Awad Mohammed (Ministry of Education), Dr. Badreldeen Taha (Ministry of Higher Education) and Abdel Rahman Eldood (UNICEF).

- Culture Sector was led by Amel Hassan (Ministry of Culture & Information), Mohamed Yousif (Ministry of Religious Affairs) and Abdegadir Salih (UNESCO).
- Sports Sector was led by Nadia Mahgoub El-Haj (Ministry of Youth & Sports) and Abdegadir Salih (UNESCO).

Productive Sectors

- Manufacturing Sector was led by Aaga Badri Abdalla (Ministry of Industry & Trade), Islam Siddig (Ministry of Industry & Trade), Maison Badawi (World Bank), Babiker Abdalla Ibrahim Hamad (World Bank), Tariro Tserayi (World Bank) and Fernanda Senra (World Bank).
- Agriculture, Fisheries & Livestock Sector was led by Elham Igaldeen Mohammed (Ministry of Agriculture), Khalid Osman (Ministry of Animal Resources), Ibrahim Elmardi (FAO) and Habab Tayfour (World Bank).

Infrastructure Sectors

- Transport & Telecommunication Sector was led by Esraa Osman El-Gadi (Ministry of Infrastructure & Transport), Nora Abdalla Hassan Basher (Telecommunication and Post Regulatory Authority), Robert Mutyaba (World Bank), Babiker Abdalla Ibrahim Hamad (World Bank) and Tariro Tserayi (World Bank).
- Energy & Electricity Sector was led by Sara Tewfeik (Ministry of Energy & Mining), Ali Habib (Ministry of Energy & Mining), Elhadi Gumaa (Ministry of Energy & Mining), Kenta Usui (World Bank), Tarig Tagalasfia (World Bank), Amin Sabri (World Bank) and Kawther Ali Ahmed Berima (World Bank).
- Water, Sanitation & Water Resource Management Sector was led by Salah El-Siddig Mohammed (Ministry of Irrigation & Water Resource Management), Amir Albashir (EOC), Habab Tayfour

(World Bank), Donald Burgess (UNICEF), Tomas Lopez de Bufala (UNICEF), Fouad Yassa (UNICEF), Mohamed Saeed Elsharif Elamin (UNICEF) and Mohammed Abdelhafeez (UNICEF).

Cross-Cutting Issues Sectors

- Disaster Risk Reduction Sector was led by Asma Adlan Abdlla Adlan (HAC), Majdeldiein Ahmed (HAC), Ibrahim Tajelsir Ibrahim (HAC), Hossam Mutwakil (Civil Defence), Lukas Loeschner (World Bank), Mohammed Abdelhameed (UNDP), Duaa Abdelhameed (Sudanese Red Crescent) and Hwaida Elkhier (Sudanese Red Crescent).
- Employment Livelihoods & Social Protection Sector was led by Suaad El-Tayeb (Ministry of Labour & Social Development), Partha Sarathi (UNDP) and Sean Donald Paterson (ILO).
- Gender Sector was led by Manazil Alshareef (Ministry of Labour & Social Development), Wisal Hussein (National Population Council), Nadia Abdelrahim (National Population Council) and Mary Mbeo (UN Women).
- Governance Sector was led by Aghari Ahmed Taha (Ministry of Federal Government) and Mohammed Abdelhammeed (UNDP).
- Environment Sector was led by Eman Altayeb Abdelkarim Mohamed (Higher Council for Environment & Natural Resources), Atila Uras (UNEP), Babiker Abdalla Ibrahim Hamad (World Bank) and Ahmed Ali Salih (UNEP).
- Human Impact Assessment Sector was led by Asma Adlan Abdlla Adlan (HAC), Elkhidir Elamin Mohammed (Private Sector) and Garima Jain (UNDP).

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- The final report was compiled by Lukas Loeschner (World Bank).
- The layout and design of the report was done by Diana De León (Consultant).

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ACRONYMS DIRECTORY

ACP	Africa Caribbean Pacific
BBB	Build Back Better
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EOC	Emergency Coordination Operation Centre
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEWS	Flood Early Warning System
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GRADE	Global Rapid post-disaster Damage Estimation
HAC	Humanitarian Aid Commission
HDI	Human Development Index
HH	Household
IDP	Internally Displaced Persons
IFRC	International Federation of Red Cross and Red Crescent
ILO	International Labour Organization
IOM	International Organization for Migration
IPC	Integrated Food Security Phase Classification
LFPR	Labour Force Participation Rate
MSME	Micro, small, and medium enterprise
NDRRC	National Disaster Risk Reduction Council
NGO	Non-Governmental Organisation
PDNA	Post Disaster Needs Assessment
PHCC	Primary Health Care Centre
PHCU	Primary Health Care Unit
RPDNRA	Rapid Post Disaster Needs and Recovery Assessment
SDG	Sudanese Pound / Sustainable Development Goal
SRCR	Sudanese Red Crescent Society
SWM	Solid Waste Management
TGoS	Transitional Government of Sudan
UN Women	United Nations Entity for Gender Equality and the Empowerment of Women
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-Habitat	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USD	United States Dollar
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WPR	Workforce Participation Rate
WRM	Water Resources Management

1. EXECUTIVE SUMMARY

In 2020, after months of unusually heavy rains across Central and North-Eastern Africa, Sudan was affected by the worst flooding in over three decades. Since the start of the rainy season in July, large rainfall surpluses had been recorded throughout the Greater Horn of Africa. Heavy rains in the upstream catchments of the Blue Nile (Ethiopia) and the White Nile (South Sudan) resulted in a dramatic increase of Nile water levels. In total, the floods affected all 18 States in Sudan. Areas along the Blue and White Nile as well as the capital Khartoum were heavily flooded, while also non-Nile States, in particular North Darfur, were impacted by heavy local rains and flash floods.

Significant impacts of flooding started in mid-July 2020 when heavy rains and flash floods affected three internally displaced people's camps in Nyala Town, South Darfur state. On July 29, the Bout Earth Dam, in the Tadamon locality of Blue Nile state, exceeded its full capacity and collapsed, seriously affecting Bout Town, destroying more than 1,200 houses, and compromising access to water for more than 100,000 people living in the area. Then, from July 31 to August 1, heavy rain in Khartoum caused further flooding and destruction. By August 12, the number of people affected had exceeded 185,000 with all states except Central Darfur being affected. The situation continued to worsen in the second half of August with the affected population reaching 506,000 by the end of the first week of September and peaking at 875,000 by the end of September.

On September 4, Sudan's Security and Defence Council declared a three-month, nation-wide state of emergency and designated the country a natural disaster zone. The emergency proclamation was decided in a meeting of the Security and Defence Council chaired by Abdel Fattah al-

Burhan, chairman of the Transitional Sovereign Council. The Sovereignty Council established a High Flood Coordination Committee to mitigate and address the impact of the floods of 2020. The committee is headed by the Ministry of Labour and Social Development (MoLSD) and includes all relevant ministries, the states, and coordinating authorities as well as local, regional, and international response organizations. The Government's Humanitarian Aid Commission (HAC) has activated and is leading a national Flood Task Force to coordinate the response with all partners. Government institutions, UN agencies, NGO partners, and the private sector are providing life-saving assistance to people affected. Moreover, an Emergency Coordination Operation Centre (EOC) has been established in September to improve the management of the response to emergency incidents through effective coordination between major relevant entities.

This Rapid Post Disaster Needs and Recovery Assessment (RPDNRA) of the Sudan Floods 2020 follows a governmental "Request for Support on Flood Emergency Response". The request was issued by the Ministry of Labour and Social Development to the World Bank Country Director on October 1, seeking assistance to carry out the assessment of the resultant damage and impacts by the floods. The objective of this RPDNRA is to assess the extent of the flood impact on Sudan and, on the basis of these findings, to produce an actionable and sustainable Recovery Strategy for leveraging targeted flood response and recovery policy/planning, including mobilizing financial and technical resources. The assessment specifically sets out to: (i) support country-led assessments and initiate recovery planning processes through a coordinated inter-institutional approach; (ii) evaluate the impact of the floods on infrastructure and assets, service delivery, governance and social processes; (iii)

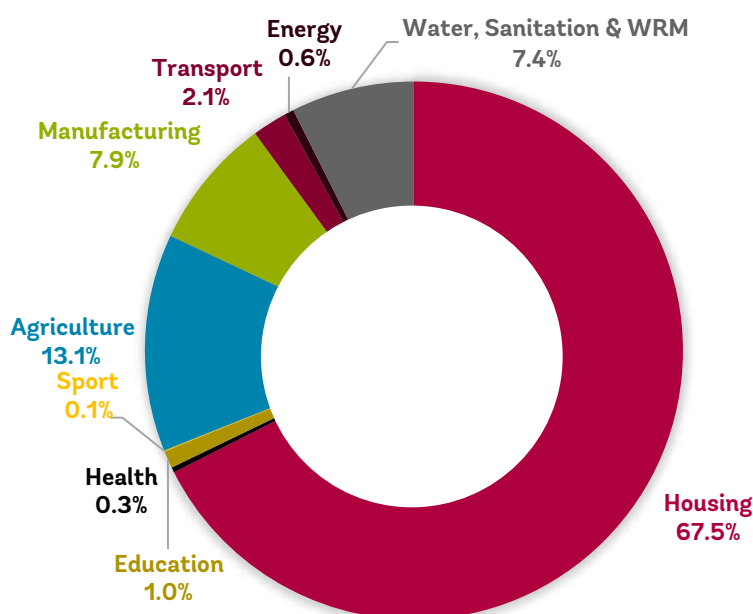
assess needs to address underlying risks and vulnerabilities so as to reduce risk and build back better; (iii) estimate the damage and losses caused by the floods; (iv) identify recovery and reconstruction needs; (v) develop a recovery strategy; and (vi) provide the basis for mobilizing resources for recovery and reconstruction through local, national and international sources.

The RPNRA has been adapted from the Post Disaster Needs Assessment (PDNA) methodology to the wider development context of Sudan in a manner to undertake a rapid and concise assessment that links to the existing needs assessments and informs the development agenda in the country. The assessment is organized along sector lines. Given the large scale and the extensive damage of the flood event, the assessment comprises four thematic areas (sectors) with in total sixteen sub-sectors. Each assessment was led by a sector team consisting of specialists from government authorities and development partner agencies.

SUMMARY OF DAMAGES AND LOSSES*

The total economic value of the effects of the floods is estimated at SDG 243.4 billion (USD 4.4 billion). Table 11 and Figure 11 summarize the effects within the different sectors: the largest total effects were incurred in the housing sector (67.5 %), agriculture sector (13.1 %), manufacturing sector (7.9 %) and water, sanitation and water resources management sector (7.4 %). In terms of damage alone, housing sector was by far the most affected with damages estimated at SDG 160.6 billion (USD 2.9 billion), which represents 87.4 % of total damages. Despite the challenges of collecting and estimating the value of loss (or change in economic flows), the assessment highlights that losses were greatest in productive sectors. The highest losses were recorded in the agriculture sector (SDG 30.1 billion/USD 546 million) and the manufacturing sector (SDG 19.2/ USD 348 million); taken together, these two sectors represent more than 82 % of total losses.

FIGURE 1 - 1: Contribution to Total Damages and Losses by Sector



* On February 21, 2021 the Sudanese government implemented a currency reform with a "flexible managed float", setting an indicative USD exchange rate of 375 Sudanese pounds (SDG). In the report, the damages, losses and recovery needs were calculated using the previous exchange rate of 55 SDG. Given high inflation and price hikes for construction materials, some sectors including housing – which represents the largest share of damages – calculated using USD values. Applying the current daily indicative rate of 379 SDG (March 1, 2021), the adjusted total figures are as follows: Damages: USD 3.2 billion (SDG 1,211.6 billion); Losses: USD 0.313 billion (SDG 118.6 billion); Recovery: USD 5.2 billion (SDG 1,968.9 billion).

TABLE 1 - 1: Estimated Damages and Losses by Sector

Sector	Sub-Sector	Damage, billion		CEF*/Losses, billion		Total Effects, billion	
		USD	SDG	USD	SDG	USD	SDG
Social	Housing	2.920	160.644	0.067	3.707	2.987	164.351
	Health	0.005	0.289	0.009	0.478	0.014	0.767
	Education	0.040	2.207	0.006	0.331	0.046	2.538
	Sport	0.002	0.120	0.001	0.026	0.003	0.146
Productive	Agriculture	0.032	1.769	0.546	30.051	0.579	31.820
	Manufacturing	0.003	0.150	0.348	19.158	0.351	19.308
Infrastructure	Transport	0.091	4.999	0.001	0.045	0.092	5.044
	Energy	0.007	0.387	0.019	1.021	0.026	1.408
	Water, Sanitation & Water Resource Management	0.240	13.200	0.088	4.813	0.328	18.013
Total		3.340	183.765	1.085	59.630	4.425	243.395

* Change in Economic Flows

Applied exchange rate: 1 USD = 55 SDG

The main findings from the sector reports are as follows:

HOUSING

In total 82,618 houses were reported to have been totally destroyed and another 93,406 partially damaged by the floods. North Darfur, Khartoum, Sinnar, Blue Nile, and West Darfur are the most affected states in terms of housing effects. In Sudan, housing even in the urban areas is predominantly informal. Many houses, especially in the rural areas, are single story, built with walls made from a mixture of mud bricks or compacted earth and wooden elements, and are particularly vulnerable to rapidly flowing flash flood waters or lingering riverine flood waters. The total economic value of damages to fully destroyed and partially damaged houses was estimated at USD 2.92 billion (SDG 160.64 billion), including damaged household goods. The total economic value of losses including demolition and debris removal, rental losses, and temporary accommodation was estimated at USD 67.4 million (SDG 3.71 billion).

Short-, medium- and long-term recovery measures include detailed field survey on flooding effects on housing, housing recovery strategy, community consultations, housing repair & rebuilding

guidelines and training, physical reconstruction, housing data management system, land-use planning, and housing recovery management, monitoring and evaluation.

HEALTH

A total of 44 health facilities, thereof 6 Rural Hospitals, 22 Primary Health Care Centres and 16 Primary Health Care Units, were damaged leading to disruption of essential lifesaving health services in 16 States of Sudan. All affected health facilities belong to the government. No private health facility was reported as damaged. The damage constitutes 0.7% (44 out of 5,997) of the total health infrastructure in the country. A minimum of 362,975 population which constituted 1.96% of the population who had access to health services in Sudan, was denied access to essential health services due to the damage. The total cost of damage on infrastructure amounted to USD 5.2 million (SDG 289 million). A total of medical equipment and furniture worth USD 99,000 was estimated to be damaged due to the flood. Cost of loss is the flood response worth USD 8.7 million (SDG 478 million) used for the establishment of mobile clinic and to respond to disease outbreaks.

The recovery plan takes into account interventions aimed at responding to the flood and subsequent public health consequences. The thematic prioritization identified pillars of interventions relevant for flood preparedness and response such as strengthening disease surveillance and epidemic alert investigation, or support for mobile clinics to reach flood affected communities with essential health services. Those states that have been frequently affected by floods and its consequences will be prioritized for preparedness and response initiatives.

EDUCATION

The Education sector has witnessed damages and losses in many of its infrastructures and physical properties and affected both students and teachers. Damage in other sectors such as agriculture and livestock, environment, employment and livelihoods, transport, health etc. has worsened the situation in education institutions. The cost is high, for it is estimated for complete and partial damages. The total damage and losses to education sector is estimated at SDG 2.54 billion, equivalent USD 46.1 million.

The recovery and reconstruction needs for the education sector for the next 3-5 years are estimated at SDG 7.51 billion (USD 136.5 million). The principal recovery measures include the reconstruction of schools using disaster resilient techniques; rehabilitation/retrofitting of schools including sanitation facilities and school environment; replacement of damaged equipment and furniture in all educational institutions.

SPORTS

The Sport sub-sector was significantly affected by the 2020 floods. Some 110 sports clubs had reported disruption to their sporting activities as a result of the flooding. Nineteen facilities had been completely destroyed, including National Stadia, Olympic Stadium, and other major State facilities. Of the eighteen States, at the time of the assessment, reports had been received from 12 States. All facilities

are public owned. The total effect to the sub-sector was SDG 146.0 million or USD 2.7 million and the cost of recovery was estimated to be SDG 170.0 million or USD 3.1 million.

In addition to the reconstruction and the repair of destroyed facilities it was acknowledged that serious consideration would have to be given to undertake such reconstruction with an eye to building with resilience to future floods. It was also agreed that as part of building resilience, the capacity of the youth of the nation would also be strengthened through training courses so that they would be better able to cope with future flooding events.

MANUFACTURING

While the major industrial establishments of the country have largely been spared, the floods have seriously damaged micro, small, and medium enterprises (MSMEs) in manufacturing, trade, and services sectors in the affected States. Total direct and indirect damages to the MSMEs were estimated to be SDG 150.0 million, equivalent of USD 2.7 million. The largest share of damage was to light manufacturing and repair shops, followed by small retail and trade services. The impact at the macroeconomic level includes lower overall production of goods and services, and reduced economic growth, though marginal. Forecasted losses in industrial production and commercial sales will mean less in value-added tax revenues, which will in turn have a negative impact on the fiscal sector.

Replacing the destroyed goods and assets will require that a sizable fraction of the value of the goods be imported from abroad; thus, reconstruction will have a negative impact on the balance of payments for the country. An additional impact will be felt by some of the workers (both formal employees and self-employed persons) in each of the sub-sectors, as the production losses will result in equivalent employment losses, until full recovery of production activities is achieved. The needs include working capital to

ensure smooth restoration of production. Refinancing or rescheduling of old loans that are nonperforming because of the disaster will also be essential for recovery.

AGRICULTURE, FISHERIES & LIVESTOCK

Approximately 2,216,362 ha of cropland is reported to have been damaged in the 15 assessed states, particularly in Gedarif, Blue Nile, Sennar and Kassala, where almost 1,906,767 ha of the planted area was submerged. The livestock sector was also severely impacted with the loss of more than 107,000 heads of livestock, particularly sheep, goats, poultry, and cattle, belonging to about 20,521 households.

Total estimated loss due to the floods amounts to SDG 30.05 billion (USD 546.4 million), and total damage due to flood's impact on livestock is estimated to be SDG 1.77 billion (USD 32.2 million). Total recovery cost, after adjusting it for 15% of inflation, is estimated to be SDG 2.55 billion (USD 46.4 million).

Short-term recovery interventions should address the need of the farmers for crop loss recovery and livestock ownership. This includes i.a. restocking of sheep, goats and chickens should take place as soon as possible to avoid a sharp decrease in family income. In the medium-term, the interventions should ensure the rehabilitation of irrigation schemes so that that affected populations can continue agricultural activities in the coming seasons. In the long-run, to ensure food security, household welfare and export earnings, the government interest and spending in the sector should increase.

TRANSPORT

The Sudan transport infrastructure was both directly and indirectly damaged, posing a threat to human safety, and causing significant disruption and associated economic and social impacts. Roads were washed away, ports facility were submerged, airport buildings were flooded, integrity of runway

pavements were undermined, and railway infrastructure was damaged. Total damage to road, railway, aviation, and river transport amounted to USD 90.9 million (SDG 5.0 billion). Indirect impacts of the flood disaster included increased vehicle and road user costs, journey times, loss of business due to farmers and producers failing to transport goods and livestock to markets. At a macroeconomic level, the flood disaster disrupted supply chains, production, movement of goods and services, and reduced the tax revenue.

Short-term recovery needs include a detailed impact assessment, temporary opening up of roads, clearing debris, selection of suitable procurement models and preparation of request for expressions of interest, request for proposals and bidding documents. Medium-term measures include carrying out detailed engineering designs, detailed engineering design reviews and procurement of supervision services. In the long term, it would be necessary to launch the civil works with building back better approach, carry out client institutional and organizational review, conduct stakeholder climate and disaster risk management capacity building and training, review and update existing design manuals and standards to incorporate changes in climate parameters, and undertake a climate and disaster review of all transport infrastructure.

ENERGY & ELECTRICITY

The River Nile flood affected the Sudan electricity generation, transmission, and distribution networks. At the national grid, the generation level in Garri 1, 2, 3 and 4 power stations have been partially damaged. Additionally, some off-grid power generation station, e.g. Elnihood in West Kordofan region was affected. The estimated total damage is USD 7.0 million (SDG 387 million). The losses at the generation level is USD 18.5 million (SDG 1.02 billion) plus the losses of electricity sales for different consumer categories, i.e. residential, commercial, governmental, agricultural, and industrial, which are not yet up to now being accurately estimated.

Recovery needs include rehabilitation of all existing thermal power generation plants at Garri, Khartoum North, and Kosti at national grid level, and, isolated power station at off-grid and also completion of Garri 3, and Port Sudan Gas Turbine as well. In the long term, the planned power generation at Garri 3, and Port Sudan gas turbines are to be converted to combined cycle plants.

WATER, SANITATION AND WATER RESOURCE MANAGEMENT

The floods directly impacted an estimated 594,676 people due to damages and losses related to water infrastructure (both WASH and Water Resources Management (WRM)) across the 18 states of Sudan. The damages and losses included damage to water supply infrastructure, sanitation (septic tanks, latrines, etc) and hygiene (handwashing facilities, ablution facilities, etc). For WRM, damages included destruction of various types of hydrological monitoring stations and equipment. It also included damages and destruction to embankments, dykes, small dams, and water harvesting structures (haffirs). Breach of small dams and dykes not only destroyed many livelihoods that impacted personal assets, agricultural land, livestock etc.

The total cost of damages is estimated at USD 240 million (SDG 13.2 billion) and losses to all water related infrastructure are estimated at USD 87.5 million (SDG 4.81 billion). An estimated USD 359 million (SDG 19.7 billion) is needed to restore damaged infrastructure, restore services, and ensure rebuilt infrastructure is more resilient to future flood disasters. Recovery efforts are aimed at short, medium- and long-term interventions and include building more resilient water infrastructure, increasing water resources monitoring as well as institutional measures. Proactive measures such as flood forecasting and early warning, operation and maintenance of existing infrastructure and policy measures are required to ensure active mitigation measures are placed rather than delayed emergency response.

DISASTER RISK REDUCTION

While the assessment did not find any direct impacts on DRR related infrastructure and assets such as warehouses and fire stations as these were located outside of flood-affected area, water pumps and other equipment were damaged or destroyed beyond repair in the course of the flood response to affected communities. The analysis clearly showed that the agencies tasked with immediate flood response were in many cases insufficiently equipped to provide the necessary assistance to the affected communities. Sudan could significantly benefit from improving its institutional structure for DRR, which currently is fragmented with partially overlapping responsibilities between the government entities tasked with civil defence and those leading the humanitarian response.

As far as recovery needs are concerned, the analysis of the DRR cross-cutting sector assessment suggests the adoption of a Build Back Better approach to enhance the disaster resilience of the affected communities. To mitigate impacts and losses from future flood events, both structural and non-structural measures need to be put in place as part of a comprehensive recovery effort. Embankments around vulnerable areas, especially the greater area of Khartoum, need to be rehabilitated and made more robust to withstand future flooding. Where possible, controlled flood retention measures should be installed to store flood waters and decelerate flood discharge. Non-structural measures, such as flood risk mapping, hazard-informed land use planning and early warning systems need to be put in place to prevent settlement growth in flood-prone areas and improve the disaster readiness of at-risk communities. Importantly, the overarching institutional structure and governance arrangements for DRR should be revisited to provide an enabling framework which supports the transition towards a more preventive, forward-looking approach of disaster risk management in Sudan.

EMPLOYMENT, LIVELIHOODS & SOCIAL PROTECTION

The floods deeply impacted the labour market and livelihoods for the Sudanese population; their overall income loss has been estimated to be around SDG 6.05 billion (USD 108.93 million). The livestock sector was severely impacted by the floods with a loss of more than 108,000 heads of livestock, particularly sheep, goats, poultry, and cattle, belonging to about 20,521 households. Horticulture, seeds, tools, equipment, machinery and agriculture and irrigation-related infrastructure were also either lost or damaged in the floods. The floods also dealt a severe blow to the already COVID-19 affected trading, micro and small manufacturing MSMEs; about 68,000 enterprises in Khartoum State were affected by floods. An increasing number of workers in the formal economy are also engaging in informal work to supplement their incomes being eroded due to spiralling inflation.

Livelihood recovery needs, linked to the respective productive and social sectors, include rolling out the flagship Sudan Family Support Program (now in pilot stage) or Thamarat – a cash transfer program managed by the Transitional Government of Sudan and international partners – as an immediate response to the crisis that has been unfolding in the country. Longer-term recovery suggestions include effectively implementing active labour market programmes for skill development and imparting vocation training.

CULTURE

The floods impacted many world heritage and other Sudanese heritage sites. These include the archaeological sites of the royal city in the world heritage property at Island of Meroe, Teseen mosque in Khartoum, Nile Museum in Khartoum and pressing groundwater rise problem in Nuri and Kerma, in addition to other sites found to need urgent attention and support for conservation. Sudan has lost many archaeological and heritage sites as

a result of the construction of dams in the Nile.

To better protect Sudan's cultural sites against disasters it is recommended to put in place a national policy on disaster risk management that covers heritage resources. This policy can then be domesticated where applicable by mainstreaming it in the management plans for the various sites. To tackle the challenges in heritage protection there is a need to study and determine the impact of groundwater on archaeological monuments and sites as a basis for developing coordinated flood management strategies, policies and laws, and innovative flood solutions.

GENDER

An estimated 206,000 women of reproductive age are living in temporary flood shelters with minimal protection. Some 20,000 pregnant women are estimated to be among the affected. Of them, an estimated 3,000 will experience pregnancy complications, requiring life-saving sexual and reproductive health services. In addition to urgent health needs, displaced women face limited settlement options, and financial difficulties as a result of job loss. They also face increased risk of gender-based violence, with limited services threatened by damaged facilities and networks.

Recovery efforts should ensure that community-based disaster risk reduction activities are sensitive to, and inclusive of, gender and diversity, are similar to those required for disaster response and recovery programming. Among other, gender and culture-specific needs should be taken into consideration when designing relief packages. Shelter and human settlement planning needs to take into account the socio-cultural and economic needs and preferences of both men and women, as well as safety considerations. It is vital that women and men from all social and economic groupings in the flood-affected communities actively participate in the design and location of new housing and

communal infrastructure as well as the repair of existing structures.

GOVERNANCE

The floods led to significant damages to government buildings located in rural areas and to a much lesser extent to government buildings located in urban areas where buildings are located in safer areas and constructed with stronger materials. The floods also affected the continuity of government services due to disruption on roads and electricity and economic losses in terms of reduction of local revenue and increased expenditure incurred on relief and recovery activities.

The assessment recognises the importance of the role of local governments in recovery and reconstruction and the need to augment capacity and technical expertise to support their role in the recovery process. This assessment has identified i.a. the following recovery priorities: ensure the movement of citizens to government service centres; expand communication networks and strengthening them to cover all parts of the country; ensure local authorities have sufficient powers and resources to deal quickly with disasters; sponsoring civil society organizations and engaging them in disaster response work; and enacting legislations and laws to prevent housing in areas threatened by floods and torrents.

ENVIRONMENT

The floods resulted in significant environmental damages, affecting riverine forests, agricultural land, biodiversity, thus impacting lives and livelihoods of local communities. The exceptional rainfall and prolonged flood period negatively impacted riverine forests through riverbank erosion along the main Nile and caused severe soil erosion in the watersheds of the Blue Nile and Atbara rivers and the main Nile. Soil erosion leads to fertility loss, deep gully formation and a large increase of sediment input to the river system, resulting in sedimentation problems downstream. Therefore, another

important environmental damage caused by the 2020 floods is the exposed soil and silting of agricultural land, which affect natural water catchments. The floods have washed tremendous territory and gigantic amounts of sand and sediment. This had a negative impact on water quality.

The recovery strategy must address the underlying problems of environmental degradation that exacerbated the impact of the floods. The proposed recovery measures include: a 'comprehensive post-disaster environmental assessment' to determine site-specific solutions that are eco-friendly and based on a landscape and ecosystem approach; riverbank rehabilitation through a mix of man-made and biological solutions, depending on risk levels; rehabilitation of degraded soils through ploughing of the soil surface to improve soil physical condition and break compacted layers and reclamation of soil salinity; as well as the rehabilitation of rangelands through the distribution of seeds and creation of protected areas.

HUMAN IMPACT ASSESSMENT

The floods are a humanitarian crisis which have made evident pre-existing vulnerabilities and contributed to severe human development setbacks. Due to compounded and cascading shocks and stresses related to the floods, many of the development gains made over the past two decades may be in the danger of getting lost. Living conditions of nearly 1.6-1.9 million households have been severely affected mainly because of widespread diseases triggered by damaged sanitation, contaminated drinking water, but also because of broken homes, loss of assets, and loss of education days. Incomes and savings of nearly 1.7 million households have been affected, of which the most impacted are the agriculturalists (634.9 thousand households), daily wage earners (607.3 thousand households), and people earning from micro-, small- or medium enterprises (374.6 thousand households). Nearly 2.2 million households are food insecure in the flood affected areas owing to their economic vulnerability. About

2.9 million women are disproportionately affected among the population, and it is expected that over 1 million women might face gender-based violence after these recent events, an increase of over 70% from before. IDPs, refugees and asylum seekers are among the most affected and excluded groups due to lack of integration within the society. They are more likely to be poorer than community members, have fewer assets (including land), live in camps with poor basic services or shelter conditions, and many are mainly dependent on humanitarian assistance. Children are another group affected disproportionately. About 770.1 thousand children may face severe physical or psychological aggression at home. Nearly 122.7 thousand children between the ages 1 to 3 risk the chance of missing vaccinations and being exposed to otherwise preventable diseases in the long-term.

The following priority areas of action are recommended: Priority 1 – Strengthen poverty alleviation & food security through cash grants and cash-for-work; Priority

2 – Improve living conditions by rebuilding sanitation and drinking water facilities; Priority 3 – Invest in building capacities of community members, organisations, and local governments to better understand and respond to future emergencies.

SUDAN NATIONAL RESILIENCE AND RECOVERY FRAMEWORK

The total costs for the recovery are estimated at SDG 379.87 billion, equivalent to USD 6.91 billion (see Figure 1 2). Given the large-scale flood damage to the housing sector and the need for housing reconstruction and rehabilitation, this sector alone represents more than half (57 %) of total recovery costs, as indicated in Figure 1 2. Recovery needs are also particularly great in the energy sector (estimated at SG 32.06 billion / USD 583 million), the water, sanitation, and water resources management sector (estimated at SDG 19.75 billion/USD 359 million) and for Employment, Livelihoods and Social Protection (SG 92.16 billion/USD 1.68 billion).

FIGURE 1 - 2: Summary of Estimated Recovery Costs by Sector

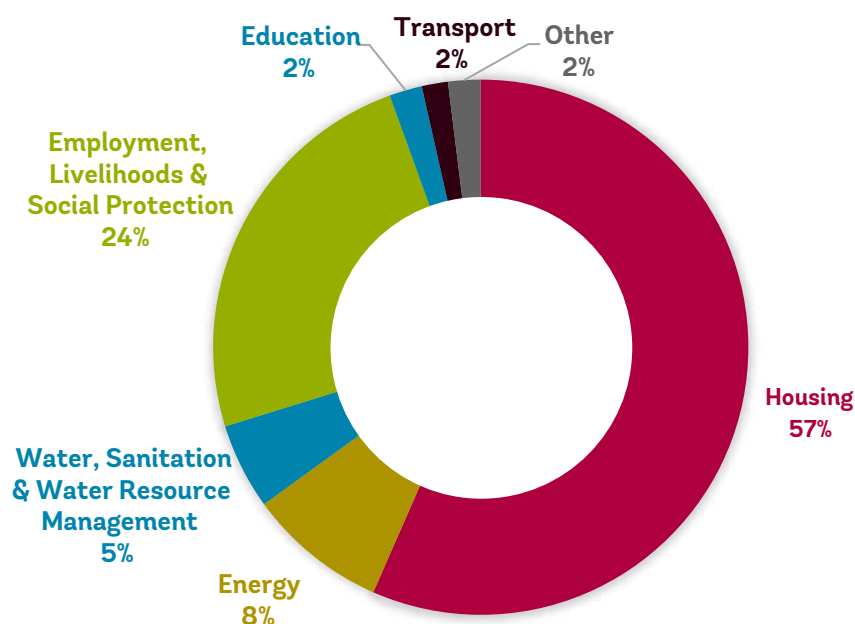


TABLE 1 - 2: Estimated Recovery Costs by Sector

Sector	Sub-Sector	Recovery, billion	
		USD	SDG
Social	Housing	3.908	214.932
	Health	0.047	2.560
	Education	0.137	7.513
	Sport	0.003	0.170
Productive	Agriculture	0.046	2.551
	Manufacturing	0.033	1.818
Infrastructure	Transport	0.109	5.999
	Energy	0.583	32.059
	Water, Sanitation & Water Resource Management	0.359	19.745
Total		5.225	287.347
Cross-Cutting issues	Culture	0.000	0.023
	Environment	0.005	0.275
	Governance	0.000	
	Gender	0.001	0.039
	Employment, Livelihoods and Social Protection	1.676	92.161
	Disaster Risk Reduction (DRR)	0.000	0.022
Grand Total		6.907	379.867

Applied exchange rate: 1 USD = 55 SDG

The Recovery Strategy is guided by the vision of “Building a democratic, development-based State for everyone, where citizens will all enjoy peace, freedom, justice and welfare,” as defined in General Framework for the Programme of the Transitional Government. In agreement with the leadership of the Higher Committee for Flood Mitigation, Sudan’s recovery efforts are based on the following five guiding principles:

1. Restore Livelihood to preserve lives.
2. Improve Resilience to minimise risks.
3. Involve Community to ensure sustainability.
4. Align with Governance to maximise coordination; and
5. Leverage on Humanitarian Effort to avoid redundancy.

For most of its independent history, Sudan has been beset by internal conflicts that weakened its ability to play a leadership role in the region.

Under the terms of a comprehensive peace agreement in 2005, South Sudan seceded in 2011 to become the latest independent State of Africa. The secession of South Sudan induced multiple economic shocks and deprived Sudan of much needed oil revenues. The outbreak of civil war in South Sudan also precipitated an increase in Sudan's already large population of refugees and internally displaced persons (IDP) with Sudan now serving as a source, destination, and transit country for irregular migration.

In April 2019 President Omar El-Bashir was removed after consistent demonstrations that started in December 2018 and culminated in a peaceful sit-in in front of the Army HQ.

A Transition Government was formed in September 2019 under a power-sharing agreement between the military and civilian forces, which allowed a civilian Prime Minister to lead the government under the authority of a Presidential Sovereign Council. A transitional legislative assembly is expected to be established soon. In July 2020 the Prime Minister appointed eighteen civilian Governors thereby achieving a key milestone included in the Constitutional Document of the transition.

In addition to the political and economic uncertainty, Sudan, like the rest of the world, has been experiencing the unprecedented social and economic impact of the COVID-19 (coronavirus) pandemic. The COVID-19 shock is expected to be transitory with potential recovery possible in 2021 but the overall adverse economic impact on Sudan will be substantial. The economic impact of COVID-19 includes the increased price of basic foods, rising unemployment, and falling exports. Restrictions on movement are making the economic situation worse, with commodity prices soaring across the country.

According to the Sudan Humanitarian Response Plan 2020, 9.6 million people require humanitarian support in 2020, including 6.2 million people who are food insecure³.

High inflation continues to reduce households' purchasing power and people are unable to meet their basic needs. Sudan continues to face persistently high levels of acute malnutrition and stunting, which constitute a significant public health problem. With two thirds of the population living in rural areas, and the economy heavily dependent on agriculture, Sudan is vulnerable to climate-related changes in temperature and precipitation, which are expected to further compound the country's food security and humanitarian situation.

NATURAL HAZARDS AND DISASTER RISK IN SUDAN

Sudan is highly prone and vulnerable to natural hazards and climate-related shocks.⁴

According to the latest World Risk Report, Sudan is among the countries with the highest vulnerability to extreme natural hazards, including droughts and floods. While hazard exposure is not as high as in other countries, the report highlights that Sudan's disaster risk is compounded by low coping and adaptive capacities.⁵ Several indices moreover rank Sudan among the most vulnerable countries in the world to climate variability and change. With the projected increase in temperature and variability in precipitation, climate-related shocks are expected to become more frequent and intense. In addition, reduced pasture and water for livestock, loss of arable land and reduced crop yields and water supply are likely to increase regional ethnic and social conflict over land and resources. Already, climate variability over the past few decades has put stress on the region's rainfed agriculture and pastoralist systems, the dominant livelihoods in rural areas.^{6,7}

³ OCHA, 2020. Sudan Humanitarian Response Plan. Humanitarian Programme Cycle 2020 issued January 2020.

⁴ Republic of the Sudan/UNDP, n.D. Sudan Disaster Loss and Damage Database. Sudan Risk Profile (2005-2015).

⁵ Bündnis Entwicklung Hilft/Ruhr University Bochum, 2020. WorldRiskReport 2020.

⁶ USAID, 2016. Climate Change Risk Profile Sudan. Fact Sheet.

⁷ Scheffran et al., 2014. Violent climate or climate of violence? Concepts and relations with focus on Kenya and Sudan.

As most of the country falls within the Sahelian belt, Sudan is periodically affected by droughts.

The most severe droughts in recent history occurred in 1967-1973 and 1980-1984 while successive years of drought between 1985-1993 led to severe food shortages. According to the international disaster database EM-DAT, in the past fifty years (1970-2020) droughts affected over 27m people in Sudan. The devastating droughts in the early 1980s resulted in a severe famine which affected over 8.4m people and left dead an estimated 150,000 people and 7.8m livestock⁸. Climate change and desertification are exacerbating the risk of drought. With arid and semi-arid lands covering an area of 1.78m sq. km (about 72% of the country's total area⁹), Sudan is the largest country most seriously affected by desertification in Africa. About 69,000 sq. km of agricultural productive land are considered drought prone and desertification is recognized as one of the most serious environmental threats affecting land productivity in Sudan.¹⁰

Riverine and flash floods are recurrent damaging hazards, especially in the Nile river basin.

Sudan is a part of the Eastern Nile region that is characterized by high variability in river flow. A significant proportion of the annual surface run-off volume of the Eastern Nile, contributing over 86% of the total River Nile flow, occurs in only three months between July to September. During high rainfall periods, major rivers in the region often give rise to large-scale riverine flooding, while heavy rain and flash flooding also affect non-Nile states.¹¹ According to EM-DAT, during the past fifty years floods affected more than 8.4m people and reportedly left 2,766 dead. In 1988, the largest flood event in Sudan's modern history with record Nile river levels, reportedly destroyed thousands of homes and displaced over one million people. EM-DAT figures moreover indicates that the frequency and intensity of floods in Sudan increased in recent years: since 2000, major floods have been recorded almost every year, which on average affected about 250,000 people and left more than 140 people dead.¹²



⁸ CRED, 2020. EM-DAT. The International Disaster Database.

⁹ Saad et al., 2018. Combating Desertification in Sudan: Experiences and Lessons Learned

¹⁰ National Council of Civil Defense/UNDP, n.D. Sudan National Disaster Risk Reduction Strategy 2016-2030.

¹¹ ibid

¹² CRED, 2020. EM-DAT. The International Disaster Database.

3. SCOPE OF THE ASSESSMENT

OVERVIEW OF THE FLOOD EVENT

In 2020, after months of unusually heavy rains across Central and North-Eastern Africa, Sudan was affected by the worst flooding in over three decades.

Since the start of the rainy season in July, large rainfall surpluses had been recorded throughout the Greater Horn of Africa.

Heavy rains in the upstream catchments of the Blue Nile (Ethiopia) and the White Nile (South Sudan) resulted in a dramatic increase of Nile water levels¹³. In total, the floods affected all 18 States in Sudan.

Areas along the Blue and White Nile as well as the capital Khartoum were heavily flooded, while also non-Nile States, in particular North Darfur, were impacted by heavy local rains and flash floods.

Significant impacts of flooding started in mid-July 2020 when heavy rains and flash floods affected three internally displaced people's camps in Nyala Town, South Darfur state.

On July 29, the Bout Earth Dam, in the Tadamon locality of Blue Nile state, exceeded its full capacity and collapsed, seriously affecting Bout Town, destroying more than 1,200 houses, and compromising access to water for more than 100,000 people living in the area.

Then, from July 31 - August 1, heavy rain in Khartoum caused further flooding and destruction. By August 12, the number of people affected had exceeded 185,000 with all states except Central Darfur being affected. The situation continued to worsen in the second half of August with the affected population reaching 506,000 by the end of the first week of September and peaking at 875,000 by the end of September.¹⁴

On September 4, Sudan's Security and Defence Council declared a three-month, nation-wide state of emergency and designated the country a natural disaster zone.

The emergency proclamation was decided in a meeting of the Security and Defence Council chaired by Abdel Fattah al-Burhan, chairman of the Transitional Sovereign Council.

The Sovereignty Council established a High Flood Coordination Committee to mitigate and address the impact of the floods of 2020. The committee is headed by the Ministry of Labour and Social Development and includes all relevant ministries, the states, and coordinating authorities as well as local, regional, and international response organizations.

The Government's Humanitarian Aid Commission (HAC) has activated and is leading a national Flood Task Force to coordinate the response with all partners. Government institutions, UN agencies, NGO partners, and the private sector are providing life-saving assistance to people affected¹⁵. Moreover, an Emergency Coordination Operation Centre (EOC) has been established in September to improve the management of the response to emergency incidents through effective coordination between major relevant entities.

OBJECTIVES OF THE ASSESSMENT

This assessment of the Sudan Floods 2020 follows a governmental "Request for Support on Flood Emergency Response".

The request was issued by the Ministry of Labour and Social Development (MoLSD) to the World Bank Country Director on October 1, seeking

¹³ Indicative of the severity of the event is the fact that, according to measurements at the Dayem station, the water level on the Blue Nile was higher than the 1946 level and close to the 1988 flood levels, with the level reaching 17.5 meters in late August, according to the Sudanese Ministry of Irrigation.

¹⁴ World Bank, 2020. GRADE Note on July-September 2020 Sudan Floods, as of October 30, 2020 (unpublished)

¹⁵ UNOCHA, 2020. Sudan: Floods, Nationwide State of Emergency Flash Update No. 6, as of 6 September 2020

assistance to carry out the assessment of the resultant damage and impacts by the floods. The objective of this Rapid Post Disaster Needs and Recovery Assessment (RPDNRA) is to assess the extent of the flood impact on Sudan and, on the basis of these findings, to produce an actionable and sustainable Recovery Strategy for leveraging targeted flood response and recovery policy/planning, including mobilizing financial and technical resources. The assessment specifically sets out to: (i) support country-led assessments and initiate recovery planning processes through a coordinated inter-institutional approach; (ii) evaluate the impact of the floods on infrastructure and assets, service delivery, governance and social processes; (iii) assess needs to address underlying risks and vulnerabilities so as to reduce risk and build back better; (iii) estimate the damage and losses caused by the floods; (iv) identify recovery and reconstruction needs; (v) develop a recovery strategy; and (vi) provide the basis for mobilizing resources for recovery and reconstruction through local, national and international sources.

The assessment is guided by the following principles:

- The assessment should be a government-led exercise;
- The assessment should be simple, rapid, and useful to both the Transitional GoS and the affected population and not create an additional burden for the teams on the ground;
- The assessment should build on the work and data collection efforts by the Transitional GoS and development partners;
- The assessment should maximize the use of satellite imagery and remote sensing technology and other readily available data on population, infrastructure, assets, etc., while performing ground-truthing and data collection on the ground to the extent feasible;
- The assessment process should provide capacity building opportunities on damage assessment and recovery planning for the relevant government officials; and
- The assessment should provide credible estimates and figures.



APPROACH AND METHODOLOGY

The RPNRA has been adapted from the Post Disaster Needs Assessment (PDNA) methodology¹⁶ to the wider development context of Sudan in a manner to undertake a rapid and concise assessment that links to the existing needs assessments and informs the development agenda in the country. The assessment is organized along sector lines. Given the large scale and the extensive damage of the flood event, the assessment comprises four thematic areas (sectors) with in total sixteen sub-sectors.

SOCIAL SECTORS



HOUSING



HEALTH &
NUTRITION



EDUCATION



CULTURE



SPORTS

INFRASTRUCTURE SECTORS



TRANSPORT



ENERGY &
ELECTRICITY



WATER,
SANITATION
& WATER
RESOURCES
MANAGEMENT

CROSS CUTTING SECTORS



DISASTERS RISK
REDUCTION



EMPLOYMENT
LIVELIHOODS
& SOCIAL
PROTECTION



GENDER



GOVERNANCE



ENVIRONMENT



HUMAN IMPACT
ASSESSMENT

PRODUCTIVE SECTORS



MANUFACTURING



AGRICULTURE,
FISHERIES &
LIVESTOCK

¹⁶ The PDNA methodology may be found at <https://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/pdna.html>

Each assessment was led by a sector team consisting of specialists from government authorities and development partner agencies. In general alignment with the PNDA approach, each sector assessment was prepared based on a standard template with four main elements:

- *Pre-Disaster context and baseline information:* analysis of the general pre-disaster conditions, which serve as a baseline to compare with post-disaster conditions in Sudan;
- *Assessment of disaster effects:* assessment of (i) damage to infrastructure and physical assets, (ii) disruption of access to goods and services, (iii) governance and decision-making processes, and (iv) flood impacts on increasing risks and vulnerabilities;
- *Assessment of disaster impacts:* assessment of the economic and human development impacts of the floods;
- *Recovery needs and strategy:* identification of recovery needs and development of a recovery strategy comprising early, medium, and long-term recovery and reconstruction interventions.

As the focal agency of the RPDNRA, the Emergency Coordination Operation Centre (EOC) led the assessment and the overall coordination between the governmental agencies and development partners. Coordination support and technical advisory for the assessment was provided by the World Bank and the United Nations Development Programme (UNDP). International and local experts financed by the development partners supported the sector teams remotely as well as on the ground.

The RPDNRA was organized along five phases:

- *Phase 1 – Preparation:* define coordination team, mobilize sector teams, and designate roles and responsibilities; determine the scope of the respective sector-wide assessments; identify data sources and information gaps; establish contact with key governmental and non-governmental partners and informants
- *Phase 2 – Data Collection:* collect pre-disaster baseline data (demographic, socio-economic, census etc), remote sensing data (satellite imagery, hazard/exposure data) and secondary data (reports, assessments, damage/loss analyses); identify data gaps and collect primary data (key informant interviews) and in situ data (field visits)
- *Phase 3 – Data Analysis and Consolidation of Sector Findings:* sector teams review and analyse collected data (desk review, statistical analysis, GIS/remote sensing applications); sector teams cross-check data with other sectors; sector teams document findings (impacts, damage, losses and needs) and validate with government counterparts
- *Phase 4 – Draft Assessment Report and Recovery Strategy:* coordination team develops structure of the assessment report and synthesizes key findings and priority recovery and reconstruction needs from sector analyses; coordination team drafts recovery strategy in coordination with sector teams; draft reports are shared with government for feedback and validation
- *Phase 5 – Finalization of Report:* refine reports and incorporate feedback; submit final report for Government approval



SOCIAL SECTORS



HOUSING



HEALTH &
NUTRITION



EDUCATION



CULTURE



SPORTS

4. HOUSING

SUMMARY

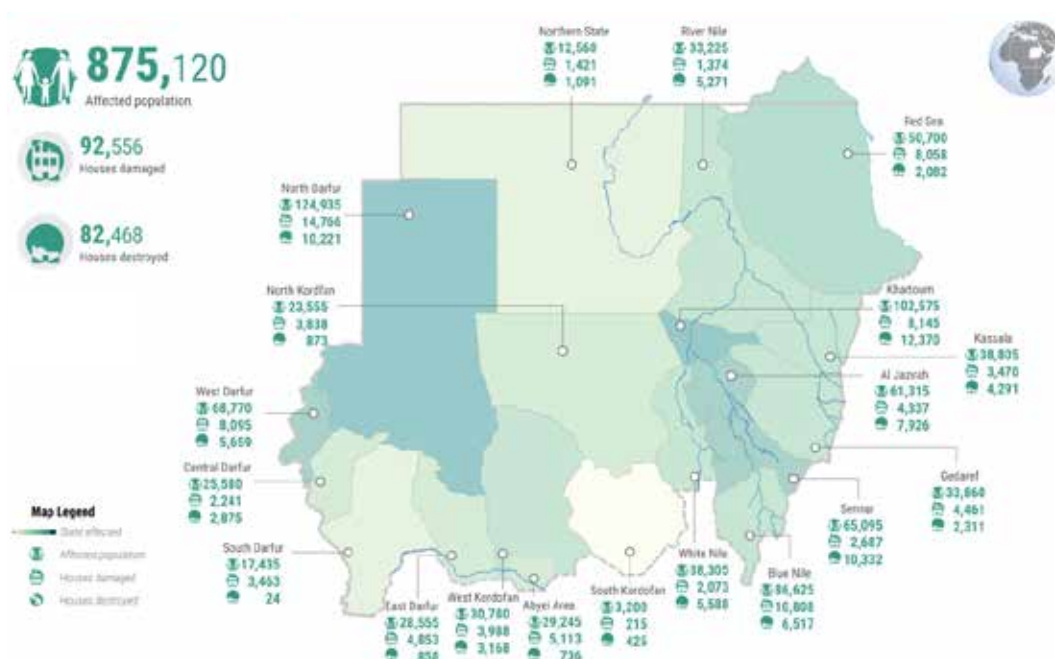
In total 82,618 houses were reported to have been totally destroyed and another 93,406 partially damaged by the floods. North Darfur, Khartoum, Sinnar, Blue Nile, and West Darfur are the most affected states in terms of housing effects. In Sudan, housing even in the urban areas is predominantly informal. Many houses, especially in the rural areas, are single story, built with walls made from a mixture of mud bricks or compacted earth and wooden elements, and are particularly vulnerable to rapidly flowing flash flood waters or lingering riverine flood waters. Figure 4 1 shows the spatial distribution of the currently reported damages by state across Sudan as per the Humanitarian Aid Commission (HAC) and UN Office for the Coordination of Humanitarian Affairs (OCHA).

Estimated damages in the housing sector are derived using knowledge of the replacement value of the various housing

types affected by the flooding. The total economic value of damages to fully destroyed and partially damaged houses was estimated at USD 2,920.8 million, including damaged household goods. The total economic value of losses including demolition and debris removal, rental losses, and temporary accommodation was estimated at USD 67.4 million.

Reconstruction and recovery needs were estimated based on the damages and losses suffered by the housing sector. Reconstruction needs were estimated on the basis of achieving disaster resiliency of the damaged or destroyed housing stock and the principle “build back better (BBB)” was incorporated in cost estimates. Short-, medium- and long-term recovery measures, including detailed field survey on flooding effects on housing, housing recovery strategy, community consultations, housing repair & rebuilding guidelines and training, physical reconstruction, housing data management system, land-use planning, and housing

FIGURE 4 - 1: Spatial distribution of housing damages (OCHA, Situation Report, October 11, 2020)



recovery management, monitoring and evaluation, were proposed and their costs were estimated.

PRE-DISASTER AND SECTOR CONTEXT

Sudan, with a population of 43,849,260 people, is experiencing rapid urbanization from massive rural-urban migration and continuous influx of internally displaced persons (IDPs) to urban centres. Demographers estimate close to 35 percent of Sudanese population dwell in urban areas in 2019 (UNDESA, 2019). Nationally, the vast majority of the population (85.5 percent) are homeowners and 7 percent live in rented housed (CBS, 2014). The higher prices of stock in urban areas lowers the rate of owner-occupied housing to 67.3 percent (CAHF, 2019). Demand has long outstripped supply in Sudan's housing market. The high levels of demand contributed to an annual house price appreciation ranging between 20 percent and 25 percent in the past five years. Many of the IDPs who were forced to flee their homes from war and conflicts have ended up living in make-shift camps in peri urban areas around the major cities. This influx is deepening the already critical housing problem, with demand hugely outstripping supply (CAHF, 2019).

Residential areas in Sudanese cities are categorized into first-, second- and third-class areas, based on a classification system that dates from colonial times. Classes are distinguished by specified criteria, namely income level of its residents, plot sizes, service, and construction standards. Four classes: (a) first-class areas in which land parcels typically range from 500-800 square meters, and up to 1,200 square meters; (b) second- class areas where the plot areas range from 400 to 600 square meters; (c) third-class areas where the plots range from 300 to 400 square meters; and (d) fourth-class areas where the plots are typically 200 square meters. A concomitant standard of construction is applied whereby houses in first-class areas are required to adopt high construction standards and use permanent building materials, while

these high standards are relaxed as one moves down the classification system. Increasing urbanization and proliferating urban growth, the threat to agricultural lands and the high cost of services forced the planning authorities in the 1980s to reduce the average plot sizes to 400, 300 and 200 square meters in first, second and third-class areas respectively (World Bank, 2011).

The construction sector experienced positive growth following the country's second civil war from 1983 to 2005. This growth has been attributed to the national development projects for infrastructure repair and rehabilitation during this period. The construction industry became the largest share of the Sudanese economy after the secession of oil fields to South Sudan in 2011. However, a large portion of building materials are imported. The local industry is incapable of matching neither the demand nor the specifications required by the regulations. Hence, a large portion of building materials (specially the finishing materials) for the 1st and 2nd class is imported. Despite this industry's vitality, housing supply remains a longstanding and ongoing concern. The national housing deficit is estimated at 4.3 million units, with a deficit of 2.5 million units in Khartoum state only (CAHF, 2019). The majority of Khartoum's urban poor rely on their own resources to construct their shelters, resulting in a proliferation of poor housing, often illegal, based on varying degrees of self-help by the inhabitants.

The government established the National Fund for Housing and Reconstruction (NFHR) in 2008 to build low-cost housing units. However, the government's lack of funding has constrained the NFHR. Input costs, such as the price of building materials, are too costly. Importers pay exorbitant fees to customs. The government also imposes local fees on building materials, like cement. As a result, banks typically require mortgage applicants to provide a quotation on the cost of building materials to contain the financial risk with new home construction projects (CAHF, 2019), which becomes obstacles to activate the nascent housing finance market.

The central government continues to struggle with the formalization of land tenure and titles. Legally, the national government owns 90 percent of the country's land. However, the government does not recognize customary land tenure and practically all land in Sudan is allocated on a leasehold basis (Hafagalla, 2018). Informal leases between land brokers connected to the government remain common. Areas of improvement include strengthening the development

of the National Land Commission as well as outstanding land issues from previous conflicts. Moreover, land rights for women remain highly insecure (CAHF, 2019).

Table 3 1 shows baseline housing stocks by various housing types. In the absence of recent statistics, the housing stocks were calculated based on the estimated 2020 population, average household size per state, and proportion of housing typology in the 2011 Labour Force Survey.

TABLE 4 - 1: Baseline housing stocks

States	Population	Total	H1 Tent	H2 Straw Mats	H3 Mud/ Gottiya	H4 Sticks/ Gottiya	H5 Flat/ Apartment	H6 1F Mud Building	H7 1F Concrete Building	H8 Wooden Plank	H9 Multi-F Building
Khartoum	7,286,523	1,216,448	0	10,948	32,844	4,866	4,866	608,224	531,588	1,216	21,896
Northern	967,005	165,018	0	495	0	660	0	161,718	2,145	0	0
Kassala	2,164,514	391,413	391	115,467	95,113	25,050	391	130,341	24,659	0	0
Blue Nile	1,161,258	206,263	0	3,300	125,614	22,895	0	35,683	18,770	0	0
White Nile	2,297,076	400,886	0	3,608	25,256	20,846	0	317,902	33,274	0	0
River Nile	1,441,140	219,686	1,098	8,568	220	220	0	182,779	26,802	0	0
Gezira	4,799,392	799,899	0	800	22,397	800	0	335,158	440,744	0	0
Red Sea	1,825,180	340,519	9,194	112,371	14,642	16,004	0	38,138	89,216	60,612	341
Gadarif	1,837,506	329,302	0	988	95,827	169,591	0	44,456	14,160	4,281	0
Sinnar	1,718,259	297,792	298	0	30,673	10,423	0	160,212	96,187	0	0
North Kordofan	2,760,441	518,880	1,557	2,076	75,238	322,743	0	87,172	29,576	0	519
South Kordofan	1,193,095	205,706	206	3,497	42,993	82,900	3,497	31,679	40,936	0	0
West Kordofan	1,730,934	298,437	298	5,073	62,373	120,270	5,073	45,959	59,389	0	0
North Darfur	2,827,153	503,052	9,558	2,515	112,181	292,776	503	46,784	38,735	0	0
South Darfur	3,747,786	638,464	5,108	70,870	94,493	395,209	638	22,985	49,162	0	0
West Darfur	1,018,581	212,204	7,427	29,921	53,476	85,094	0	18,462	17,825	0	0
Central Darfur	757,408	139,486	2,883	11,949	28,967	74,485	93	10,043	11,066	0	0
East Darfur	1,605,653	295,700	6,111	25,332	61,407	157,904	197	21,290	23,459	0	0
Total	41,138,904	7,179,154	44,129	407,777	973,712	1,802,737	15,259	2,298,984	1,547,691	66,110	22,755

POST-DISASTER EFFECTS FOR THE SECTOR

The floods caused total or partial damage to 176,024 housing units across the country. An estimated 82,618 houses have been completely destroyed and another 93,406 suffered partial damage. Across provinces, the housing stock in North Darfur, Khartoum, Sinnar, Blue Nile, and West Darfur has been the worst affected, with almost 89,600 housing units completely or partially damaged, which is 51 percent of the total affected housing stock.

Damages were calculated due to structural damage to the housing stock caused by the floods. The damage costs vary depending on the severity of damage, size of houses and construction materials. For fully destroyed houses, reconstruction cost was calculated for each housing typology; for partially damaged houses, considered repairable, repair cost was calculated for each housing typology; the cost of replacing the destroyed household goods was calculated and added to the damages.

Change in flows (losses) were estimated for (i) debris demolition and removal; (ii) rental income losses to the rented housing affected by the floods; and (iii) temporary shelter or alternative temporary accommodation for the households who have lost their homes.

The following will be reviewed in more detail as part of the recovery efforts:

Governance and social process for land and property registration, settlements in informal settlements and hazardous land, and land for relocation areas; status of services provision to affected settlements; administrative and market capacity to manage recovery efforts; availability of local construction materials, tools and equipment, transport, and building skills; locally present social system and community-based organizations.

Increased risks and vulnerabilities should be assessed and relocation plans for settlements exposed to disaster risks and vulnerabilities should be prepared during the recovery process. The aspect of improving disaster resiliency for the Housing Sector was addressed only to a limited extent, primarily because resilience action plans and regulations in this sector do not exist.

Cross-cutting Issues

New vulnerabilities such as lack of a sense of security particularly for women for lack of privacy in housing or temporary shelters were noted but no exploitation or gender-based violence was reported. Livelihoods were affected due to the loss of rental incomes, damage to agricultural activities and livestock within housing premise.

Environment and health risks increased after flooding due to damages to sanitary facilities, inundation of pit latrine by flooding and associated environmental and public health risks.

TABLE 4 - 2: Summary table of damage and loss for the Housing Sector

Damage and Loss	Damages (USD 000)	Losses (USD 000)
Damages		
a) Fully destroyed houses	513,428	
b) Partially damaged houses	2,380,983	
c) Damaged household goods	26,404	
Losses		
a) Debris demolition and removal		17,602
b) Rental income losses		20,052
c) Temporary shelter/housing		29,743
Total	2,920,815	67,398

MACRO-ECONOMIC AND HUMAN IMPACT

The majority of fully destroyed houses were belonging to the poor and housing was the most important asset owned by the household. Some used the housing for livestock, backyard gardens and other home-based enterprises, thus the loss of shelter was a double loss to many of the poorest in the society. Populations affected by disasters experienced a significant loss of employment and income, a deterioration of livelihood options and opportunities, a decline in the provision of and access to critical services, increased prices, and other negative effects. While the exact impact was not measured, the flooding significantly affected the Housing Sector including land and is likely to have serious consequences

for increased poverty, particularly for small and marginal households.

RECOVERY NEEDS AND STRATEGY

Reconstruction and recovery needs were estimated based on the damages and losses suffered by the housing sector. Reconstruction needs were estimated on the basis of achieving disaster resiliency of the damaged or destroyed housing stock. The principle "build back better (BBB)" is incorporated in cost estimates of fully destroyed houses, building stronger foundation, use of improved quality and standards and hazard-resistant construction materials. The increased cost of reconstruction due to application of these measures is addressed by applying the "BBB coefficient" of 1.2.

TABLE 4 - 3: Summary of reconstruction and recovery needs

Damage and Loss	No. of houses/ area	Value of damage/ loss (USD 000)	BBB coefficient	Reconstruction/ recovery needs (USD 000)
a) In-situ reconstruction of houses				
Fully destroyed	57,833	359,400	12	431,280
Partially damaged	93,406	2,380,983	12	2,857,179
b) Reconstruction of houses in relocation site				
New land plots (square meters)	5,948,496	297,425		297,425
Infrastructure - water, electricity, sanitation	24,785	7,436		7,436
Construction of houses	24,785	154,029	12	184,834
Planning and administrative costs	24,785	744	12	744
c) Replacement of household goods	176,024	26,404		31,684
d) Debris demolition and removal	176,024	17,602		17,602
	24,785	29,742		29,742
Total				3,857,927

Principles and priorities for housing reconstruction and recovery are as follows:

- Rebuilding is owner-driven;
- Rebuild in-situ as far as possible, but relocate settlements away from high-risk areas;
- Adopt and promote the use of cost-effective, hazard-resistant engineering designs and reconstruction standards, taking into account availability of local construction materials, and tools and equipment;
- Availability of construction materials during the reconstruction phase will be critical, particularly with the compounded needs of multiple sectors. Special efforts will be needed such as setting up of construction material hubs throughout the affected areas;
- Train artisans, contractors, home-owners, and construction supervisors on the safe reconstruction and recovery, including the use of cost-effective and hazard-resistant engineering designs, reconstruction standards and practices;
- Recycling materials from debris will reduce reconstruction costs and have a positive environmental impact. Communities need to be educated on optimal reuse of materials from housing debris;
- Develop incentivized community protection approaches and programs to ensure greater disaster (flood) risk reduction for communities at high risk of recurrent flooding;
- Establish participatory and inclusive information management and grievance redressal systems. Community mobilization will be needed to ensure information dissemination, better construction methods/skills training, mutual support, and oversight. Moreover, vulnerable-headed eligible households will need special attention and assistance via such mechanisms;
- Information dissemination shall be a crucial part of the Government's strategy. This should include information on the full range of assistance options, their eligibility criteria, and the means of accessing them, as well as improved construction

methods for hazard-resistant houses;

- Settlement planning and development should be reviewed in light of the possibility of introducing flood protection measures for entire communities in areas prone to risks of recurrent flooding.

Recommendations for DRR and Building Resilience in Sector

Reconstruction is carried out according to BBB – retrofitting, repairing, rebuilding or relocation and in accordance with agreed safe building practices; relocation is limited to the enforcement of safety from hazards; cost-effective, hazard-resistant engineering designs and reconstruction standards will be adopted, taking into account availability of local construction materials, and tools and equipment; a city-wide approach will be adopted to policies aimed at addressing informal settlements and land-use planning, and securing the full range of durable solutions for displaced population for their return, relocation and local integration.



TABLE 4 - 4: Table of Short, Medium & Long-term Recovery Initiatives and Costs

Item	Description	Cost (USD 000)			Total
		Short-term (<1yr)	Medium-term (1-3yr)	Long-term (>3yr)	
Detailed field survey for flooding effects and refining recovery strategy	Undertaking detailed field survey for each state affected by the flooding to measure and verify the effects, damages, and losses; and refining the recovery strategy according to the verified effects	221			221
Housing recovery strategy	Development of a systematic housing recovery strategy focused on disaster risk reduction, building back better, including detailed assessment of effects, relocation to less vulnerable areas, cost-effective and hazard-resistant reconstruction methods, land tenure management	50			50
Communication and consultations	Information dissemination to, and collection from, the affected communities. This should include information on the full range of assistance options, their eligibility criteria, and the means of accessing them, as well as on improved construction methods for hazard-resistant houses.	261	131	131	523
Housing repair and rebuild guidelines and training	Development, dissemination, and training of guidelines for housing repair and reconstruction for affected communities and construction sector based on the principle of 'building back better', using innovative resilient housing models such as improved foundation, material, and construction designs	18,623	7,921		26,544
Reconstruction of housing and physical assets	Reconstruction, repair, replacement, relocation costs for housing and physical assets; debris demolition and removal; temporary shelter/housing	2,700,549	1,157,378		3,857,927
Housing data management system	Establishing a system to ensure an updated inventory of housing and assets which can be effectively used in the development planning, assessment, and verification of damage during disasters, and in the process of putting together assistance packages.		200	100	300

Item	Description	Cost (USD 000)			Total
		Short-term (<1yr)	Medium-term (1-3yr)	Long-term (>3yr)	
Land-use planning	Review and revision of land-use plans, incorporating land zonation aligned with structure plans, based on risk profiling maps, revision, and enforcement of construction planning, and building regulations in all states. This could also include reviewing and amending as appropriate bylaws/ regulations/ consenting requirements to expediate housing recovery whilst ensuring appropriate environmental and social requirements		1,000	2,000	3,000
Housing recovery management, monitoring and evaluation	Housing recovery management, supervision, monitoring and evaluation at the national, state, locality levels	13,503	5,787		19,290
Total		2,733,207	1,172,417	2,231	3,907,853

Implementation Arrangements

National Council for Urban Development and Physical Planning is responsible for the PDNA for the housing sector at the national level and supported by State

Ministry of Physical Planning at state level. Housing recovery planning, management, supervision and monitoring and evaluation will also be undertaken by the same national and state level implementation arrangements.

5. HEALTH

SUMMARY

The main drivers of the humanitarian crisis include, but are not limited to, recurrent and protracted armed conflict, population displacement, disease outbreaks, and floods. For the last several years, three groups of epidemics dominated the history of disease outbreaks in Sudan; namely, water and sanitation related diseases (e.g. cholera), vector-borne diseases (e.g. malaria and viral haemorrhagic fevers) and vaccine preventable diseases (e.g. measles, polio, and diphtheria).

According to the Humanitarian Aid Commission (HAC) report, a total of more than 888,150 people were affected by the recent flood in all 18 States of Sudan, including Abyei, between the period June 10 to October 15, 2020. Thereof, 123 people lost their lives while around 200 people were injured. According to Federal Ministry of Health (FMOH) report, a total of 44 health facilities, including 6 Rural Hospitals, 22 Primary Health Care Centres (PHCCs) and 16 Primary Health Care Units (PHCUs) were damaged, leading to disruption of essential lifesaving health services in 16 States of Sudan. All affected health facilities belong to the government. No private health facility was reported as damaged.

The damage constitutes 0.7% (44 out of 5,997) of the total health infrastructure in the country. A minimum of 362,975¹⁷ people, which constituted 1.96%¹⁸ of the population who had access to health services in Sudan, was denied access to essential health services due to the damage. The total cost of damage on infrastructure amounted to USD 5,162,040. A total of medical equipment and furniture worth USD 99,000 was estimated to be damaged due to the flood. Cost of loss is the flood response worth USD 8,683,550 used for establishment of mobile clinic and respond to disease outbreaks.

The public health consequences of floods are multi-fold. Flood causes direct injuries, drowning, mass casualties, displacement, and collapse of basic infrastructures such as houses, latrines and health facilities creating favourable grounds for water and sanitation related and vector borne diseases to flourish. Hence, the recovery plan takes into account interventions aimed at responding to the flood as a hazard and subsequent public health consequences. The total recovery plan for health sector is estimated at USD 47 million.

TABLE 5 - 1: Summary of damages to health facilities during flood 2020 in Sudan (Source: FMOH)

Type of health facilities	Level of damages				Total
	Minor (15% damage)	Moderate (35% damage)	Major (50% damage)	Complete (100% damage)	
Rural Hospital	5	1	-	-	6
PHCC	5	11	1	5	22
PHCU	3	5		8	16
Total	8	17	1	13	44

¹⁷ The estimated number of populations denied access to health services due to the damage of the 44 health facilities was calculated based on the minimum catchment population per type of health facilities and level of damage as shown in the table.

¹⁸ The assumption is that only 43% of the 43 million population in Sudan have access to health services (i.e. 18,490,000 pop); of which, 362,975 population who lost access to health services due to damage constitutes 1.96%.

PRE-DISASTER AND SECTOR CONTEXT

Sudan, with a current population of 43,849,260¹⁹, is administratively divided into 18 States and 187 localities. Sixty-seven percent of the population lives in rural areas. The United Nations Development Program (UNDP) Human Development Report for 2019 ranked Sudan at 168th out of 189 countries and territories in the world with Human Development Index (HDI) value of 0.507 which put the country in the low human development category²⁰. Life expectancy at birth (years) is 65.1. The Sustainable Development Goal (SDG) 3 aims to “ensure healthy lives and promote well-being for all at all ages”. However, across Sudan, maternal, new-born and child health indicators are still far from reaching the SDG targets for 2030, unless accelerated efforts exerted. The maternal mortality ratio remains unacceptably high at 295 per 100,000 live births (in 2017) which is much higher than the regional average for Eastern Mediterranean Region (EMR) which is 164²¹. The under-five mortality rate (probability of dying by age 5 per 1,000 live births) in Sudan stood at 68.21% in 2019, which is almost double the rate of global under-five mortality rate (34%)²².

Infrastructure and Assets

The Transitional Constitution of 2005 in Title II (Bill of Rights) in Article 46 specifies that the state undertakes the development of public health and the establishment, development and rehabilitation of basic therapeutic and diagnostic institutions and must provide primary health care and emergency services free of charge to all citizens.

Although the Constitution gave the states exclusive authority to establish, regulate and provide health care, including hospitals and other health institutions, it excluded national facilities to be within the jurisdictions of the national level of government.

The basic health care is provided on two levels: Community Services Package (services provided outside health institutions by health staff), and Health Institutions Services Package. This package is located at areas outside the coverage of health institutions in remote or peripheral areas or nomadic communities are provided with health assistant staff and/or community midwife they provide health services such as disease control and environmental health services to the communities.

This package includes all basic healthcare services provided at the level of, primary health unit (B1), Primary Health Centre (B2) and Local Hospital (B3).

Service delivery, availability, access, and demand

Health services in Sudan are provided by the Federal and State Ministries of Health, military medical services, police, universities, Non-Governmental Organizations (NGOs) and private sector. The public health care delivery system in Sudan is provided through close to 6,000 health facilities comprising 511 hospitals, 1,398 Primary Health Care Centres (PHCCs) and 4,088 Primary Health Care Units (PHCUs). In addition, there are tertiary level teaching hospitals, universities with medical and health science facilities, and allied health cadre's schools and institutes.

¹⁹ <https://www.worldometers.info/demographics/sudan-demographics/>

²⁰ Human Development Report 2019. Inequalities in Human Development in the 21st Century

Briefing note for countries on the 2019 Human Development Report, Sudan <http://hdr.undp.org/en/countries/profiles/SDN>

²¹ GH0 | Global Health Observatory Data Repository (Eastern Mediterranean Region) | Maternal deaths - Data by WHO region

²² Child Mortality - UNICEF DATA

TABLE 5 - 2: Number and type of health facilities in Sudan

Healthcare facility	Public sector	Private sector	Total
Health Post/Unit	4,088	n/a	4,088
Health Centre	1,398	n/a	1,398
District /Locality hospital	242	n/a	242
Provincial /State hospital	n/a	256	256
Regional/ Referral hospital	13	n/a	13
Total			5,997

TABLE 5 - 3: Standard population covered by health institutions²³

Type of health facility	Catchment population
Rural/community hospitals	100,000 – 250,000
Primary Health Centre	20,000 – 50,000
Primary Health Unit	5,000-15,000

As summarized in Table 4 4, access to health services is low with large disparities between States and urban and rural settings. Most health services are concentrated in urban and central areas as opposed to the peripheries. The population coverage with essential health services was 43% (in 2015) which is way below the universal health coverage target by the year 2030. Access to and utilization of essential child health services such as immunization are also low. The full immunization coverage among one-year-olds was 59.45% (in 2014) while Measles-Containing-Vaccine second-dose (MCV2) coverage by the national recommended age was 74% (2019) which did not provide the level of herd immunity in the population to prevent occurrence of epidemic-prone disease outbreaks. Utilization of

key maternal health services are also low in Sudan. Unmet need for family planning is key indicators for measuring improvements in access to reproductive health. The proportion of married or in-union women who have their need for family planning satisfied with modern methods in Sudan was 30.1% (in 2014) which is way below the ambitious target 3.7 of the Sustainable Development Goals (SDGs) that calls on countries “by 2030, to ensure universal access to sexual and reproductive health-care services, including for family planning”²⁴. Antenatal care coverage of at least four visits, key to measure quality of maternal health services, was 50.70% (in 2012-2014). Births attended by skilled health personnel (in the two or three years preceding the survey) was 77.7% (in 2014).

²³ Ebrahim M. A. Ebrahim, Luam Ghebrehewot, Tasneem Abdalgfar, and Muhammad Hanafiah Juni, (2017) “Health Care System in Sudan: Review and Analysis of Strength, Weakness, Opportunity, and Threats (SWOT Analysis);” Sudan Journal of Medical Sciences, vol. 12 (2017), issue no. 3, 133–150. DOI 10.18502/sjms.v12i3.924

²⁴ [FamilyPlanning_DataBooklet_2019.pdf](#) (un.org)

TABLE 5 - 3: Key Baseline Data for the Sector

Key health status and core performance indicators ^{25,26,27}	Latest available data by year
Health status and performance	
Population coverage with essential health services (%)	43% (2015)
Life expectancy at birth m/f	63/66 (2016)
Neonatal mortality rate (per 1,000 live births)	31.79‰ (2019)
Under-five mortality rate (probability of dying by age 5 per 1,000 live births)	68.21‰ (2019)
Full immunization coverage among one-year-olds	59.45% (2014)
Measles-containing-vaccine second-dose (MCV2) immunization coverage by the national recommended age	74% (2019)
Children under 5 who are stunted	38.2%
Proportion of married or in-union women who have their need for family planning satisfied with modern methods	30.1% (2014)
Antenatal care coverage-at least four visits	50.70% (2012-2014)
Births attended by skilled health personnel (in the two or three years preceding the survey)	77.7% (2014)
Maternal mortality ratio (per 100,000 live births)	295 (2017)
International Health Regulation (IHR)	
Average of 13 IHR core capacity score	67.2% (2019)
Health Care Financing	
Health care spending per capita, 2017 (US\$)	100-199 (2017)
Out of Pocket Expenditure as % of Total Health Expenditure	76% (2014)
Coverage of social health insurance	5-15% (2017)
External aid as % of total health expenditure	3% (2014)
General Government Health Expenditure as % of General Government Expenditure	12% (2014)
Total expenditure on health as % of GDP	8.43% (2014)
Health Workforce	
Ratio of physicians per 10,000 population	4.1 (2015)
Ratio of nursing and midwifery per 10,000 population	8.3 (2015)
Access to health and related services	
Availability of selected essential medicines in public health facilities	49.3% (2014)
Availability of selected essential medicines in private health facilities	69.5% (2014)
Ratio of primary health care facilities per 10,000 population	1.6 (2014)
Ratio of annual outpatient visits per capita	0.5 (2014)
Access to improved drinking water	55% (2015)
Access to improved sanitation facilities	24% (2015)

²⁵ Sudan (who.int) THE GLOBAL HEALTH OBSERVATORY DATA

²⁶ Global spending on health: a world in transition. Geneva: World Health Organization; 2019 (WHO/HIS/HGF/HFWorkingPaper/19.4). Licence: CC BY-NC-SA 3.0 IGO.

²⁷ WHO. Framework for health information systems and core indicators for monitoring health situation and health system performance (2016). Available: https://applications.emro.who.int/dsaf/EMROPUB_2016_EN_19169.pdf?ua=1&ua=1

Governance

The governance framework adopts a devolved structure of distinguished three tiers systems. The federal level is responsible for policy setting, planning, coordination, and international relations. The States are concerned with planning and implementation at the State level; while, the localities being responsible for providing health services to the local population. There are marked variations in terms of access, quality, and capacity of health systems between States and as well as urban and rural settings.

The public health system in Sudan has also been characterized by structural bottlenecks such as shortage and rapid turnover of qualified health workers, underfunding, stockout of essential medicines and underreporting compromising access to quality health services. The disease surveillance sentinel sites cover only 28% of the health facilities. This leave huge void to detect and control disease outbreaks in time. The population coverage with essential health services in Sudan stands at 43% in 2015, which is far behind the Universal Health Coverage (UHC) target by the end of 2030²⁸. Sudan has 4 medical doctor for 10,000 people (i.e. 1 doctor for 2,500 people (1:2,500)) which is less than the World Health Organization (WHO) desirable doctor–population ratio of 1:1,000. The out of pocket expenditure (76%) in Sudan exceeds the threshold of 10% household expenditure levying catastrophic health expenditure on vulnerable population to access health services on the time of need. The contribution of external aid (3%) and social health insurance (15%) is very low. The General Government Health Expenditure as a share of General Government Expenditure was 12% (2014), which was less than the head of African states pledged set of targets to allocate at least 15% of their annual budget to improve the health sector by the year

2015 enshrined in the Abuja declaration. Such constraints in resource allocation for health significantly compromised access, quality, and utilization of health services.

Risks and vulnerability

The health system in Sudan is severely impacted by myriads of man-made and natural hazards. There are a total of 8.6 million people in need of humanitarian health assistance in Sudan, according to the Humanitarian Needs Overview (2020)²⁹. The main drivers of the humanitarian crisis include, but are not limited to, recurrent and protracted armed conflict, population displacement, disease outbreaks, and floods. For the last several years, three groups of epidemics dominated the history of disease outbreaks in Sudan; namely, water and sanitation related diseases (e.g. cholera), vector-borne diseases (e.g. malaria and viral haemorrhagic fevers) and vaccine preventable diseases (e.g. measles, polio, and diphtheria). In Sudan, on average, 250,000 people have been affected by floods every year since 2016. White Nile, Kassala, Sinnar and West Kordofan States registered the worst figures of affected population with an average of more than 20,000 people every year (OCHA 2020). As a result, a multi-hazard preparedness and response plan targeting four major hazards (floods, disease outbreaks, mass casualty and drought) have been developed and used during the year 2020³⁰.

The latest (2019) average of 13 International Health Regulation (IHR) core capacity score for Sudan was 67.2%. Investment to strengthening the IHR core national capacities³¹, prioritizing minimum core capacities³² like detection, identification, and response to the public health events, is critical in building resilient health system in Sudan that can prevent, detect, respond, and recover from all hazard public health emergencies.

²⁸ WHO/WB: Tracking Universal Health Coverage: 2017 Global Monitoring Report

²⁹ HUMANITARIAN NEEDS OVERVIEW SUDAN (January 2020)

³⁰ Sudan Multi-Hazard Preparedness and Response Plan, 2020

³¹ <https://www.who.int/data/gho/indicator-metadata-registry/imr-details/4824>

³² The 13 core IHR capacities are: (1) National legislation, policy and financing; (2) Coordination and National Focal Point communications; (3) Surveillance; (4) Response; (5) Preparedness; (6) Risk communication; (7) Human resources; (8) Laboratory; (9) Points of entry; (10) Zoonotic events; (11) Food safety; (12) Chemical events; (13) Radio nuclear emergencies.

POST-DISASTER EFFECTS FOR THE SECTOR

According to FMOH report, a total of 44 health facilities, including 6 Rural Hospitals, 18 PHCCs and 10 PHCUs were damaged, leading to disruption of essential lifesaving health services in 16 States of Sudan. Of the total health facilities damaged, 6 health facilities were fully damaged while 38 health facilities sustained major, moderate, and minor

damages respectively. The damage constitutes 0.7% (44 out of 5,997) of the total health infrastructure in the country. On average, 539,000³³ people which constituted 2.9%³⁴ of the population who had access to health services in Sudan, were denied access to essential health services due to the damage.

Details of the location, type and ownership of damaged health facilities are summarized in Table 5-5.

TABLE 5 - 5: Number of health facilities and level of damaged during flood 2020, Sudan (Source HAC and SMOH)

S.N	State	Locality	Type of health facility	Name of Health Facility	Ownership		# Health facility damaged	Level of damage (minor=15%, moderate 35%, major 50% Complete=100%)
					Public	Private		
1	Khartoum	Jebel Awli	Rural locality hospital	Jebel Awlia	Yes		1	Minor
		Umdurman	Rural locality hospital	Umbeda	Yes		1	Minor
		Bahri	Rural locality hospital	Al Kebashi	Yes		1	Minor
2	West Kordofan	El Nohoud	PHCC		Yes		1	Complete
		El Nohoud	PHCC		Yes		1	Moderate
		Wd Banda	PHCC		Yes		1	Minor
		Alsnuot	PHCC		Yes		1	Minor
		Abugabad	PHCU		Yes		1	Moderate
3	River Nile	Berber	PHCC		Yes		1	Complete
		Berber	PHCU		Yes		1	Minor
		Berber	PHCU		Yes		1	Minor
		Berber	PHCU		Yes		1	Minor
4	Kassala	Aroma	PHCC		Yes		1	Minor
		Nahar Atbara	PHCU		Yes		6	Complete
		Khashm Algerba	PHCC		Yes		2	Complete
		North Delta	Rural locality hospital		Yes		1	Moderate
6	Al Geziera		PHCC		Yes		1	Moderate
			PHCC		Yes		1	Moderate
			PHCC		Yes		1	Moderate
			PHCC		Yes		1	Moderate

³³ The estimated number of population denied access to health services due to the damage of the 44 health facilities was calculated based on the assumption that the average damage to health facilities constitute moderate damage (i.e.35% damage), and considered the average catchment population of 35,000 (used PHCC as average) i.e. 44 HFs*35,000 catchment pop * 35% damage=539,000).

³⁴ The assumption is that only 43% of the 43 million population in Sudan have access to health services (i.e. 18,490,000 pop); of which, 539,000 population who lost access to health services due to damage constitutes 2.9%.

7	Northern	Dalگو	Locality general hospital	Yes	1	Minor
		Marawi	PHCU	Yes	1	Moderate
		Marawi	PHCC	Yes	1	Minor
		Marawi	PHCC	Yes	1	Major
8	South Darfur	Ketila	Locality general hospital	Yes	1	Minor
11	White Nile	Eldowem	PHCC	Yes	1	Moderate
12	North Darfur	Quly	PHCU	Yes	1	Complete
		Al leat	PHCC	Yes	1	Moderate
		Kebkabiya	PHCC	Yes	1	Moderate
		Al leat	PHCU	Yes	1	Moderate
13	East Darfur	El Furdos	PHCC	Yes	1	Moderate
14	Sinnar	Senja	PHCU	Yes	1	Complete
	Sinnar	El souky	PHCU	Yes	1	Moderate
	Sinnar	El souky	PHCC	Yes	1	Moderate
15	Gadaref	Guresha	PHCC	Yes	1	Complete
		Guresha	PHCC	Yes	1	Moderate
		Al mafaça	PHCC	Yes	1	Minor
16	North Kordofan	Um Rawapa	PHCC	Yes	1	Moderate
	Total				44	

In summary, as shown in Table 5 6, a total of 44 health facilities in 16 States sustained various level of damage due to the floods. Thereof, 13 health facilities (5 rural hospitals, 5 PHCCs and 3 PHCUs) experienced minor damage (15% damage); 17 health facilities (1 rural hospital, 11 PHCC and 5 PHCU) sustained moderate damage (35% damage); 1 PHCC faced major (50% damage) while 13 health facilities (5 PHCC and 8 PHCUs) completely damaged (100% damage) due to the flood.

TABLE 5 - 6: Summary of damages to health facilities during flood 2020 in Sudan (Source: FMOH)

Type of health facilities	Level of damages				Total
	Minor (15% damage)	Moderate (35% damage)	Major (50% damage)	Complete (100% damage)	
Rural Hospital	5	1	-	-	6
PHCC	5	11	1	5	22
PHCU	3	5		8	16
Total	8	17	1	13	44

The damage constitutes 0.7% (44 out of 5,997) of the total health infrastructure in the country. A minimum of 362,975 people, which constitutes 1.96% of the population who had access to health services in Sudan, was denied access to essential health services due to the damage.

³⁵ The estimated number of populations denied access to health services due to the damage of the 44 health facilities was calculated based on the minimum catchment population per type of health facilities and level of damage as shown in the table.

³⁶ The assumption is that only 43% of the 43 million population in Sudan have access to health services (i.e. 18,490,000 pop); of which, 362,975 population who lost access to health services due to damage constitutes 1.96%.

TABLE 5 - 7: Estimated affected population during flood 2020 in Sudan

Type of health facilities	Estimated minimum number of catchment population affected by the damages				Total pop denied access to health services due to damage
	Minor (15% damage)	Moderate (35% damage)	Major (50% damage)	Complete (100% damage)	
Rural Hospital	5 hospital X 100,000 pop X 15% damage=75,000 pop	1 hospital X 100,000 x 35%=35,000 pop	-	-	110,000
PHCC	5 PHCCs X 20,000 catchment pop X 15% damage =15,000 pop	11 PHCCs x 20,000 pop X 35%=77,000 pop	1 PHCC X 20,000 pop X 50%=10,000 pop	5 PHCC x 20,000 pop X 100%= 100,000 pop	202,000
PHCU	3 PHCU X 5,000 catchment pop X 15% damage = 2,225 pop	5 PHCU x 5,000 pop X 35%=8,750 pop	-	8 PHCU X 5,000 pop X 100%= 40,000 pop	50,975
Total					362,975

The average building costs per square metre in Sudan vary from SDG 1,200/m² (USD 67/m²) to SDG 3,000/m² (USD167/m²)³⁷. The team used average cost in US\$ in calculating the cost of rehabilitation and construction which is US\$ 117/m² and used the current exchange rate of 55 SDG for US\$ 1. Standard space for PHCU is 600 square metres; PHCC is 3,000 square metres and rural hospital is 7,000 square metres. Accordingly, the cost of construction is calculated per facility type and level of damage as below. The total cost of damage on infrastructure amounted to USD 5,162,040.

TABLE 5 - 8: Estimated cost of damaged health facilities during flood 2020 in Sudan

Type of health facilities	Estimated cost of damage to the infrastructure/building				Estimated total cost of damage on the infrastructure
	Minor (15% damage)	Moderate (35% damage)	Major (50% damage)	Complete (100% damage)	
Rural Hospital	5 hospital X 7,000sqm X USD 117/m ² X 15% damage = USD 614,250	1 hospital X 7,000 sqm USD 117/m ² x 35%= USD 286,650	-	-	USD 900,900
PHCC	5 PHCCs X 3,000sqm X USD 117/m ² X 15% damage =USD 263,250	11 PHCCs x 3,000sqm X USD 117/m ² X 35%= USD 1,351,350	1 PHCC X 3,000sqm X USD 117/m ² X 50%= USD 175,500	5 PHCC x 3,000sqm X USD 117m ² X 100%= USD 1,755,000	USD 3,545,100
PHCU	3 PHCU X 600sqm X USD 117/m ² X 15% damage = USD 31,590	5 PHCU x 600sqm X USD 117/m ² X 35%= USD 122,850	-	8 PHCU X 600sqm X USD 117/m ² X 100%= USD 561,600	USD 716,040
Total					USD 5,162,040

³⁷ http://www.internationalhousingassociation.org/fileUpload_details.aspx?contentTypeID=3&contentID=266313&subContentID=721497&channelID=38488

For lack of actual detailed account of damage on medical equipment and furniture documented for each facility, the cost of damage on medical equipment and furniture was calculated based on the recent project cost which spent USD 10,000 for PHCC. The team assumed the cost of rural hospital will be double while the PHCU is halved. A total of USD 99,000 was estimated to be damaged due to the flood as detailed in Table 5 9.

TABLE 5 - 9: Estimated cost of damaged equipment of the affected health facilities during flood 2020 in Sudan

Type of health facilities	Estimated cost of damage to medical equipment and furniture				Estimated total cost of damage on medical equipment and furniture
	Minor (15% damage)	Moderate (35% damage)	Major (50% damage)	Complete (100% damage)	
Rural Hospital	5 hospital X USD 20,000 X 15% damage=USD 15,000	1 hospital X USD 20,000 x 35%=USD 7,000	-	-	USD 22,000
PHCC	5 PHCCs X USD 10,000 X 15% damage =USD 7,500	11 PHCCs x USD 10,000 X 35%= USD 38,500	1 PHCC X USD 10,000 X 50%= USD 5,000	5 PHCC x USD 10,000 X 100%= USD 10,000	USD 61,000
PHCU	3 PHCU X \$5,000 X 15% damage = USD 2,250	5 PHCU x USD 5,000 X 35%= USD 8,750	-	8 PHCU X USD 5,000 X 100%= USD 5,000	USD 16,000
Total					USD 99,000

The public health consequences of floods are multi-fold. Floods cause direct injuries, drowning, mass casualties, displacement, and collapse of basic infrastructures such as houses, latrines and health facilities creating favourable grounds for water and sanitation related and vector borne diseases to flourish.

Flood affected communities drink water from open sources (contaminated water), which combined with poor sanitation conditions and open defecation practices, will lead to the risk of occurrence, and spread of water and sanitation related disease outbreaks. Open defecation is rampant in Sudan. A third of the population have no access to safe-drinking water sources and improved sanitation in Sudan. Poor access to safe drinking water and sanitation services is linked to transmission of diseases such as cholera, acute watery diarrhoea, dysentery, hepatitis A and typhoid. Since the start of the rainy season, nearly half of the water sources

found contaminated and lacks meeting the Free Residual Chlorine (FRC) standards that guard infections. Therefore, with no timely and strategic response, the current conditions create favourable ground for occurrence and spread of water and sanitation related disease outbreaks in Sudan. Regular water quality monitoring reports during the current flooding attested 54% of drinking water samples failed to meet the minimum Free Residual Chlorine (FRC) target while 51% of samples analysed for bacteriological presence found contaminated.

Following floods, water stagnates in widespread areas and is stored in domestic water containing materials such as discarded tyres and plastic cans creating favourable ground for vectors such as mosquitos to breed. Usually, vector-borne diseases flourish after 4-6 weeks after flooding. The predominant mosquito vector, *Aedes aegypti*, transmitting viruses causing

Dengue Fever, Chikungunya Fever, Yellow Fever (YF), West Nile, Rift Valley Fever (RVF) and Zika virus, is prevalent in all 18 States of Sudan. Hence, without timely and integrated vector control measures after such devastating floods, the risk of vector borne diseases outbreaks such as malaria, dengue fever, chikungunya, and rift valley fever is very high in Sudan. During the flood, 16 out of 18 States of Sudan surpassed the epidemic threshold for malaria.

As shown in Figure 5 1 and Figure 5 2, the number of water and sanitation related, and vector-borne disease increased during and immediately after the rainy season that started in June (epidemiologic week 23) up until 31 October (epidemiologic week 44). The increase showed similar trends over the past three years, 2018-2020.

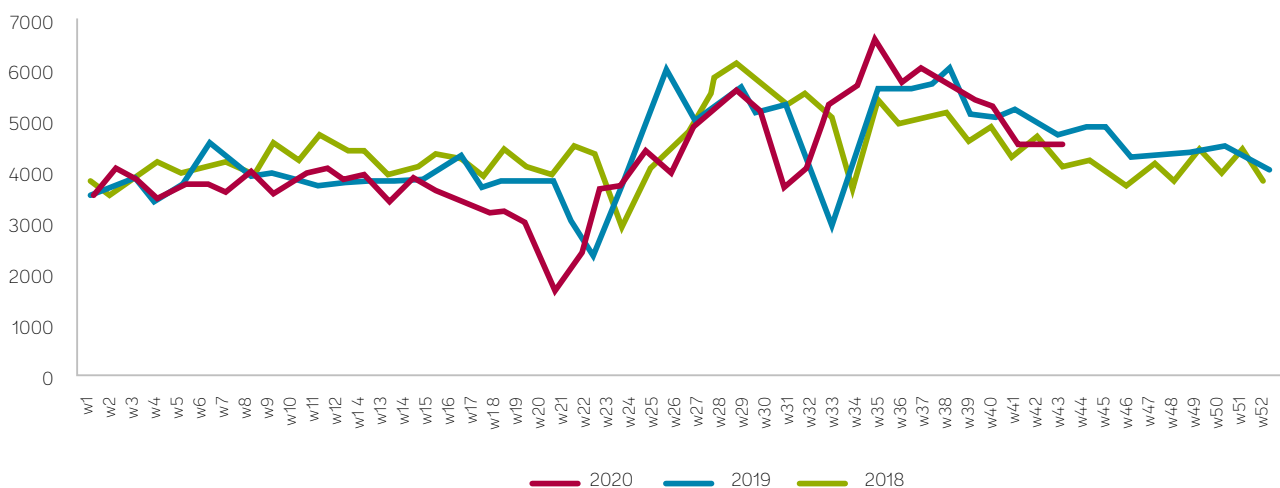
FIGURE 5 - 1: The number of malaria cases by epidemiologic week in Sudan, 2018-2020 (Source: FMOH)

The graph shows the number of confirmed malaria cases in Sudan states over the epidemiological weeks with comparison for the malaria incidence among population of Sudan at 2018, 2019 and 2020 until week 44. If we look at the trend over the time, we can see sharp increase in the malaria incidence at the rainy and flood season.



FIGURE 5 - 2: The number of dysentery cases by epidemiologic week in Sudan, 2018-2020 (Source: FMOH).

The graph illustrates the number of watery diarrheal cases among the Sudan states over the epidemiological weeks. It is clear that there is a dramatic increase after the rainy and flood season due to spreading of the bacterial pathogen, the graphs showing the comparison for the dysentery cases at 2018, 2019 and 2020 until week 44.



Floods expel dangerous animals from their holes exposing affected communities to snake and scorpion bites while searching for dry areas for settlement. Floods cut off affected communities from accessing essential health services for lack of roads and transport means requiring mobile and outreach programs to reach affected communities. About 50 mobile clinics were established and supported during the flood. On average a mobile clinic costs USD 5,000 per month and usually runs for 3 months. No proper assessment was done on the extent of psychosocial and mental health consequences of the flood.

Coordination of the flood response mainly followed the humanitarian cluster structure at national and State level. The Humanitarian Aid Commission (HAC) chaired the multi-sectoral flood taskforce. The FMOH and health cluster (WHO) coordinated the health response at national and State levels. The Emergency Operation Centre (EOC) was activated at national and State level to gather situation updates and guide responses throughout the flood season.

The FMOH and health partners contributed to the achievement of the flood response plan worth USD 8.6M which is considered as loss.

TABLE 5 - 10: Public health response to floods in Sudan, Oct-Dec, 2020 (Source FMOH/Health cluster)

S.N	Key Interventions	Budget in USD
1	Support mobile clinics	750,000
2	Surveillance and epidemic alert investigation	196,200
3	Laboratory support	188,400
4	Case Management and Infection Prevention and Control (IPC)	1,579,500
5	Water Quality Monitoring and Chlorination	1,691,960
6	Integrated Vector Control	3,629,440
7	Community Engagement, Risk Communication and Health Promotion	540,600
8	National Leadership and coordination	107,450
	Total	8,683,550

TABLE 5 - 11: Summary Table of Damage and Loss for Sector (in local currency and USD)

Damage and Loss	Damage Local Currency (i.e. 1USD=55 SDG)		Loss Local Currency	
	Public	Private	Public	Private
Itemized list of Damages	Infrastructure= SDG= 283,912,200 (USD 5,162,040) Medical equipment and furniture=SDG 5,445,000 (USD 99,000)	NA	-	-
Itemized list of Losses	-	-	Cost of flood response= SDG477,595,250 (USD 8,683,550)	
Total	SDG 289,357,200		SDG 477,595,250	

Cross Cutting Issues (Gender, Environment, Employment, Livelihoods and Social Protection, DRR)

One of the major health concerns during this emergency is the collapse of latrines that pose serious risks to public health. The Federal Ministry of Health (FMOH) reported gaps related to water chlorination, water quality testing and environmental sanitation, operational funding for the next two months is considered a gap. Waste and garbage accumulated over the last two weeks pose another health hazard. To date, 127 out of the targeted 137 garbage collection campaigns have been implemented.

More than half of the identified breeding sites showed presence of larvae which will develop into mature flies in the next few days or weeks, if vector control interventions are not initiated. According to FMOH, 3,734 breeding sites have so far been sprayed and treated.

RECOVERY NEEDS AND STRATEGY

The recovery needs considered the losses and multi-hazard preparedness plans. The preparedness plan focuses on the floods and its public health

consequences. The recovery plan considered rehabilitation or construction of damaged health facilities and preparedness measures to prevent and control diseases outbreaks as outlined in the tables below.

Prioritization of the interventions takes thematic and geographic angles. The thematic prioritization identified pillars of interventions relevant for flood preparedness and response such as strengthening disease surveillance and epidemic alert investigation, support for mobile clinics to reach flood affected communities with essential health services, support for laboratory, case management and Infection Prevention and Control (IPC), Water Quality Monitoring (WQM) and chlorination, Integrated Vector Control (IVC), Community Engagement, Risk Communication and Health Promotion and strengthening National Leadership and coordination to spearhead the preparedness and response efforts of the government and other stakeholders. The geographic prioritization of affected areas is based on history of flood and disease outbreak for the last five years. That means, those states that have been frequently affected by floods and its consequences will be prioritized for preparedness and response initiatives.

TABLE 5 - 12: Short, Medium & Long-term Recovery Initiatives and Costs (local currency & USD)

	Item	Description	Cost	
			Local Currency	USD
Short term 1yrs	Repair and re-construct the physical assets Restore service delivery	Cost of the reconstruction and rehabilitating, consider the quality improvement and the inflation		10,324,080
		Equipment and consumables required for services delivery		500,000
		Strengthen the local capacity for preparedness and response to the outbreak (training need assessment, allocation for medical supplies for prepositioning, support rapid response team, laboratory, EOC and strengthening coordination)		1,500,000
		Essential Medical supplies		1,859,376
Medium-term 3-5yrs	Restore the preparedness measures	<ul style="list-style-type: none"> - Support mobile clinics during emergencies - Surveillance and epidemic alert investigation - Laboratory support - Case Management and - Infection Prevention and Control (IPC) - Water Quality Monitoring and Chlorination - Integrated Vector Control - Community Engagement, Risk Communication and Health Promotion - National Leadership and coordination 		17,367,100
Long Term >5yrs	Reduce the risks and vulnerabilities	Health System Resilience		15,000,000

Recommendations for DRR and Building Resilience in Sector

- Repair and rebuild damaged health facilities;
- Strengthen the national capacity through strengthening core IHR capacities to prevent, detect, and respond to multi-hazard public health emergencies;
- Strengthen multi hazard preparedness plan and multi-sectoral response;
- Support building the community resilience;
- Regularly assess risks and vulnerabilities at national, sub-national and localities level to help inform preparedness and response plans;
- Develop and fund multi-hazard preparedness and response plans to preposition medicines and medical supplies and build local capacities in advance;

- Procure and preposition essential medicines and medical supplies in strategic locations before emergencies occur.

Implementation Arrangements

The FMOH will coordinate national preparedness and response while States and localities adapt the plans to their context and priorities and implement the plan. The health and WASH cluster will coordinate the planning, implementation and reporting of preparedness and response to public health emergencies with UN agencies and NGOs consistent with the national policies, strategies, priorities, and plans. Local communities will be involved in the planning and response to emergencies in their respective locations to foster accountability to affected people.

6. EDUCATION

SUMMARY

The assessment of the education sector is a joint exercise of the Government of Sudan which was led by the Federal Ministry of Education and the Federal Ministry of Higher Education and Scientific Research and supported by United Nations agencies (with UNDP as the lead agency and contributions from UNICEF). This assessment covers primary schools, secondary schools, and higher education institutions. The education sector has witnessed damages and losses in many of its infrastructures and physical properties and affected both students and teachers. Damage in other sectors such as agriculture and livestock, environment, employment and livelihoods, transport, health etc. has worsened the situation in education institutions. The cost is high, for it is estimated for complete and partial damages. The chapter also provides estimates for a recovery and reconstruction plan for alleviating and sustainably developing the sector, using the principle of 'Build Back Better'.

The total damage and losses to education sector is estimated at SDG 2.5 billion which include damages of SDG 2.2 billion and loss of SDG 0.33 billion. The recovery and reconstruction needs for the education sector for the next 3-5 years are estimated at SDG 7.5 billion.

As this report is concerned with assessment of damage and loss and medium- to long-term recovery needs, it should be interrelated to other sector reports. This means that some damaged elements such as school environment, roads, protection structure, hostels and

teachers housing must be integrated to other relevant sector reports.

The principal recovery measures suggested in this chapter include:

1. Conduct a detailed School Structural Assessment of damage buildings and soil testing to determine actual needs of each educational facility as well as feasibility of reconstruction/retrofitting in existing sites;
2. Reconstruction of schools using disaster resilient techniques;
3. Rehabilitation/retrofitting of schools including sanitation facilities and school environment;
4. Replacement of damaged equipment and furniture in all educational institutions;
5. Introduce the use of technology in the education system to enable reaching out to children during COVID-19 and separation from institutions due to the flood;
6. Development of School Flood Preparedness plans and create school Disaster Risk Management Committees;
7. Incorporation of Disaster Risk Reduction principles and approaches into school curricula;
8. Strengthening psychological health programmes with focus on DRR (through psycho-social support and school counselling) for both students and teachers;
9. Training in primary health for students and children in view the recent floods and COVID-19.

PRE-DISASTER AND SECTOR CONTEXT

Directorates of Education in localities are responsible for pre-school and basic education including school infrastructure, teacher recruitment and management. Education Councils are important institutions at the school level ensuring popular participation in school supervision, maintenance, provision of teachers' housing, etc. State Governments are responsible for secondary education while higher education comes under the purview of the federal government. Sudan's general education system, which is now under revision, consists of three levels: two years of pre-school; eight years of compulsory basic education; followed by three years of general or technical secondary education. The Sudan has achieved considerable improvements in human indicators in the last few years with Gross Enrolment Rate (GER) for primary education increasing from 69% in 2010/11 to 76.4% in 2014.

While 77.4 % of males of primary school age are enrolled, 75.5% female children of similar ages are enrolled for primary education. In secondary education, GER reached 28.4% with 27.4% of male children of secondary education age level enrolled and 29.4% of females enrolled in education programmes. This is likely because male children are made to start working and contributing to family income earlier than their female counterparts.

However, these figures do not tell the full story of the large disparities amongst and within states. For example, in 2014/15, the highest GER in primary education in Sudan reached 95.5% in the Northern State, and the lowest in West Darfur at 50.3%. GER in secondary education in Khartoum state was 56.1% whereas in Central Darfur state was only 12.2%. The completion rate for urban schools is 77% more than double the completion rate in rural schools (38%), translating to retention rate of 85% and 49% for urban and rural schools respectively. The disadvantaged in terms of access to quality education include nomadic population, returnees, and IDPs. A recently concluded base line survey conducted by the Federal Ministry of Education with support from the UNICEF, financed by the European Commission, highlights inequality, geographical and gender disparities as the key problems within the system.

As for the Higher education, the country experienced both public and private higher education systems since early 1900 as a result of both colonial and national policies. Lately, during the last three decades, the Sudan has witnessed an enthusiastic expansion of higher education institutions. GER in tertiary education increased from 8.7 to 17% between 2004 and 2017. Today the number embarks on 123 universities and colleges in different specialties in all 18 states. Nevertheless, the institutional expansion has many problems related to physical and educational structures and the ability to withstand disasters. The recent floods which hit the education hard in many states did not spare structures from partial damage in many universities and colleges. The damage has affected building structures, libraries, laboratories and lecture rooms' equipment and furniture. In addition, student's hostels and staff housing have been partially affected. The general environment, open spaces and sports facilities were left in bad conditions (i.e. need to be rehabilitated, redesigned and greened). The overall damage is partial, and the cost can be estimated to cover 40-50% from the 123 higher education institutions.



TABLE 6 - 1: Key Education Indicators

School attendance		
Primary school attendance TOTAL	% of children of primary school age	76.4
Primary school attendance Urban	% of children of primary school age	91.4
Primary school attendance Rural	% of children of primary school age	70.6
Primary school attendance Males	% of children of primary school age	77.4
Primary school attendance Males Urban	% of children of primary school age	91.6
Primary school attendance Males Rural	% of children of primary school age	71.9
Primary school attendance Females	% of children of primary school age	75.5
Primary school attendance Females Urban	% of children of primary school age	91.3
Primary school attendance Females Rural	% of children of primary school age	69.2
Secondary school attendance TOTAL	% of children of secondary school age	28.4
Secondary school attendance Urban	% of children of secondary school age	42.2
Secondary school attendance Rural	% of children of secondary school age	22.2
Secondary school attendance Males	% of children of secondary school age	27.4
Secondary school attendance Urban Males	% of children of secondary school age	39.7
Secondary school attendance Rural Males	% of children of secondary school age	21.9
Secondary school attendance Females	% of children of secondary school age	29.4
Secondary school attendance Urban Females	% of children of secondary school age	44.6
Secondary school attendance Rural Females	% of children of secondary school age	22.4
Education level by sex		
Illiterate TOTAL	% of total above 6 years	30.6
Illiterate Male	% of total males above 6 years	25.1
Illiterate Female	% of total females above 6 years	36.4
Less than Intermediate TOTAL	% of total above 6 years	46.8
Less than Intermediate Male	% of total males above 6 years	49.9
Less than Intermediate Female	% of total females above 6 years	43.4
Intermediate /Secondary TOTAL	% of total above 6 years	15.1
Intermediate /Secondary Male	% of total males above 6 years	17.1
Intermediate /Secondary Female	% of total females above 6 years	12.9
University/ Tertiary TOTAL	% of total above 6 years	6.2
University/ Tertiary Male	% of total males above 6 years	6.4
University/ Tertiary Female	% of total females above 6 years	5.9

Source: Sudan MICS5 2014 (Multiple Indicator Cluster Survey)

TABLE 6 - 2: Number of Schools by State and type

States	Pre-Primary	Primary	Secondary	Universities
Khartoum	4,953	3,703	1,268	61
Northern	806	552	117	5
Kassala	513	859	129	3
Blue Nile	542	372	70	2
White Nile	1,429	1,154	293	6
River Nile	1,477	842	179	7
Gezira	3,805	2,427	762	8
Red Sea	550	544	85	5
Gadarif	564	829	148	2
Sinnar	805	830	214	2
North Kordofan	1,308	1,543	186	3
South Kordofan	338	638	102	3
West Kordofan	276	1,095	123	6
North Darfur	1,839	1,170	269	1
South Darfur	912	1,552	326	4
West Darfur	652	437	98	2
Central Darfur	168	351	113	1
East Darfur	235	500	85	2
Total	21,172	19,398	4,567	123

Source: Ministry of Education and Ministry of Higher Education and Scientific Research

POST-DISASTER EFFECTS FOR THE SECTOR

Based on the quantitative and qualitative analysis, the team assessed the varying degrees of impact of the recent floods on the educational infrastructures and physical assets. The floods caused damages to almost 1,360 education facilities, ranging from primary, secondary, and higher education institutions, across all States. After the floods, the Government of Sudan in collaboration with development partners, proceed with debris removal, cleaning and sanitizing, and provision of temporary learning spaces to ensure the re-establishment of service delivery.

The floods left 123 primary schools fully destroyed including all its equipment and furniture, and partially damaged 1,148 primary schools and 81 secondary schools, including its sanitation facilities. At the time of the writing of this report,

6 universities had also reported damages to infrastructure and physical assets, comprising libraries, laboratories, administrations offices, etc.

The States that reported the highest number of destroyed schools were Gadarif (23), River Nile (19), Central Darfur and Red Sea (16). The States with the worst damage to educational facilities are Gezira (273), Khartoum (224), and Blue Nile (93), Kassala (69), West Darfur (66) and Sinnar (60). The extent of damage varies from partial to complete destruction, but it disrupted education in all the affected areas, especially as some of the schools have been transformed into shelters for people who evacuated their homes.

Since late 2018, there have been almost constant interruptions in education in Sudan. The popular protests that broke out in December 2018 and culminated in the toppling of the Government of former President Omar al-Bashir in April 2019

caused the suspension of the academic year for a period of up to 10 months.

The academic year of 2020 has also witnessed interruptions as schools and universities closed classrooms due to the coronavirus lockdown measures and attempted to shift to online teaching. However, the country was largely unprepared for online education, especially considering disparities in the availability of internet, high poverty levels that prevent many from owning personal computers, and general lack of digital education skills.

The effect of the floods has further compounded the risk of school interruption. In September 2020, 137,854 children between 6 and 16 years were affected by the floods. More than 130,000 children were at risk of not returning

to schools when schools reopened on November 22, 2020 from COVID-19 related school closures, leading to increasing learning losses.

In addition, students lost educational assets due to the floods. According to the primary survey conducted as part of the PDNA, 40% of households indicated having lost books and certificates and 15% indicated having lost other education-related assets (e.g. computers, etc.).

As result, the estimated total damage caused by the floods in the education sector amounts to SDG 2.2 billion while losses amount to SDG 331 million. Damages are higher in the primary education sector amounting to SDG 2.0 billion.

TABLE 6 - 3: Number of Flood Affected Schools by State

States	Totally Destroyed	Partially Damaged		
	Primary	Primary	Secondary	Universities
Khartoum	8	224	34	1
Northern				1
Kassala	11	69	6	
Blue Nile	2	93		1
White Nile	4	6		
River Nile	19	22		1
Gegira	13	273	41	1
Red Sea	16	13		
Gadarif	23	41		
Sinnar	2	60		
North Kordofan		19		
South Kordofan		27		
West Kordofan	7	77		
North Darfur		38		
South Darfur	2	40		
West Darfur		66		
Central Darfur	16	34		1
East Darfur		46		
Total	123	1,148	81	6

TABLE 6 - 4: Total School Damages, Estimates by State (SDG)

	Totally Destroyed	Partially Damaged			Equipment/Furniture	
States	Primary	Primary	Secondary	Universities	Primary	Secondary
Khartoum	19,760,000	331,968,000	50,388,000	20,000,000	624,886	491,844
Northern	-	-	-	2,800,000	-	-
Kassala	27,170,000	102,258,000	8,892,000		215,478	86,796
Blue Nile	4,940,000	137,826,000	-		255,880	-
White Nile	9,880,000	8,892,000	-		26,935	-
River Nile	46,930,000	32,604,000	-	7,450,000	110,432	-
Gezira	32,110,000	404,586,000	60,762,000	11,095,000	770,333	593,106
Red Sea	39,520,000	19,266,000	-		78,111	-
Gadarif	56,810,000	60,762,000	-		172,382	-
Sinnar	4,940,000	88,920,000	-		166,995	-
North Kordofan	-	28,158,000	-		51,176	-
South Kordofan	-	40,014,000	-		72,724	-
West Kordofan	17,290,000	114,114,000	-		226,252	-
North Darfur	-	56,316,000	-		102,352	-
South Darfur	4,940,000	59,280,000	-		113,126	-
West Darfur	-	97,812,000	-		177,769	-
Central Darfur	39,520,000	50,388,000	-	36,735,000	134,674	-
East Darfur	-	68,172,000	-		123,900	-
Total	303,810,000	1,701,336,000	120,042,000	78,080,000	2,866,105	1,171,746

TABLE 6 - 5: Summary of Total Flood Damages and Losses, Estimates (SDG)

		Primary	Secondary	Universities	Damage	Losses
Schools Fully Destroyed	Number of schools	123				
	Estimated cost of damage	303,810,000			303,810,000	45,571,500
Schools Partially Destroyed	Number of schools	1,148	81	6		-
	Estimated cost of damage	1,701,336,000	120,042,000	78,080,000	1,899,458,000	284,918,700
Equipment and Furniture destroyed		2,866,105	1,171,746		4,037,851	605,678
Summary of estimated damage and losses, in SDG		2,008,012,105	121,213,746	78,080,000	2,207,305,851	331,095,878

RECOVERY NEEDS AND STRATEGY

The recovery needs estimates for the education sector amount to SDG 7.5 billion and consider the imperative of building resilient and durable education institutions and facilities based on the principle of Build Back Better. The focus is on ensuring uninterrupted and quality education service delivery in a safe environment.

Recovery Needs and Prioritization

The education sector recovery strategy in Sudan will be planned considering the following aspects:

- Delayed academic year due to COVID-19 related restriction measures;
- Some schools are out of service

because they were taken as shelters for the IDPs;

- Disease Outbreaks (diarrhea and malaria, psychological impact of students and teachers);
- High rate of school dropout;
- Low admission rates;
- Increase in the number of children out of school, leading to an increase in illiteracy, early marriage, an increase in crime, and an increase in child labor, among others.

The education recovery strategy can be implemented in two phases: first being the immediate recovery needs in the short-term (6-12 months) and simultaneously, starting long-term reconstruction (2-5 years). The given strategy seeks to address both academic and infrastructure recovery needs.

TABLE 6 - 6: Education Recovery Needs

N.	Measures	Period			Total Cost	
		Short	Medium	Long	(SDG)	(US\$)
1	Conduct a detailed School Structural Assessment of damage buildings and soil testing to determine actual needs of each educational facility as well as feasibility of reconstruction/retrofitting in existing sites;	x			33,000,000	600,000
2	Reconstruction of schools using disaster resilient techniques;		x	x	613,893,000	11,161,691
3	Rehabilitation/retrofitting of schools including sanitation facilities and school environment		x	x	3,698,321,800	67,242,215
4	Replacement of damaged equipment and furniture in all educational institutions	x			4,643,529	84,428
5	Introduce the use of technology in the education system to enable reaching out to children during COVID-19 and separation from institutions due to the flood - Provision of laptops to 50% of the affected students;		x		3,164,052,500	57,528,227
6	Development of School Flood Preparedness plans and create school Disaster Risk Management Committees		x		TBD	TBD
7	Incorporation of Disaster Risk Reduction principles and approaches into school curricula		x		TBD	TBD
8	Strengthening psychological health programmes with focus on DRR (through psycho-social support and school counselling) for both students and teachers	x			TDB	TBD
9	Training in primary health for students and children in view	x			TBD	TBD
Total Recovery Needs					7,513,910,829	136,616,561

Recommendations for DRR and Building Resilience in Sector

The implementation of the recovery strategy will be guided by Build Back Better principles to avoid future risks. School buildings need to be constructed or rehabilitated according to the concept of safe schools and relevant DRR norms in Sudan. It is important to promote the adoption of risk-informed approaches to ensure that schools are reconstructed at right locations, away from flood-prone areas. There is a need for on-going and in-depth risk assessment of educational infrastructure in the country, which needs to be updated regularly with the measures required to reduce or withstand future risks. It is expected that appropriate site planning will be undertaken to ensure safety of the built environment including the access roads and playgrounds. In addition, the reconstruction process should promote construction technologies based on local materials that ensure educational building standards and infrastructure resilience. The rebuilding should ensure proper protected drinking water and toilet facilities that are child-friendly and cater to children and people with special needs. Also, some communities with particular culture and customs, such as nomads, need mobile schools, such as constructing buildings from local raw materials (compressed straw, for example) that are light in weight,

easy to disassemble and install, and do not occupy much space when traveling.

The implementation of the Recovery Strategy should be led by the Government of Sudan in close partnership with communities and NGOs. This may require capacity building of district officials to monitor the processes and establishing working relationships with communities and local credible NGOs.

The Education Team acknowledges that there is a lack of studies on the effects of floods on school children and infrastructure. Therefore, it is important for the different stakeholders to be mobilized in order to develop different tools to manage and respond to floods. Floods impact the education sector in different ways which include destruction of buildings and infrastructure, function of institutional and organizational structures as well as the wellbeing of individuals and communities. Therefore, the assessment recognizes the importance of developing school level preparedness plans and incorporation of Disaster Risk Reduction into school curricula in order to ensure that both teachers and students are better prepared to cope with future emergencies. When there are no plans for alternative locations and students are denied continuous schooling, many will never be able to catch up and will drop out permanently.



7. SPORTS

SUMMARY

Sudan is home to many different ethnic peoples, with many different traditional sporting activities. However, the most popular sport in this part of the world is football. With the youth comprising some 62% of Sudan's total population³⁸ it is no wonder that sports play a big role in the social life of the country. Sport sector is a key economic sector in Sudan, especially football that receives great media and public attention and contributes to economic activities in the country. Most importantly, sports channel youth energy and attention from violence and extremism to team building and healthy lifestyles. Along with football other sports are popular such as athletics and track and field. There is also rising popularity of other sports such as basketball, handball, and volleyball. Sudan has long been involved in football and is one of the founders of African football along with Ethiopia, Egypt, and South Africa. Sudan hosted the African Cup of Nations and won it in 1970.

The Government has as one of its priorities "Enhancing the role of youth of both sexes and expanding their opportunities in all areas", and sports is such a key area. The Sudan Transitional Government recognizes the importance of youth involvement in sports in keeping with the United Nations acknowledgement of "the growing contribution of sport to the realization of development and peace in its promotion of tolerance and respect and the contributions it makes to the empowerment of women and of young people, individuals and communities as well as to health, education and social inclusion objectives"³⁹. Sport has been reported to have a positive impact on

the emotional and physical wellbeing of youth and is seen as a vehicle for social cohesion and the reduction of conflict. The Sport sub-sector was significantly affected by the 2020 floods. At the time of this report some 110 sports clubs had reported disruption to their sporting activities as a result of the flooding. Nineteen facilities had been completely destroyed, including National Stadium, Olympic Stadium, and other major State facilities. Of the eighteen States, at the time of the assessment, reports had been received from 12 States. All facilities are public owned.

The total effect to the sub-sector was SDG 146 million or US\$ 2.7 million and the cost of recovery was estimated to be SDG 170 million or US\$ 3.1 million. In addition to the reconstruction and the repair of destroyed facilities it was acknowledged that serious consideration would have to be given to undertake such reconstruction with an eye to building with resilience to future floods. It was also agreed that as part of building resilience, the capacity of the youth of the nation would also be strengthened through training courses so that they would be better able to treat with future flooding events.

PRE-DISASTER AND SECTOR CONTEXT

The responsibility of sports in Sudan is mandated to the Ministry of Youth and Sports in terms of the planning framework, coordination, and external work, as well as the direct responsibility for the sports work in the ministries of youth and sports in states or in its rule of the states. The direct technical and administrative responsibility of the activity is subordinate to the national

³⁸ <https://www.youthpolicy.org/factsheets/country/sudan/#:-:text=In%202013%2C%20Sudan%20will%20have,lives%20in%20a%20productive%20way>.

³⁹ A/RES/70/1, para. 37. Available from <https://sustainabledevelopment.un.org/post2015/transformingourworld>.

and state unions, which are regulated in accordance with the Law of Youth and Sports Bodies of 2016 and international and regional unions.

There is a shared responsibility in the discovery, refinement, and development of talent, and this is done in cooperation between the Centre, the states, and the Unions, and we point out that there is work for the sports sector in the number of (12) states.

Table 7 1 presents the details of stadia and grounds for Sudan. It indicates that in the twelve states there are some 49 stadia, 228 grounds and well over 2,000 clubs. Other sporting facilities amount to over 2,000.

POST-DISASTER EFFECTS FOR THE SECTOR

The sport sub-sector was significantly affected by the floods, as detailed in Table 7 2. At the time of this report some 110 sports clubs had reported disruption to their sporting activities as a result of the flooding. Nineteen facilities had been totally destroyed, including National Stadia, Olympic Stadium, and major State facilities, according to reports received from 12 States. All facilities are public owned.

The economic value of the damage to the sector is presented in Table 7 3. Estimates suggest that the value of damage to the sector amounted to approximately SDG 120 million and the loss amounted to some SDG 26 million.

TABLE 7 - 1: Key Baseline Data for the Sector

State	No of stadiums/ yards	No of sport clubs	No of Sport Facilities
North Kordofan	17 (5 stadiums)	192	73
Kassala state	15 stadiums	106	110
White Nile state	200 (6 stadiums)		889
South Darfur	2	43	178
East Darfur		30	15
Central Darfur		60	7
Sinnar state			9
Red sea		156	23
West Kordofan		550	339
River Nile	14 stadiums	512	548
Khartoum			
Blue Nile	8 (1 stadium)	45	4
Northern state	23 (8 stadiums)	398	
Al Jageera			
Gadarif	19 (5 stadiums)		7



TABLE 7 - 2: Effects of Flooding on the Sport Sub-sector

State	Description of Effects	Sport Clubs disrupted	Facilities Affected	
			Totally Destroyed	Partial Damage
Khartoum	16 sport clubs have been affected. 10 facilities had been reported as totally destroyed; 7 suffered partial damage. Details were presented in the Khartoum state report.	16	10	7
Northern Kassala	Clubs were affected by this year's flooding. There are reported damages in Aroma stadium that has been rectified	8		1
Blue Nile	Reported stands collapse of Damazin stadium. In addition to cracks in 5 a side playground. Also, there is settlement in the Ministry because of stagnant water for a long time.			2
River Nile	State reports indicated clubs to be affected by recent floods in Sudan.	36		
Gegira	Stadiums and clubs affected by floods			15
Red Sea	Tokar stadium collapsed. Three youth clubs' buildings collapsed, in addition to one more partially collapsed. Reported cracks in Youth club and damages in equipment and furniture in another. Also, the playgrounds being filled with water led to increased violence as they are not utilizing their energy in sports.		4	1
Gadarif	The external wall from the South/West sides in Gadarif stadium has been affected from recent floods. Also, Al-Fashga stadium external walls in the east, south side and the gate in the north/west side has been affected. In addition to the ceiling of one of the 5-aside yards. There are three sport clubs affected and the one sport person accommodation has been affected as mentioned by state report. Three sport facilities shops have been affected.			9
Sinnar	Sport activities stopped for a long time because of floods and stagnant water. Total damage of 2 clubs and cracks in 18 clubs (1000 m per club), cracks at Singa Stadium cabin 20x15 plus the floor and wall of approximately for the number of six stadiums, almost complete collapse in 2 youth centres.		4	25
South Darfur	The swimming pool drain has been blocked. The fences for three 5-aside playing ground has collapsed but was rehabilitated again. Additionally, the 43 sport clubs stopped activities for 4 months because of stagnant flood water. Affected 3 special quintets and maintained and discontinued for 3 months (rent for the group 200 pounds working approximately 5 sets per day	43		
Central Darfur	External and internal cracks in the Youth Centre where the Ministry is located. Also, stagnant flood water in 4 playing grounds, as a result sport activities stopped for 4 months			1
East Darfur	Major fault crack in the Grand stadium and medium fault crack in the Olympic stadium. One 5-aside playground collapsed, and another partially collapsed. Also, seven sport clubs mentioned to be affected. Also, stagnant flood water in 4 playgrounds for other clubs. Furthermore, there is partial collapse in the Football Union building and its main gate broken.	7	1	1
Total		110	19	62

TABLE 7 - 3: Damage and Loss for Sports Sector

	Number	Damage (SDG)	Losses (SDG)
Damage			
Totally destroyed facilities	19		
	30 Stadiums;		
Partially destroyed facilities	228 Grounds;	120,000,000	
	2,000 Sports Clubs		
Losses			
Clearing of debris			26,000,000
Total		120,000,000	26,000,000

RECOVERY NEEDS AND STRATEGY

Based on the total and partial destruction to facilities identified during the assessment, it has been agreed that the following actions should be taken to ensure that the sport sub-sector is better prepared to deal with future flooding.

1. The damages mentioned above need to be rectified and addressed with

consideration of lessons learnt and ensuring future flooding risks are addressed during restoration work; and

2. Water Education courses for youth are proposed between the Ministry of Youth and UNESCO to increase youth resilience in managing water disasters such as floods and droughts in the future.

TABLE 7 - 4: Short, Medium & Long-term Recovery Initiatives and Costs

	Measure	Cost	
		SDG	USD
Short term	Reconstruction and repair of destroyed/ damaged facilities with improvements	139,500,000	
Medium Term	Water course training for youth to increase youth resilience to floods and drought	30,000,000	
Total		169,500,000.00	3,081,818

It is expected that the Ministry of Sport and Youth, together with stakeholders from the sporting community, will work closely with its development partner UNESCO, in the implementation of the recommendations.





PRODUCTIVE SECTORS



MANUFACTURING



AGRICULTURE,
FISHERIES &
LIVESTOCK

8. MANUFACTURING

SUMMARY

While the major industrial establishments of the country have largely been spared, the floods have seriously damaged micro, small, and medium enterprises (MSMEs) in manufacturing, trade and services sectors in the affected States. Damages inflicted on MSMEs by the recent floods are categorized as partial and total. Indirect losses are pertaining to interruptions to production and business revenues inclusive of sales, production, and wages, and are estimated for the duration of 40 days. Direct damages are reflective of losses in physical assets inclusive of raw material, machines and buildings, workshops, or business location.

Total direct and indirect damages to the MSMEs were estimated to be SDG 150 million, equivalent of USD 2.7 million. The largest share of damage was to light manufacturing and repair shops, followed by small retail and trade services. The worst affected States were Khartoum, Sinnar, Kassala and Northern State. It must be pointed out that production losses (though not estimated) could spill over into 2021 for the manufacturing sector, even as recovery and reconstruction activities are concluded. It is also important to point out that production losses in these sectors are due not only to the destruction of the sector assets (premises, equipment, machinery, raw materials, and finished goods) but also to the absence of electricity and water supply.

The impact at the macroeconomic level includes lower overall production of goods and services, and reduced economic growth, though marginal. In addition, the forecasted losses in industrial production and commercial sales will mean less in value-added tax revenues, which will in turn have a negative impact on the fiscal sector. Replacing the destroyed goods and assets will require that a sizable fraction

of the value of the goods be imported from abroad; thus, reconstruction will have a negative impact on the balance of payments for the country. Full particulars of these negative impacts arising from the manufacturing sector will require a macroeconomic impacts analysis. An additional impact will be felt by some of the workers (both formal employees and self-employed persons) in each of the sub-sectors, as the production losses will result in equivalent employment losses, until full recovery of production activities is achieved.

The needs include working capital to ensure smooth restoration of production. Refinancing or rescheduling of old loans that are nonperforming because of the disaster will also be essential for recovery. It is foreseen that these funding requirements are to be split into two categories: a scheme of cash grants for micro entrepreneurs and a second scheme of soft-term credit lines with low interest rates and relatively long repayment periods channelled through the national private or development banking system. In regard to requirements for reconstruction, the value of destroyed physical assets has been supplemented to introduce disaster-resilient features, including elevated floor levels in buildings and roof anchoring to prevent wind damage, as well as other considerations such as relocation to safer areas (in very limited cases), modernization of machinery, and others.

PRE-DISASTER AND SECTOR CONTEXT

Sudan witnessed a major political change in 2019. The new transitional government has opened a new opportunity for Sudan to resume its normal relations with the international community after 25 years of US sanctions. However, as a fragile country, the government is facing immense challenges including accumulated economic problems, and

institutional and human resources capacity gaps, which hinder the country's ability to build resilience and promote private sector-led growth. Millennium Development Goals (MDGs), and its progress lags on many fronts. The 2019 UN Human Development Index ranked Sudan 168 out of 189 countries. Inflation reached 112 percent in 2020, fuelled by high production input costs due to currency depreciation. The overall contraction in economic performance is attributed to Sudan's weak business environment, macroeconomic imbalances influenced directly by the overvalued exchange rate, high inflation rate, unstable fiscal policies, and the effects of 25 years of US sanctions, which pondered private investment and foreign exchange availability, pushing trade transactions and overall cost of doing business, while restricting repatriation of earning.

The World Bank Enterprise Survey (2014) identified access to credit as a major constraint to the private sector, with only 4.6 percent of firms having access to a loan or a line of credit from a bank. In the 2020 Doing Business Survey, Sudan ranked 176 out 190 countries in the Ease of Getting Credit category, far below the sub-Saharan Africa average. Notwithstanding the expansion of mobile banking and the development of microfinance institutions, banking infrastructure is relatively weak and correspondent banking relationships are lacking. Digital financial services are picking up but are still at a nascent stage of development.

The manufacturing sector is one of the economic sectors that has been acutely affected by the country's unstable macroeconomic conditions. The sector can be classified by production types into food and non-food manufacturing activities. This includes construction materials of various kinds, a range of consumer goods, and local assembly and or production of specific types of capital goods including tannery and leather production, paper mills, plastics, minerals, pharmaceuticals, car and appliances assembly, ores, and raw materials extraction, cement

and steel, while agricultural related manufacturing includes, weaving mills, spinning mills, and gum arabic production. Despite of the diversity of Sudan's manufacturing sector, its ability to raise its share of products in the domestic, international, and regional markets remains narrow. The sector's productive rate as of 2017 was 2.5 percent compared to agriculture (CBoS-2017). Its' share in GDP and total employment stands at less than 1 and 2 percent, respectively.

Further to size classification, the sector also includes different representation, with various types of formal and informal, public, private, foreign, public-private, public-foreign, and private-foreign owned enterprises. The formal private sector in Sudan is characterized by small and medium enterprises (SMEs) with informal representation, and a few large companies, many of which are state-owned. SMEs account for most private business activity in Sudan and the few large companies that exist are clustered in trade and industrial processing areas, mostly concentrated in Khartoum state, as few other places in the country offer the necessary infrastructure for large-scale commercial activities.

According to ILO, the estimated number of registered MSMEs in Sudan in 2014 was around 600,000 (ILO-2015), with microenterprises representing 75 percent, small enterprises representing 23 percent and medium enterprises representing only 2 percent (ILO-2015). Based on Sudan's working definitions, microenterprises employ an average of two workers, small enterprises employ up to 5 workers and medium enterprises employ up to 49 workers.

Large-scale enterprises employing more than 100 workers do not exceed more than 2 percent of the private sector while micro, small and medium-sized enterprises represent up to 98 percent of the sector. The ILO report also estimates that formal MSMEs employ less than 1.5 million workers or about 20 percent of the total number of jobs in Sudan, compared to 60 percent of jobs created in the informal

sector. Further, it implies that many Sudanese workers, and probably MSMEs, operate outside the formal economy. It is estimated that the formal manufacturing sector employs 131,506 persons out of which 68 percent are employed in the large establishments ⁴⁰.

The informal sector hosts a wide a range of economically marginalized rural and urban communities. Its concentration is uneven but appears in key productive sectors, namely the agriculture, livestock, mining, trade, service, and small manufacturing sectors. Despite their presence in key sectors, the informal activities have been obstructive by the virtue of their informality, as their prospects to access formal financial sources and other inputs are severely constrained. Moreover, they are non-tax paying entities with no access to public services, and formal skills training opportunities, which narrows their chances to benefit from market linkages contracts or investments.

The manufacture of food products and beverages represents a significant fraction of the Sudan gross output, estimated at 55.3 percent followed by manufacture of coke, refined petroleum products & nuclear fuel at 16.8 percent, whilst the other sector sub-activities gross output is minimal⁴¹. Needless to say, many more persons are informally employed and

involved in trading, as a supplementary income-earning activity.

POST-DISASTER EFFECTS FOR THE SECTOR

While the major industrial establishments of the country have largely been spared, the floods have seriously damaged micro, small, and medium enterprises (MSMEs) in manufacturing, trade, and services sectors in the affected States. Damages inflicted on MSMEs by the recent floods are categorized as partial and total. Indirect losses are pertaining to interruptions to production and business revenues inclusive of sales, production, and wages, are estimated for the duration of 40 days, while direct damages are reflective of losses in physical assets inclusive of raw material, machines and buildings, workshops, or business location.

In order to ascertain the effects and impact of floods on the manufacturing MSMEs sector, the assessment took into account a special report by Small Industry Chamber Khartoum, which was commissioned by the Secretary General for this assessment. It should be noted that data on the estimated value of physical assets destroyed and of production or sale losses was not available for analysing the sector effects. However, the assessment team

TABLE 8 - 1: Key Baseline Data for the Manufacturing Sector

Type of Ownership	Number of Establishments	Total Cost of Industrial Services (SDG '000)	Cost of Goods for Resale (SDG '000)
Total Manufacturing	1,654	13,858,412	2,482,707
Public	89	2,233,714	1,061,486
Public & Private Sudanese	17	137,958	8,431
Public & Foreign	7	902,399	-
Private Sudanese	1,477	3,778,418	1,412,790
Private Sudanese & Foreign	39	6,753,169	-
Private Foreign	25	52,754	-

⁴⁰ Comprehensive Industrial Survey Project March 2005, Ministry of Industry in co-operation with the Central Bureau of Statistics and with technical assistance from UNIDO

⁴¹ Comprehensive Industrial Survey Project March 2005, Ministry of Industry in co-operation with the Central Bureau of Statistics and with technical assistance from UNIDO

estimated MSMEs losses in terms of income loss to the sector. Total direct and indirect damages to the MSMEs were estimated to be SDG 150 million, equivalent of USD 2.7 million with the official exchange rate while losses were calculated at over SDG 19 billion (USD 348 million). The largest share of damage was to light manufacturing and repair shops, followed by small retail and trade services. The worst affected States were Khartoum, Sinnar, Kassala and Northern State. In Khartoum State agro-processing and horticulture are the main activities affected and in Khartoum State, transportation and logistics services are the main sectors damaged by floods. Along with direct damage, the floods have also adversely affected the livelihoods and household incomes of the affected communities. The unlikely recovery of informal credit extended to MSMEs and the likely increase in production costs due to use of imported raw materials are expected to reduce the competitiveness of MSMEs products in both local and international markets.

It must be pointed out that production losses (though not estimated) could spill over into 2021 for the manufacturing sector, even as recovery and reconstruction activities are concluded. It is also important to point out that production losses in these sectors are due not only to the destruction of the sector assets (premises, equipment, machinery, raw materials, and finished goods) but also to the absence of electricity and water supply.

MACRO-ECONOMIC AND HUMAN IMPACT

Table 8-2 shows that the losses exclusively affected private MSMEs entities; no government-owned establishments were affected by the floods. This distribution will translate into an impact at the macroeconomic level that includes lower overall production of goods and services, and reduced economic growth, though marginal. In addition, the forecasted losses in industrial production and commercial sales will mean less in value-added tax

TABLE 8 - 2: Summary Table of Loss for Sector (in local currency and USD)⁴²

#	Enterprise/Activity	# of affected Establishments	# of workers affected	Estimated number of days not operational	Average daily income (SDG)	Total Loss (SDG)	Total Loss (USD) Official (CBoS) rate 55 SDG
1	Agro-processing, horticulture, and allied sectors	2,600	26,000	90	2,000	4,680,000,000	85,090,909
2	Light manufacturing and repair shops	12,000	70,000	60	2,000	8,400,000,000	152,727,273
3	Small retail, trade services	10,000	20,000	60	2,000	2,400,000,000	43,636,364
4	Transportation and logistics	1,400	2,800	30	2,000	168,000,000	3,054,545
5	Restaurants and eateries	2,000	12,000	60	2,000	1,440,000,000	26,181,818
6	Construction material production units	1,500	10,000	90	1,500	1,350,000,000	24,545,455
7	Other sectors	2,000	4,000	90	2,000	720,000,000	13,090,909
	Manufacturing Total	31,500	144,800	480	13,500	19,158,000,000	348,327,273

⁴² Small Industry and Handcrafts Chamber-Sudan Business Federation

revenues, which will in turn have a negative impact on the fiscal sector. Replacing the destroyed goods and assets will require that a sizable fraction of the value of the goods be imported from abroad; thus, reconstruction will have a negative impact on the balance of payments for the country. Full particulars of these negative impacts arising from the manufacturing sector will require a macroeconomic impacts analysis.

An additional impact will be felt by some of the workers (both formal employees and self-employed persons) in each of the sub-sectors, as the production losses will result in equivalent employment losses, until full recovery of production activities is achieved. Since estimated production losses might be relatively small compared to the value of the total normal production in the manufacturing sector, equivalent employment losses will be relatively limited. It should be noted that these figures refer to the informal sector, and that additional losses in employment and livelihoods occurring might not be fully accounted for.

RECOVERY NEEDS AND STRATEGY

In connection with recovery activities, the needs include working capital to ensure smooth restoration of production. Refinancing or rescheduling of old loans

that are nonperforming because of the disaster is also essential for recovery. The amounts required for such recovery activities should be estimated as a function of the value of production losses, taking into consideration the types of production and trade activities and their specific working capital requirements. It is foreseen that these funding requirements are to be split into two categories: (i) a scheme of cash grants for micro entrepreneurs; and (ii) a second scheme of soft-term credit lines with low interest rates and relatively long repayment periods channelled through the national private or development banking system.

In regard to requirements for reconstruction, the value of destroyed physical assets has been supplemented to introduce disaster-resilient features, including elevated floor levels in buildings and roof anchoring to prevent wind damage, as well as other considerations such as relocation to safer areas (in very limited cases), modernization of machinery, and others. The financial requirements for reconstruction are to be channelled in a manner similar to those for recovery: (i) cash grants to micro entrepreneurs; and (ii) soft-term credit lines to creditworthy enterprises.

Most of the challenges for recovery and reconstruction in manufacturing sector reside with the private sector. However,

TABLE 8 - 3: Short, Medium & Long-term Recovery Initiatives and Costs

Intervention	Timeframe			Total Cost (SDG)	Total Cost (USD)
	Short-term (6 months - Year 1)	Medium-term (Years 2-3)	Long-term (Years 3+)		
Rehabilitation of infrastructure and assets of the affected MSMEs and areas	905,000	543,000	362,000	1,810,000	7,240
Cash grants for microenterprise working capital recovery				tbd*	tbd*
Soft-term credit lines for small and medium enterprise working capital recovery				tbd*	*tbd*

* recovery cost is yet to be determined at the time of the assessment



participation by the government is essential for some of the components; this is especially true for attending to the needs of the micro entrepreneurs in both formal and informal sectors. In addition, the government's initiative and strong support are required to enable the banking sector to establish the special, post-disaster soft term credit lines required for both recovery and reconstruction. It is foreseen that the cash grant scheme will also be left in the hands of the government of Sudan through one of its ministries. Provision of cash grants and soft-term credit lines to entrepreneurs in these two sectors is essential to keep them from falling prey to the action of private lenders and loan sharks, who would impose high credit terms that could easily wipe out the recovery and

reconstruction efforts. The timeliness of these recovery and reconstruction schemes is of particular relevance. Should there be delays in making these financing schemes available, owners of the manufacturing sector establishments may in their efforts to overcome the impact of the disaster begin reconstructing their premises using the same pre-disaster standards and designs, instead of adopting disaster-resilient features. For that reason, prompt availability of these financing schemes should be combined with the required urgent technical assistance to define a new construction design and specifications. The government should consider making financing conditional on adopting these new standards, in order to lessen the risk in future disasters

9. AGRICULTURE, FISHERIES & LIVESTOCK

SUMMARY

Approximately 2,216,362 ha of cropland is reported to have been damaged in the 15 assessed states, particularly in Gedarif, Blue Nile, Sennar and Kassala, where almost 1,906,767 ha of the planted area was submerged. The livestock sector was also severely impacted with the loss of more than 107,000 heads of livestock particularly sheep, goats, poultry, and cattle, belonging to about

20,521 households. North Darfur, Blue Nile and Sennar states registered the highest number of losses with a combined total of 75,597.

Total estimated loss due to the floods amounts to SDG 30.051 billion (USD 546.4 million), and total damage due to flood's impact on livestock is estimated to be SDG 1.769 billion (USD 32.2 million). Total recovery cost, after adjusting it for 15% of inflation, is estimated to be SDG 2.5 billion (USD 46.4 million).

TABLE 9 - 1: Summary of Damage and Loss Estimates

States	Damage		Loss		Total Effect	
	SDG	USD	SDG	USD	SDG	USD
East Darfur	9,000,000	163,636	854,649,514	15,539,082	879,18,8596	15,985,247
Red Sea	22,799,000	414,527	106,752,103	1,940,947	131,492,050	2,390,765
White Nile	82,048,000	1,491,782	298,284,702	5,423,358	385,756,060	7,013,747
Kassala	109,036,000	1,982,473	1,668,087,885	30,328,871	1,807,452,756	32,862,777
Gedarif	153,335,000	2,787,909	12,946,367,040	2,353,88,492	13,335,090,532	242,456,191
West Darfur	145,149,000	2,639,073	239,041,886	4,346,216	388,537,102	7,064,311
North Darfur	289,400,000	5,261,818	542,474,385	9,863,171	841,737,556	15,304,319
South Kordofan	0	0	296,415,389	5,389,371	301,804,760	5,487,359
Central Darfur	0	0	682,442,727	12,408,050	694,850,777	12,633,650
Blue Nile	516,225,000	9,385,909	9,806,727,874	178,304,143	10,501,257,017	190,931,946
Sennar	423,338,000	7,697,055	1,497,203,996	27,221,891	1,947,763,887	35,413,889
West Kordofan	18,804,000	341,891	387,551,546	7,046,392	413,401,938	7,516,399
River Nile	0	0	599,819,130	10,905,802	610,724,933	11,104,090
Khartoum	0	0	67,611,582	1,229,301	68,840,884	1,251,652
North Kordofan	0	0	5,7718,607	1,049,429	58,768,037	1,068,510
South Darfur	0	0	0	0	0	0
Gegira	0	0	0	0	0	0
Total	1,769,134,000	32,166,073	30,051,148,368	546,384,516	32,366,666,883	588,484,852

PRE-DISASTER AND SECTOR CONTEXT

Crop Production

The Sudan has diversified crop portfolio, which includes cereals (such as sorghum, millet, wheat, rice and maize), oilseeds (sesame, groundnuts and sunflowers), industrial crops (cotton and sugarcane), fodder crops (alfalfa, fodder sorghum and Rhodes grass), pulses (broad beans and pigeon peas) and horticultural crops (okra, onions, tomatoes, citrus, mango, etc.). The country is the third major producer of sugarcane in Africa after Egypt and South Africa. The Sudan is also experiencing renewed growth in

cotton plantation since 2016-2017 due to high international prices and highly productive improved seeds.⁴³

Livestock

The Sudan is one of the largest livestock-producing countries in Africa and the Arab World, where the livestock sector contributes to the livelihoods of at least 26 million people. It provides more than 60 percent of the estimated value added to the agriculture sector and is a substantial contributor to the GDP with an average of 20-22 percent. An estimated total livestock population in 2019 is about 119 million heads of cattle, sheep, goats, camels, and others.

TABLE 9 - 2: Crop production patterns in the Sudan

#	Production Pattern	Area	Principal crops
1	Irrigated agriculture <ul style="list-style-type: none"> a) Large national irrigation schemes (Gezira, Suki, New Halfa and Rahad) using river flow from the Nile and its tributaries b) Large scale irrigation schemes (Gash and Tokar) using seasonal floods c) Small-scale irrigation along the banks of the Nile and its tributaries. <p>The sector also takes advantage of rains, which is important especially during the establishment of summer crops and for reducing production costs on privately-owned irrigated smallholdings along the banks of the Nile and its tributaries that depend on diesel-powered pumps.</p>	1.68 million hectares	sugar cane, cotton, sorghum, groundnuts, wheat, vegetables, fruits, and green fodders
2	Semi mechanized rainfed agriculture <ul style="list-style-type: none"> • It runs through Kassala, Gadarif, Blue Nile, Sennar, White Nile and South Kordofan states. • The belt receives, on average, more than 500 mm of rainfall annually 	6.7 million hectares	Sorghum (accounting for about 80 percent of the cultivated land and usually producing about 45 percent of the country's requirements), sesame, sunflowers, millet, and cotton
3	Traditional rainfed agriculture <ul style="list-style-type: none"> • Occupies the largest number of farmers and includes small family units farming from 2 to 50 hectares for both income and subsistence. • On the larger units, there may be a modicum of mechanization in the form of land preparation, but most operations are carried out manually. • The traditional sector predominates in the west of Sudan, in Darfur and in much of Kordofan State. 	9 million hectares	Millet, sorghum, groundnuts, sesame, hibiscus (karkadé), watermelon and Gum Arabic

⁴³ FAO. 2020. Special Report - 2019 FAO Crop and Food Supply Assessment Mission to the Sudan. Rome. <https://doi.org/10.4060/ca7787en>

The main livestock production systems include the following:

- **Nomadic pastoralism** – Livestock ownership per household is large and may vary from 100 to 1,000 heads of livestock, including cattle, camel, goats, and sheep. Livestock move over long distances stretching over more than 500 kilometres in search of feed and water.
- **Agropastoralism** – Crop production is small and mixed with livestock rearing with livestock ownership per household ranging from 7 to 15 small animals, mainly local chickens, goats, and sheep. Goats and poultry are kept mainly as a source of animal protein in the form of milk, eggs, and poultry meat, while sheep are kept mainly as a source of income. Unlike nomadic pastoralism, in agropastoralism, livestock cover shorter distances depending on the rainfall situation.

Private and public services

In 2017, the government implemented several reforms to promote the private sector and in 2018, it undertook legislative review and a number of procedural changes. Sudan Multi Partner Trust Fund (SMPF) managed by the World Bank has been providing technical assistance activities for Agribusiness, Micro, Small and Medium Enterprises (SMEs) development and Special Economic Zones (SEZs) since mid-2019. In recent years, several large private enterprises have emerged, producing fodder crops such as alfalfa and Rhodes grass for export, mainly to the Gulf countries. These enterprises are usually highly mechanized, use efficient irrigation systems such as centre pivots and other forms of sprinkler irrigation and generally achieve high yields of good quality fodder.

Risks and vulnerabilities

While there is considerable potential for agricultural crop production in

the Sudan, the subsector has faced a number of challenges that have constrained and restricted opportunities for sustainable growth to support the economy and the people that depend on the sector for their livelihoods. Among the key constraints are limited resource allocations, capacity, and infrastructure; limited enabling environment for business; and climate challenges, including agro-climatic conditions. Being mainly rainfed, agriculture in the Sudan is highly vulnerable to variations in rainfall amounts and timing.

The total production of sorghum and millet in 2019/20 is estimated at 5.1 million tonnes, 57 percent below that of the previous year and 18 percent less than the five-year average.

Sorghum production is estimated at about 4 million tonnes, 26 percent lower than the level of the previous year and 19 percent less than the five-year average.

National millet production is estimated at 1.1 million tonnes, 63 percent lower than the bumper production of 2018 and 16 percent less than the five-year average.

- The 2019/2020 CFSAM Report

- **Unreliable rainfall:** Agriculture is predominately rain-fed in Sudan, where the majority of the population live, thereby impacting the food security in the country. Crop production in the rainfed sectors exhibits very wide annual fluctuations as a result of unreliable rainfall amounts and distribution, resulting in late sowing, long dry spells, flooding from intense downpours, the necessity to re-sow and, not uncommonly, complete crop failure.
- **Limited resource allocations and lack of enabling business environment:** The situation in the

⁴⁴ FAO. 2020. Special Report - 2019 FAO Crop and Food Supply Assessment Mission to the Sudan. Rome. <https://doi.org/10.4060/ca7787en>

irrigated sector is more predictable. Nevertheless, viewed globally, yields are generally low in all sectors for various reasons other than the rainfall variability. These include, inter alia, a shortage of efficient, well-maintained farm machinery, a shortage of credit and working capital, the use of low yielding crop varieties with scarce availability of improved seeds and poor agricultural practices in weed and pest control.

- **Inadequate infrastructure:** Crop yields in the federal irrigated schemes remain low by world standards, largely due to the poor maintenance and silting up of canals, the shortage of efficient modern pumps and the adoption of traditional agricultural practices that do not allow to make the most efficient use of the constant water resource and exploit the full potential of more intensive farming.

Despite the efforts, the overall agriculture production remains far from its potential. These efforts were also inadequate in developing rural agriculture and address the food security because of the lack of investment research, extension, markets development, efficient farmer's organizations, value chains, credit etc. in rain fed areas. The situation was complicated further by the conflict and displacement in several areas of Sudan (Darfur, Blue Nile and South Kordofan).

The policy actions in the Five Years Program for Economic Reform (2015-2019) included modernization of the irrigated sector, supporting traditional rain fed with research, improved seeds, using zero tillage techniques, storage, markets, water harvesting, credit, and rural infrastructure as well as providing price incentives (minimum floor prices) and introducing crop insurance. Also, the program targeted improvement of livestock breeds and providing the animal wealth with veterinary services vaccinations, quarantines, extension, artificial insemination, and modern slaughterhouses, while providing fodder in irrigated area and improving range and pasture in rain fed areas.

In addition, the Program focused, among other themes, on ensuring tree cover of 10 percent of the area under mechanized farms and rehabilitating the gum Arabic belt. Addressing gender disparities was also a main focus of the Program. A major drawback of the aforementioned plans is the failure of putting the industrial sector (including agro-industries) as an engine for growth for export-oriented direction to achieve the needed economic transformation.⁴⁵

In the crop sector, production of groundnut in 2019/20 is reported to be 2.6 million tonnes followed by Sorghum (about 2 million tonnes), millet (1 million tonne), and sesame (0.6 million tonnes).

Agriculture revitalization efforts in the Sudan

Several efforts were exerted to revitalize agriculture. Total expenditures on agriculture including related infrastructure increased as percent of total public expenditure from 6.4 percent in 2012 to reach over 10 percent on average during 2015-2017 in line with the IPoA and the CAADP.

Investment in livestock sector included the successful health program of vaccination and inspection for livestock exports of sheep and investments in quarantines during 2012-2018 that resulted in remarkable recovery of live animal's exports.

Suitable policies in the area of liberalizing and investments in the Gum Arabic, led to increased gum exports.

Investments in technological improvement in cotton (genetically modified cotton) resulted in its recovery; the yield had more than two folds' increase.

⁴⁵ FAO. 2020. Special Report - 2019 FAO Crop and Food Supply Assessment Mission to the Sudan. Rome. <https://doi.org/10.4060/ca7787en>

The area planted with sorghum in 2019/20 is estimated at 9 million hectares, about 13 percent less than in the previous year, due mainly by a reduction of 21 percent in the traditional rainfed sector and of 7 percent in the mechanized rainfed sector. However, the area planted with millet was estimated at a near-average level of 4 million hectares, 16 percent less compared to 2018. The reduction in millet plantings was confined mainly to North and West Kordofan and North and West Darfur, where, in particular, tribal clashes restricted access to agricultural land.⁴⁶ See Annex, Table 20 2 for the detailed baseline data statistics.

Livestock is raised in almost all parts of the country and animals are owned primarily by nomadic tribes. In 2018, the total number of sheep, goats and cattle in Sudan were estimated to be about 40 million, 55 million, and 31 million respectively. See Annex, Table 20 3 for the detailed baseline data for livestock.

POST-DISASTER EFFECTS FOR THE SECTOR

Since July 2020, through mid-September, continued torrential rains and flooding combined with the historical overflow of the River Nile and its tributaries have affected all the states in the Sudan with the exception of South Darfur, causing devastating damage alongside riverbanks in the northern, central and eastern regions of the country. This has caused widespread damage in a range of sectors, including and most significantly, the agriculture sector.⁴⁷

Floods and waterlogging due to intense rainfall heavily damaged crop and pasture lands in the Sudan. Flash floods also caused major losses of agricultural inputs, tools, and pumps, as well as the destruction of agriculture and livestock service facilities.

Limited movement and access to farms and inputs was also recorded, affecting the livelihoods and food security of thousands of already vulnerable communities across the country.

Moreover, the wet environment constitutes favourable conditions for the spreading of weeds, plant pests and livestock diseases, posing additional risks to the agriculture and livestock sectors.⁴⁸ The estimated the crop loss is shown in Table 9-3 below. The flood resulted in severe damage to

As per the Sudan 2020 Flood impact rapid assessment carried out by the FAO jointly with the Government of the Sudan in September 2020

- Approximately 2,216,362 ha of cropland is reported to have been damaged in the 15 assessed states, particularly in Gedarif, Blue Nile, Sennar and Kassala, where almost 1,906,767 ha of the planted area was submerged.
- About 597,689 farming and pastoral households have been affected by the floods and heavy rains. It includes 527,968 farming households in rainfed areas; 49,200 farming households in the irrigated sector, and 20,521 pastoral households
- About 42 percent of the total affected households are female-headed.

cultivated crops, particularly sorghum – the staple food crop in the Sudan. The FAO estimated the total production loss at 1,044,942 tonnes in the rainfed sector.⁴⁹ Seeds, tools, equipment, machinery, and agriculture-related infrastructure was also lost.

⁴⁶ FAO Floods Report 2020 and 2019 FAO Crop and Food Supply Assessment

⁴⁷ Food and Agriculture Organization of the United Nations. (September 2020). The Sudan 2020 Flood impact rapid assessment. A joint assessment with the Government of the Sudan.

⁴⁸ Ibid.

⁴⁹ The analysis of the production losses refers only to groundnut, millet, sesame and sorghum. The overall production loss does not include losses to vegetables and pulses due to the lack of disaggregated information (i.e. varieties of crops affected).

TABLE 9 - 3: Estimated Loss of Agricultural Tools

#	Agricultural tools	Number of damaged/lost tools	Unit Cost (SDG)	Total Damage (SDG)
1	Tractors	256	1,045,000	267,520,000
2	Disc ploughs	200	495,000	99,000,000
3	Sprayers	150	49,500	7,425,000
4	Hand tools	310	2,750	852,500
5	Donkey ploughs	1,000	71,500	71,500,000
	Total			446,297,500

About 111 tonnes of different seed varieties were reported to be washed away. However, this loss in seeds is under-reported and might be higher than stated. Additional agricultural assets such as 256 tractors, 200 disc-ploughs, 150 sprayers, 310 hand tools and 1,000 donkey ploughs were reported lost but may also be under-reported. Estimated cost of the loss of these tools is shown in Table 9-3.

In the rainfed areas of the flood-affected states, other agriculture-related assets like water harvesting structures, including shallow wells, irrigation pumps, power generators, dams, *hafirs*, irrigation systems, slaughter slabs, village markets, and horticulture were damaged by the floods.



TABLE 9 - 4: Crop Loss Estimates (SDG)

#	States	Total Area cultivated (ha)	Total planted area damaged (ha)	Estimated production losses (tonnes)					Economic value of production losses (SDG)					Total Loss (Million SDG)
				Sorghum	Millet	Sesame	Groundnut		Sorghum	Millet	Sesame	Groundnut		
1	East Darfur	478,829	87,150	9,410	5,088	2,926	12,294		94,103,015	178,068,917	29,263,743	553,213,839		855
2	Red Sea	48,145	12,131	1,175	635	366	1,536		11,754,169	22,242,137	3,655,260	69,100,537		107
3	White Nile	446,463	44,326	3,284	1,776	1,021	4,291		32,843,276	62,148,557	10,213,458	193,079,411		298
4	Kassala	359,310	109,048	18,367	9,930	5,712	23,994		183,668,389	347,551,363	57,116,389	1,079,751,743		1,668
5	Gedarf	2,436,000	1,067,721	142,549	77,069	44,329	186,226		1,425,487,472	2,697,416,335	443,291,836	8,380,171,397		12,946
6	West Darfur	136,107	8,120	2,632	1,423	818	3,438		26,320,219	49,805,130	8184,946	154,731,591		239
7	North Darfur	237,804	27,180	5,973	3,229	1,857	7,803		59,730,304	113,026,246	18,574,668	351,143,167		542
8	South Kordofan	650,000	26,842	3,264	1,765	1,015	4,264		32,637,451	61,759,080	10,149,451	191,869,407		296
9	Central Darfur	400,925	17,500	7,514	4,063	2,337	9,817		75,141,818	142,189,091	23,367,273	441,744,545		682
10	Blue Nile	1,850,529	617,419	107,979	58,379	33,579	141,064		1,079,790,777	2,043,262,629	335,788,595	6,347,885,872		9,807
11	Sennar	688,261	112,579	16,485	8,913	5,127	21,536		164,852,853	311,947,167	51,265,216	969,138,760		1,497
12	West Kordofan	315,000	31,573	4,267	2,307	1,327	5,575		42,672,193	80,747,585	13,270,011	250,861,757		388
13	River Nile	160,000	39,956	6,604	3,571	2,054	8,628		66,044,370	124,974,204	20,538,188	388,262,368		600
14	Khartoum	30,110	8,517	744	402	232	973		7,444,518	14,087,086	2,315,064	43,764,915		68
15	North Kordofan	63,000	6,300	636	344	198	830		6,355,231	12,025,854	1,976,322	37,361,201		58
16	South Darfur	-	-	-	-	-	-		-	-	-	-		-
17	Gegira	-	-	-	-	-	-		-	-	-	-		-
Total		8,300,483	2,216,362	330,885	178,893	102,897	432,268		3,308,846,056	6,261,251,379	1,028,970,420	19,452,080,510		30,051

Source: FAO Floods Report 2020 and PDNA Estimates; *Production losses only refer to sorghum, millet, sesame, and groundnut in the rainfed sector

In addition to the crops losses, the livestock sector was also severely impacted with the loss of more than 107,000 heads of livestock particularly sheep, goats, poultry, and cattle, belonging to about 20,521 households. North Darfur, Blue Nile and Sennar states registered the highest number of losses with a combined total of 75,597.⁵⁰ Table 8 5 below shows the economic cost of total damages in livestock.

TABLE 9 - 5: Total Livestock Damage Estimates (SDG)

States	Sheep	Goats	Cattle	Poultry	Total damages
East Darfur	0	9,000,000	0	0	9,000,000
Red Sea	7,809,000	14,640,000	350,000	0	22,799,000
White Nile	45,714,000	7,884,000	28,450,000	0	82,048,000
Kassala	66,500,000	18,000,000	24,500,000	36,000	109,036,000
Gedarfif	36,537,000	84,348,000	32,450,000	0	153,335,000
West Darfur	61,693,000	33,876,000	49,500,000	80,000	145,149,000
North Darfur	228,000,000	56,400,000	5,000,000	0	289,400,000
South Kordofan	0	0	0	0	0
Central Darfur	0	0	0	0	0
Blue Nile	399,399,000	28,476,000	88,350,000	0	516,225,000
Sennar	400,938,000	9,600,000	12,800,000	0	423,338,000
West Kordofan	16,188,000	26,16,000	0	0	18,804,000
River Nile	0	0	0	0	0
Khartoum	0	0	0	0	0
North Kordofan	0	0	0	0	0
South Darfur	0	0	0	0	0
Gezira	0	0	0	0	0
Total	1,262,778,000	264,840,000	241,400,000	116,000	1,769,134,000

Source: FAO Floods Report 2020

The damage and loss of horticulture, seeds, tools, equipment, machinery and agriculture and irrigation-related infrastructure would risk many farmers to miss the start of the upcoming agriculture seasons, starting in October 2020 and March 2021, respectively. This subsequent impact of the floods demands timely replacement of agricultural inputs and tools, rehabilitation of irrigation schemes, as well as provision of support to livestock, fishery, and forestry subsectors.

Cross Cutting Issues (Gender, Environment, Employment, Livelihoods and Social Protection, DRR)

The assessment findings show that job opportunities such as casual agricultural labour – considered one of the most important income-generating activities for the rural population – have already diminished and will probably decrease even further during the upcoming

⁵⁰ Food and Agriculture Organization of the United Nations. (September 2020). The Sudan 2020 Flood impact rapid assessment. A joint assessment with the Government of the Sudan.

harvest season. Consequently, a lack of job opportunities in areas such as farm labour and agri-food processing and marketing will have a significant impact on the livelihoods of many vulnerable women. Women play a significant role in agriculture, with 80 per cent of farming households having at least one woman involved in harvesting on average.⁵¹

A survey by the Union of Small Industries and Handicrafts in Sudan estimates that in Agriculture, Horticulture and allied sectors, the SMEs lost their income of about SDG 468 million⁵².

Additional findings of the assessment show that affected populations have begun to engage in distress coping mechanisms such as borrowing money and selling productive assets to access food. Levels of debt are escalating and affected populations will need to access cash as soon as possible to repay their debts.

Prior to the ongoing devastating floods, a desert locust invasion in the Horn of Africa and surveillance efforts in the affected countries had already eroded the Government's fiscal capacity to respond to the disaster, which led to the mobilization of external support. The combination of

the impact of the economic downturn, high level of inflation, COVID-19 pandemic, desert locust invasion and now the ongoing flooding, will likely further weaken the agriculture sector, adversely impacting the most vulnerable population of the country.

MACRO-ECONOMIC AND HUMAN IMPACT

Agriculture sector activities are the primary livelihood for more than 70 percent of the Sudanese population and support a large proportion of people in rural areas. Agricultural activities are an important contributor to urban area economies through activities like storage, processing, and trade. At least 55 percent of the total population in the flood-affected states pursue agricultural and livestock activities as their main sources of income.

Women farmers constitute about 42 percent of the total farmers engaging in agriculture and livestock rearing. If not directly engaged in agricultural production activities, the majority of rural populations undertake activities and services closely related to the sector, such as procuring inputs, processing, transport, and trading among others.



⁵¹ OCHA January 2020, Humanitarian Needs Overview, Sudan

⁵² For more details, please see the Employment and Livelihood chapter of the report

In fact, the economy of the Sudan is highly dependent on agriculture, which occupies an estimated 43 percent of its labour force (ILO estimates of 2019) and accounts for about 30 percent of its GDP (World Bank). Yet, investment in the agriculture sector is low. Macroeconomic instability with high inflation and multiple exchange rates is creating unpredictable environment for private investment and to production including agriculture. Investment in agriculture and the policies facing the agro processing sector do not create a conducive environment for economic transformation. Flooding has further weakened the economic sector, which has affected the level of investments in the sector.

Additionally, the share of Sudan's export in world trade is still low ranging from 0.02-0.03 percent. The government policies did not materialize in shifting exports from agriculture raw material and natural resource to agro processing and industrial goods. Agriculture is therefore still facing problems of low inputs (research, extension, improved seeds, better livestock breeds, etc.), poor markets (including poor livestock infrastructure), weak credit institutions, and inefficient farmer's organizations. As most resources, financial and institutional, will be steered toward meeting the immediate recovery needs of the sector, it becomes challenging to develop trade market for the sector to support its long-term resilience.

RECOVERY NEEDS AND STRATEGY

Recovery Needs and Prioritization
Based on the damage and loss incurred due to the floods, the short-term recovery interventions should address the need of the farmers for crop loss recovery and livestock ownership. Restocking of sheep, goats and chickens should take

place as soon as possible to avoid a sharp decrease in family income. The replacement of agricultural inputs and tools should be a short-term priority to protect the affected farmers from spiralling impact of the floods on their livelihood. Also, as an immediate recovery measure, additional funds must be raised to continue the distribution of food and non-food items to the affected states. Currently, this support is provided by the World Food Programme (WFP), non-governmental organizations (NGOs), Zakat Chamber and national voluntary and charity organizations. In the medium-term, the interventions should ensure the rehabilitation of irrigation schemes so that that affected populations can continue agricultural activities in the coming seasons. These interventions should be merged with the cash-for work programmes, which are critical to rehabilitate affected areas and allow for income generation through restoring irrigation systems, repairing roads, rehabilitating small *hafirs* and shallow wells, removing debris from agricultural land, etc.

In the long-run, to ensure food security, household welfare and export earnings, the government interest and spending in the sector should increase, especially following the secession of South Sudan in 2011 and the loss of substantial oil revenues and current low market prices.⁵³

One of the medium to long-run focuses of the recovery intervention should be capacity building to not only support agriculture in Sudan but to bring innovation and risk reduction practices into the sector. Seed banks, breeding techniques, crop insurances etc. should be institutionally encouraged and supported, which could in turn reduce the potential disaster impacts on farmers in future.

⁵³ According to the World Bank, the annual government expenditures on agriculture accounts for under 3 percent of total public expenditures.

Recommendations for DRR and Building Resilience in Sector

The high impact of natural hazards and disasters on agriculture calls for enhanced mainstreaming of disaster risk reduction and resilience building within the agriculture sector to strengthen the livelihoods and food security and nutrition of the Sudanese people.

In the medium to long-run, it is essential to obtain external robust support from resource partners to respond to the needs of affected communities and strengthen the resilience of the most vulnerable households through devising preparedness and preventive measures for flood management.

Restoring roads, bridges, and providing easy access to markets, seed banks and other agricultural inputs for the farmers constitute an essential part of the overall resilience of the sector. Bringing the principles of Build Back Better (BBB) into recovery interventions, especially in terms of infrastructure repairs and reconstruction, could mainstream DRR in agriculture and enhance preparedness of the agriculture communities against

potential disasters.

See Annex, Table 20 4 for detailed calculation for recovery needs estimation.

Recovery interventions pertaining to restoration of roads, irrigation systems, removal of debris etc. merged with Cash for Work programs are estimated in the Employment and Livelihood chapter.

Implementation Arrangements

Provision of seeds and agricultural tools as well as restocking of livestock could be rolled out through in-kind mechanisms, vouchers, input trade fairs, or cash transfers. In-kind intervention mechanism could be utilized to distribute storage bags for seeds to avoid post-harvest losses, and provide animal feed, veterinary drugs, and vaccines to the affected and poor households. Cash transfers could be particularly useful in meeting immediate food needs of the most affected and vulnerable population. And cash for work programmes should be rolled out to restore irrigation systems, repair roads and other agriculture infrastructure with BBB components integrated in the implementation.

TABLE 9 - 6: Short-term (3-6 months) Recovery Initiatives and Costs

Item	Description	Cost	
		SDG	USD
Livestock	Restocking of lost livestock – distribute sheep, goats, cattle, poultry to the affected households	1,769,134,000	32,166,073
Replenish lost seeds of affected crops	Distribute Sorghum, Millet, Groundnut, and Sesame seeds to the most affected and vulnerable agriculture households	2,862,746	52,050
Replace damaged or lost agriculture tools	Provide agriculture tools such as disc ploughs, sprayers, tractors, hand tools, donkey ploughs to the affected households	446,297,500	8,114,500
Total		2,218,294,246	40,332,623
Total Recovery Cost (adjusted for inflation, 15%)		2,551,038,383	46,382,516

Source: (i) The Sudan 2020 Flood impact rapid assessment. A joint assessment with the Government of the Sudan; (ii) 2019 FAO Crop and Food Supply Assessment Mission to the Sudan; (iii) FAO, GIEWS Update, 2018, "The Sudan Fuel shortages and high prices of agricultural inputs affecting planting of 2018 crops".



The government and Ministry of Agriculture should ensure, in medium to long terms, that farmers have adequate tools and seeds for the next farming season. Special trainings could be held at local level to educate farmers regarding seed banks, improved breeding techniques, livestock management, and also to learn from them critical challenges they face during the time of a calamity and otherwise.

One of the most important long-term recovery measures includes financing

the sector and insuring farmers against natural disasters. The government along with relevant line ministries, local and multilateral financial and technical institutions should develop a financial system that safeguards the agriculture sector and all its actors against major damages and in turn loss of livelihoods, and economic downfall.

Strong financial support, proper access to markets and tools, along with disaster preparedness could take agriculture ahead in the path of resilience in Sudan.



INFRASTRUCTURE SECTORS



TRANSPORT



ENERGY &
ELECTRICITY



WATER,
SANITATION
& WATER
RESOURCES
MANAGEMENT

10. TRANSPORT

SUMMARY

This chapter provides an assessment of the transport infrastructure before and after the flood disaster, estimating the losses and damages, and proposes a prioritized list of recovery needs and recovery strategy. Transport networks underpin economic activity by enabling the movement of goods and people. During this extreme weather event, the Sudan transport infrastructure was both directly and indirectly damaged,

posing a threat to human safety, and causing significant disruption and associated economic and social impacts. According to the Sudan Federal Ministry of Infrastructure and Transport, roads were washed away, ports facility were submerged, airport buildings were flooded, integrity of runway pavements were undermined, and railway infrastructure was damaged. A summary of estimated damages to the transport infrastructure and where possible the resultant losses have been estimated below.

TABLE 10 - 1: Damages and losses in the Transport sector

Sub sector	Damages (USD)	Losses (USD)
Road Transport	83,015,090	
Railways	492,454	820,756
Aviation Transport	6,935,908	
River Transport	453,109	
Total	90,896,562	820,756

Indirect impacts of the flood disaster included:

- Increased vehicle and road user costs, journey times, loss of business due to farmers and producers failing to transport goods and livestock to markets.
- Outbreak of water borne diseases due to water stagnation and contamination
- Loss of social safety nets for the vulnerable groups like elderly, women, and children
- Pushing the poor deeper into poverty as the cost of basic needs increased many folds.

At a macroeconomic level, the flood disaster disrupted supply chains, production, movement of goods and

services and most importantly for the Government of Sudan, reduced the tax revenue and the ability to provide adequate public services.

After a rapid assessment of the damage to transport infrastructure, an approximately USD 109 million recovery needs strategy has been drawn. This strategy is based on a prioritised list of short, medium, and long-term actions recommended with the sustainable build back better approach.

- For the short-term, we propose conducting the necessary impact assessment, temporary opening up of roads, clearing debris, selection of suitable procurement models and preparation of request for expressions of interest, request for proposals and bidding documents.

- In the medium term, we propose carrying out detailed engineering designs, detailed engineering design reviews and procurement of supervision services.
- In the long term, it would be necessary to launch the civil works with building back better approach, carry out client institutional and organizational review, conduct stakeholder climate and disaster risk management capacity building and training, review and update existing design manuals and standards to incorporate changes in climate parameters, and undertake a climate and disaster review of all transport infrastructure.

PRE-DISASTER AND SECTOR CONTEXT

Railways Transport

Sudan's railways network is considered one of the longest railway networks in Africa with a 4,587 Km length for a 1,076 mm rail width. This rail network links the different regions of Sudan with the three main lines: Port Sudan –Atbara – Khartoum, Al Obayed – Nyala , and Atbara-Abuhamad-Half.

The railways network comprises 2,225 bridges and culverts ranging between 6ft to 15ft in size and consist of pre-stressed

FIGURE 10 - 1: Map showing the railway network of Sudan.

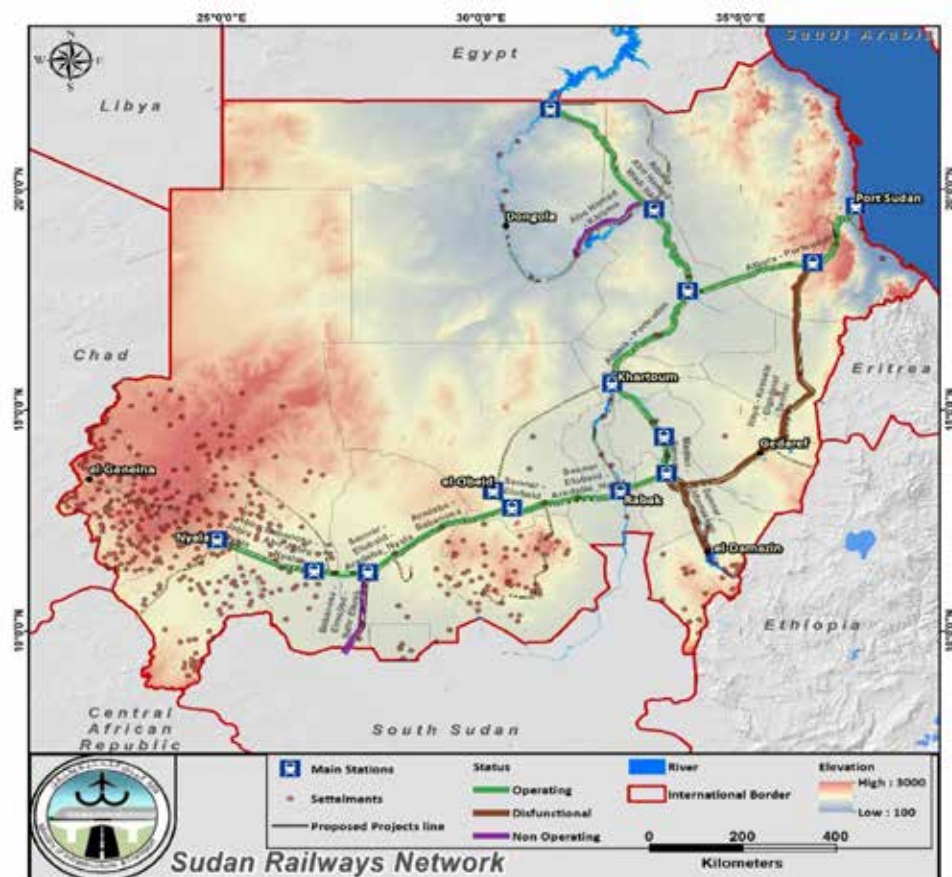


TABLE 10 - 2: Status of Sudan's railway lines

Line	Construction date	Length in Kms.	Rail Weight	Status
Wadi Halfa- Abu Hamed	1898-1897	350	93 Kms. 75 lb. yard 257 Kms. 50 lb. yard	Not Functioning
Abu Hamed – Atbara	1899	244	244 Kms. 75 lb. yard	Not Functioning
Atbra – Khartoum	1900 – 1898	313	313 Kms. 90 lb. Yard	Functioning
Atbra – Port Sudan	1906- 1904	474	474 Kms. 90 lb. Yard	Functioning
No.(10) Karima	1905	222	222 Kms. 50 lb. Yard	Not Functioning
Khartoum – Kosti – El Obied.	1911 – 1909	689	573 Kms. 75 lb. Yard 116 Kms. 90 lb. Yard	Functioning
Haiya – Kassala	1924 – 1923	347	347 Kms. 75 lb. Yard	Not Functioning
Kassala – Gedarif	1928 – 1924	218	218 Kms. 75 lb. Yard	Not Functioning
Gedarif – Sennar	1929 – 1928	237	237 Kms. 75 lb. Yard	Not Functioning
Sinnar – Damazine	1954 – 1953	227	227 Kms. 50 lb. Yard	Not Functioning
Alrahad - Babanousa	1957 – 1956	354	346 Kms. 75 lb. Yard 8 Kms. 90 lb. Yard	Functioning
Babanousa – Nyala	1959 – 1957	335	325 Kms. 50 lb. Yard 10 Kms	Functioning
Babanousa – Wau	1962 – 1959	446	446 Kms. 50 lb. yard	Not Functioning
Girba – Digiam	1962	70	70 Kms. 50 lb. Yard	Not Functioning
Muglad – Abu Gabra	1995	52	52 Kms. 50 lb. Yard	Not Functioning
Total length		4578		

concrete bridges & steel bridges, large span bridges sizes varying from 26ft-250ft. There are 85 bridges of 15ft and 43 pipes culverts on the line between Seinnar / El Obied. Type of sleepers used throughout the network included solid wood, concrete, and steel. Not all of the railway lines are functioning due to various reasons. Table 10-2 shows detailed status of the railway lines:

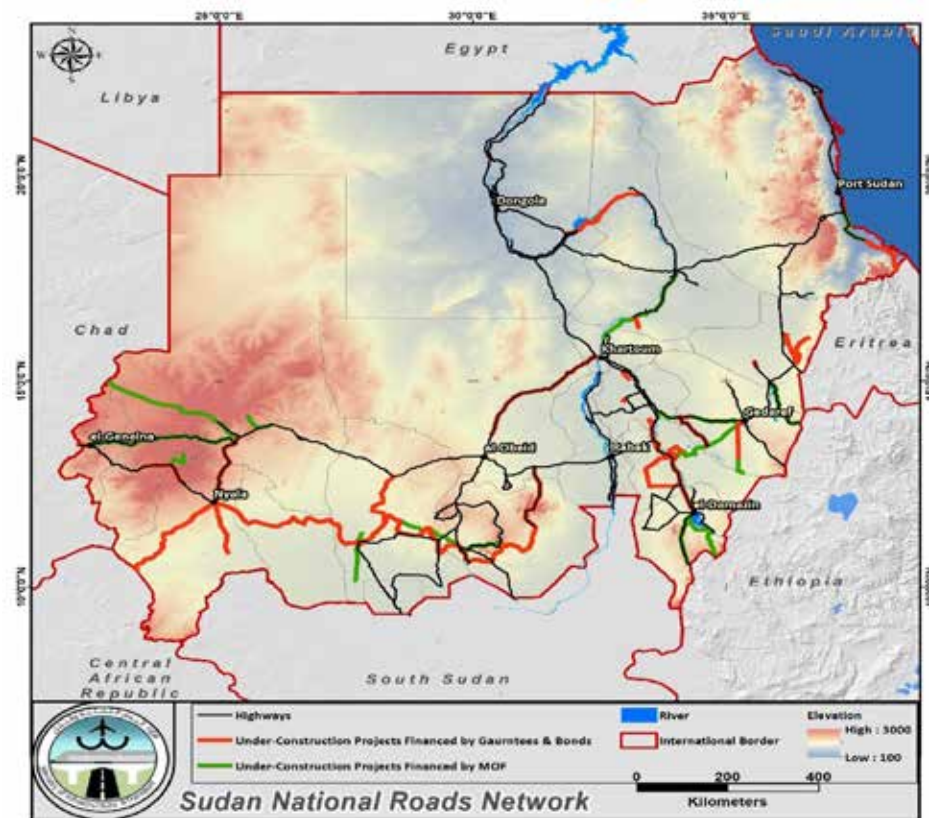
Road Transport

The National roads network consists of arterial roads connecting Khartoum with the different regions of Sudan. The main roads link the capital with the coastal gateway of Port Sudan, Egypt and North Africa, Eritrean, and Ethiopian border. The existing road arteries originate from Khartoum and connect to the western region of Sudan. There are two major arterial roads with most roads radiating from them, one linking the states of

Kurdufan and Darfur, and the other is linking Khartoum state to Red Sea state.

The traffic flow overall is considered low except between Red Sea and Khartoum states, and between Red Sea and Gadarif states. The total length of the national road network is about 12,316 km excluding state and urban roads. The overall road network condition is patchy and only fair for the recently maintained roads. Many highways traverse rolling terrain with many valleys and streams. Poor detailed engineering designs have made most roads susceptible to climate and disaster risks. The last maintenance on the network was carried out in 2017 and only focused on traffic accident blackspots and sections with very poor pavement. National roads are the responsibility of the Federal Ministry of Infrastructure and Transport while urban roads which may be categorised as primary, secondary, or tertiary are under the responsibilities of the respective states.

FIGURE 10 - 2: Extent of the Sudan National Road Network



River Transport

River transport is one of the cheapest and most environmentally friendly means of transport contributing to the development of the Sudanese economy. The history of modern river transport in Sudan dates back more than 150 years since the introduction of steam vessels during the Turkish and English-Egyptian periods. As a result of policy changes over the years, the Karima-Dongola line and the Khartoum Coastline were suspended, navigation was restricted to only between Kosti and Juba, which also ceased after the outbreak of the civil war in the south and after the secession of South Sudan. Construction of river transport infrastructure and the ship-building equipment in Khartoum Bahri has since been destroyed. Management and development of River Navigation Transport in Sudan is the mandate of the River Navigation Authority under the supervision of the Ministry of Transport. Established in 1980, the aim of the authority is to activate and regulate river navigation along the 4,000 km shipping

waterways and to de-monopolize public operations by encouraging the private sector to invest in river transport and provide conducive conditions to attract investment. The River Navigation Authority Act was amended in 1992 and some of its tasks include technical inspection of the containers and their suitability for river navigation, as well as issuance of licenses for transportation of passengers, luggage or tourism, and to determine the technical specifications of the ships manufactured locally or imported. Since the establishment of the department, it has not been able to fully play its role either because of shortcomings in the law, or the lack of budgets and plans that would enable it to execute its mandate. The department has not had specialized staff since its inception. There are two functioning river ports in Sudan:

- Halfa port in the Nubian lake which operates the line that connects Sudan to Egypt (Halfa/ Aswan) with total length of 350 Km. The annual tonnage of commodities is above 111,000 tons,

and over 60 passengers' trips per month between Sudan and Egypt. The traffic on Halfa port is directly connected to the function of the Eshkeet Border crossing. Halfa port is managed by a joint entity between Sudan and Egypt called the Nile valley corporation.

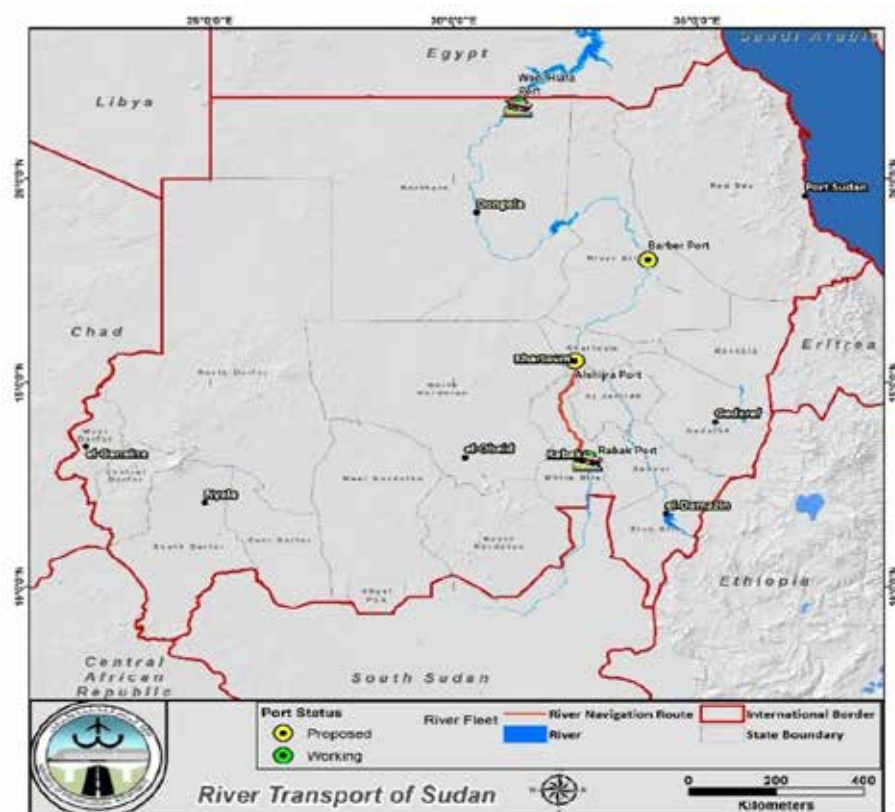
- Kosti port which operates the line that links Sudan and South Sudan (Kosti/ Juba) with total length of 1436 Km. Currently the main activity at Kosti port is shipping humanitarian aid to South Sudan by UN agencies and other organizations.

TABLE 10 - 3: A few facts and inventory about Sudan River Transport

Item	No.
Number of registered Marine units	1,059
Number of driving licenses	742
Check points	204
Marine units manufacturing workshops	16
Companies & Corporations transporting goods	18
Companies & Corporations transporting passengers	7

River transport in Sudan is still poor, but authorities are determined to develop it to strengthen commercial and social ties with the neighbouring countries of Egypt and South Sudan, thus contribute the GDP with an environmentally friendly means of transportation.

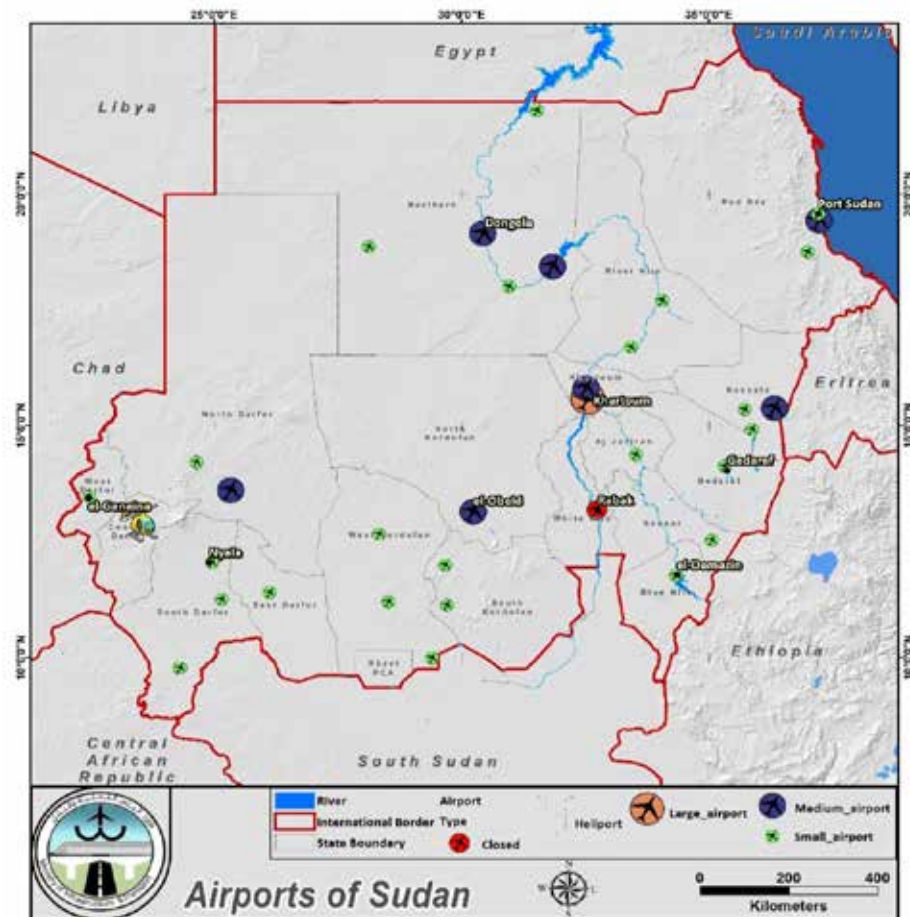
FIGURE 10 - 3: River navigation routes and ports in Sudan



Air Transport

Sudan's air transport is relatively developed as compared to other African countries and is largely driven by intercontinental traffic. The contribution of air transport to national GDP has decreased in the last four years despite the increase in domestic carriers operating between local and international destinations. Air transport in Sudan boasts over 10,000 international passenger flights and over 380 cargo flights annually.

FIGURE 10 - 4: Sudan's Airports and Airfields



POST-DISASTER EFFECTS FOR THE SECTOR

Road Transport

National roads in Red Sea, Algardarif, Kassala, Sinnar, Northern, Blue Nile, River Nile, White Nile, Darfur, and Kurdufan states were the most affected by the flood disaster. These are also the states with

the richest agricultural soils in Sudan and conducive for livestock farming. Floods damaged more than 130 locations of the road network with a cumulative damage length of 55 kilometres. These damages interrupted the supply of agricultural and animal products, other daily needs to local communities, fuel, and export. As a result, inflation rates reached 212.30% in September 2020.

FIGURE 10 - 5: National Roads damaged by the floods

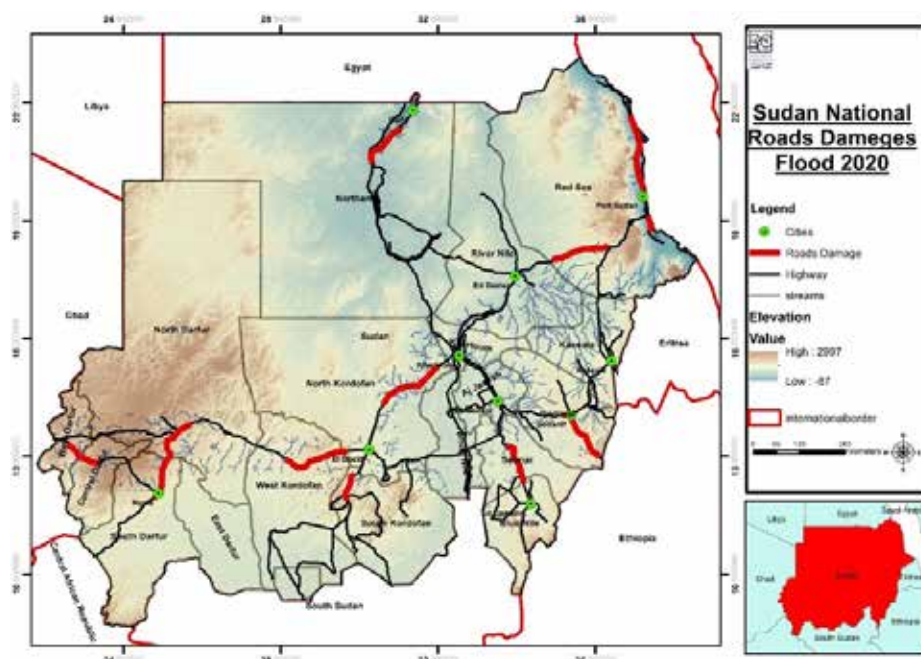


FIGURE 10 - 6: Selection of photos showing the extent of the National Road damages due to the 2020 floods



Alrahad Bridge



Sinnar – Sinja – Addamagine Road

Halfa – Alselaim Road

TABLE 10 - 4: Summary of the damages and costs to the National Road sector in all regions

Total length of Damaged roads (Km)	55
Estimated damage cost/Km (USD)	1,509,365
Estimated total cost of reconstruction (USD)	83,015,090

It should be noted that the Government of Sudan is in the process of carrying out immediate repairs or quick fixes to maintain connectivity and ensure some transportation of good and passengers to the all affected regions.

Railway Transport

Over 230 location in the railways network were damaged or affected by the floods. The damage to bridges and railway infrastructure has affected movement of goods and passengers leading to delays and increases in prices and impacting profitability of businesses.

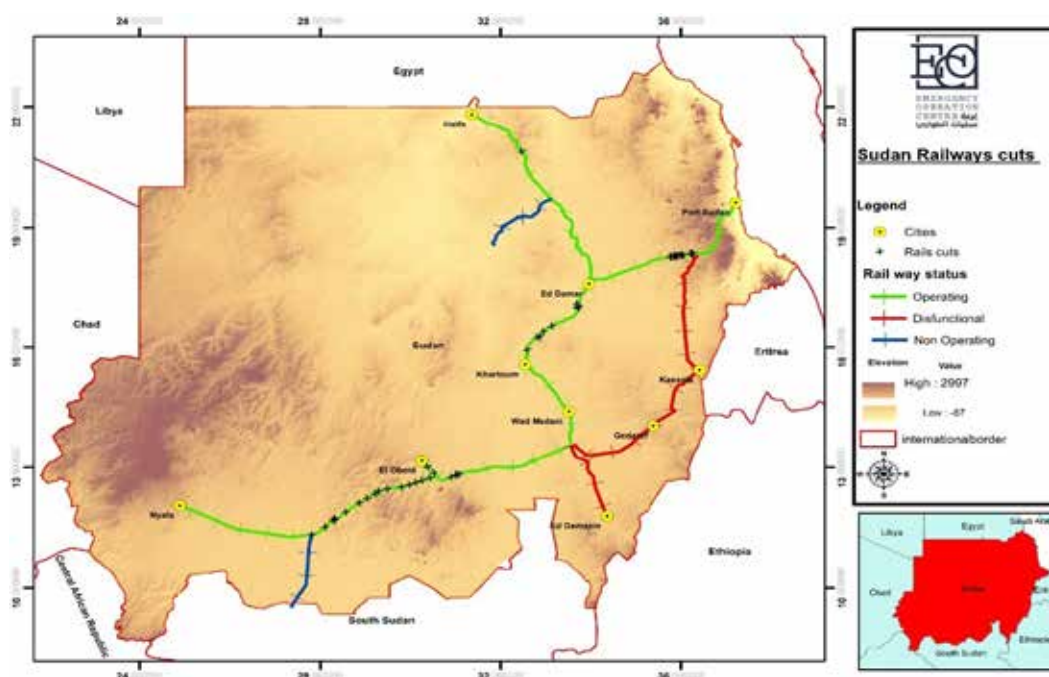
TABLE 10 - 5: Summary of the flood damages and losses to the Railway Sector

Region	Damage (USD)	Loss (USD)
Northern	133,177.83	221,963.05
Eastern	159,224.42	265,374.02
Southern	168,206.92	280,344.87
Western	31,844.88	53,074.80
Total	492,454.05	820,756.74

FIGURE 10 - 7: Selection of photos showing the extent of the National Road damages due to the 2020 floods



FIGURE 10 - 8: Damages to the railway network due to the floods



Air Transport

The aviation sub sector suffered damages to airport infrastructure such as runways and airport buildings, which affected smooth operation of flights.

TABLE 10 - 6: Aviation sector damages descriptions and the associated restoration costs

Airport	Description of damage	Cost (USD)
Aljinaina airport	Collapse of CD building & toilets due to flash flood	1,999.63
Al fashir Airport	flash floods damaged the APRON (Settlement) & the mosque building	4,318.36
Neyala Airport	TAX	3,829.09
Alobayed Airport	Runway flooding resulted in cracks, settlement, and ditching	1,276,363.63
Kadogli Airport	, Runaway ditches & Bushes	638.18
Zalinji Airport	Runway& APRON bushes, fence damage	8,509.09
Al dea'in Airport	Runway bushes & ditches	2,978.18
Kassala Airport	runway ditches, APRON, internal service roads Damages in the terminal building	5,637,272.72
Total		6,935,908.88

River Transport

There was total shutdown in Kosti port for about 20 days due to the increase in the water level while at Halfa port, operations decreased to one trip per week with one functioning dock. Damage to river transport infrastructure was estimated at USD 453,109.08. Indirect losses from river transport as result of the floods could not be accurately determined at the time of preparing this document.

Cross Cutting Issues

Transport networks in Sudan underpin economic activity by enabling the movement of goods and people.

- Gender: In transport, gender issues will need to be incorporated in the interventions by letting more women participate in road construction works. In addition, interventions should take into consideration concerns of women, e.g. safety of transport services.
- Social Protection: Since the livelihood of communities is hugely affected, employment will need to be considered to allow the local people to earn a living. Labour intensive methods of road rehabilitation will be considered for rehabilitation works especially for feeder roads. Schemes will be designed in such a way that local people are engaged whilst ensuring good quality works through proper supervision and monitoring. The experience of some NGOs engaged in the sector e.g. International Labour Organization (ILO) will be sought, where communities are contracted directly to carry out labour intensive works but an individual supervisor (local) is employed to ensure quality of works.
- Displacement and Migration: The movement of people will cause some areas to have inadequate local workers for the labour-intensive works while more demand for work would be available where more people have migrated to. Works programs will need to take this into consideration when designing projects.
- Environment & Natural Resources: Environmental issues should be considered in all road works. For instance, the natural habitat of pests and animals would need to be conserved as much as possible and trees should not be cut unnecessarily during implementation. Measures should be taken to replace vegetative cover where it has been removed due to the works.
- Governance: The recovery of the private sector is vital for the economy of the country. Wherever possible, Government could consider cutting on taxes for transporters to minimize costs that are transmitted to the consumer for transported goods. Consideration should also be made when procuring works, goods, and services, to give priority to the local private sector wherever possible in order to improve capacity.
- Disaster Risk Reduction: To improve disaster resilience, all transport infrastructure needs to be constructed using the building-back-better concept, placing particular emphasis on the consideration of hazard areas to avoid future damage.

MACRO-ECONOMIC AND HUMAN IMPACT

The 2020 extreme weather event both directly and indirectly damaged the transport infrastructure, posing a threat to human safety, and causing significant disruption and associated economic and social impacts. This flooding was as a result of intense precipitation, and predominantly caused weather-related disruption to the transport sector in Sudan. In addition to loss or reduced connectivity, the 2020 flood in Sudan led to many impacts i.e. increased journey times as vehicles tried to manoeuvre flooded roads, increased road accident due to skidding, fatalities and injuries, increased vehicle and road user costs, loss of commerce due to farmers and producers failing to transport goods and livestock to markets. Wells and other fresh water sources were contaminated,

and stagnant water became a breeding ground for mosquitoes causing water borne diseases. These floods negatively impacted vulnerable groups like women, children, and the elderly. Expectant mothers could not easily access medical care, children could not attend school and pushed the poor into extreme poverty as the cost of basic needs increased manifold.

Some of the economic impacts of the flood disaster include:

- Business interruptions (the interruption in production during the flood event);
- Production losses directly due to asset losses (because damaged or destroyed assets cannot produce, during a period that is much longer than the event itself);
- Supply-chain disruptions caused by lack of input or reduced demand responsible for a reduction in production from a production site that is not directly affected;
- Macro-economic feedbacks (e.g., the impact of reduced final demand because consumers and businesses suffer from a reduced income, and the effect of lost tax revenue on public demand);
- Long-term adverse consequences on economic growth (e.g., due to changes in risk perception (including over-reactions) that can drive investors and entrepreneurs out of the affected area or Sudan altogether);
- Increased production from the “reconstruction boom” that may act as a stimulus for the economy.

For Sudan in particular, impassable road sections such as those washed away will be a major factor to delay the emergency relief and reconstruction efforts in all sectors in the areas connected via those bridges. Access delays to those areas due to detours or slowing down will have a long lasting and broad impact. Importing and exporting of goods to and from the neighbouring countries will also be affected as strategic international corridors pass through Sudan. The

damages on the road network is likely to affect the gateway to the sea through Port Sudan, which transport export products like mineral ores, food products, fuel oils, and import products like cement, fertilizers, heavy machinery and equipment, textiles, and beverages. Roads serve as the lifeline of the disaster-affected region. Road was virtually the only mode of transport for people in the regions to send goods to markets and factories, to go to cities to receive health and civil services. The extensive damages to roads significantly stalled the economic activities of regions of Sudan and reduced the quality of life for the affected households. Until restoration works are completed, the areas connected via such roads and infrastructure will suffer from loss or limited access to market, services, and employment.

Losses in revenue will be experienced by transporters during the downtime period; however, there might be an increase in transportation of goods when government imports food and relief items that need to be distributed to the affected areas, requiring the services of transport sector enterprises. Impassable road sections such as those washed away will be a major factor in delaying the emergency relief and reconstruction efforts in all sectors.

RECOVERY NEEDS AND STRATEGY

The assessed total cost of reconstruction is USD 90,896,562, which is composed of USD 83,015,090 for Roads reconstruction, USD 492,454 for railways damages restoration, USD 6,935,908 for aviation recovery, and USD 453,109 for river transport recovery. If the agencies are to take into consideration the build-back-better approach, the reconstruction cost estimate will be 20 percent more at USD 109,075,875. The recovery interventions are suggested as follows:

- Carry out clearing of debris and temporary reconstruction of roads, bridges, and bypass roads on strategic road corridors to allow passage of vehicles for relief and reconstruction.

This can improve the access to remote locations while accelerating the reconstruction of infrastructure in the region;

- Concurrently with the above, plan and carry out disaster impact surveys to develop an inventory of transport infrastructure requiring reconstruction and repair works. Due to the extensive damages caused by the floods, the Federal Ministry of Transport and Infrastructure would need to take a holistic and coordinated approach to recover to the pre-disaster state. For example, an inventory based on detailed field surveys would help establish the actual cost required for

roads managed by the National Road Agency and enable the prioritization of the road sections to be reconstructed;

- Once the above is completed for all sub sector (roads, railways, waterways, and aviation) the preparation of detailed engineering designs as per the priority list can be conducted;
- Procure for civil works using quick and efficient models suitable for the circumstances and construction industry e.g. design and build, output, and performance-based contracts, input based construction contract, etc.

TABLE 10 - 7: Summary of the flood damages and losses to the Railway Sector

Term	Activity	Description	Cost (US\$)
Short term (6-12 months)	Impact Survey	Plan and carry out disaster impact surveys to develop an inventory of road infrastructure requiring reconstruction and repair works	1,000,000
	Temporary road access	Carry out clearing debris and temporary reconstruction of roads, bridges, and bypass roads on strategic routes to allow passage of vehicles for relief and reconstruction	1,400,000
	Determine contract models, packages, prepare calls for expressions of interest, request for proposals and bidding documents	Assessment of the availability of construction materials (e.g. bitumen/asphalt, cement, steel) and determine alternatives. Assessment of the availability of skilled and unskilled manpower for construction works Based on capacity of construction industry, assess determine contracting models to be used	700,000
Medium-term (2-3yrs)	Detailed engineering design	Launch procurement of detailed engineering designs for the priority list projects.	3,000,000
	Designs review and preparation of supervision	Carry out design review and procure supervision consultant	200,000
	Carry out civil works construction and supervision	Construction of works	98,675,875

Long Term (3-5yrs)	Review institutional and governance arrangements of responsible transport agencies	Carry out an institution gap analysis to determine the current needs to for good practice sector management	500,000
	Review technical standards in use	Carry out an update of detailed engineering design standards and manuals to ensure consideration for current climatic hazards like increased precipitation and rising temperatures	1,500,000
	Climate and Disaster Risk Management capacity building and training	Responsible agencies and private sector practitioners to attend seminars, conferences and academic training on Climate and Disaster Risk Management	100,000
	Carry out climate and disaster vulnerability assessment of all the Transport infrastructure assets	Prepare a prioritised investment plans to ensure all transport infrastructure are resilient to future climate and disaster risks	2,000,000

The purpose of the recovery strategy is to restore road infrastructure, ensure cost effective and quality services, while ensuring sustainable disaster resilient infrastructure and safe transport system for affected areas. The strategy is aligned to international commitments such as the Sustainable Development Goals (SDGs) for an efficient transport system to stimulate production and development by linking production to demand, employment creation and income generation. The broad objectives include:

- Reduce and control transport costs for affected areas during restoring period;
- Assure quality, sustainable and durable restored works network;
- Improve safety mobility of goods and passengers during restoring period;
- Assure public mobility to access essential social services before and during restoring period;
- To facilitate a strategy for mobilisation of funds to finance temporary and long term sustainable and disaster resilient transport infrastructure for the affected areas.

Implementation Arrangements

The Federal Ministry of Infrastructure and Transport is the government organ for the overall responsibility for transport infrastructure policy, strategy, planning, monitoring and evaluation. Ministry of Finance is responsible for the overall economic planning, allocation of financial resources, national public investment programs including transport and also mobilizing of financial resources.

Recovery Strategy for the Sector

The strategy for the sector aims at bringing accessibility to those areas that have been prioritized by the respective sectors. Reconstruction works will aim at linkages that are completely destroyed but are critical for the recovery, especially National roads. These would require total reconstruction with a bituminous surfacing to restore riding quality and reduce road users' costs. Meanwhile some of the roads that would bring positive impact but are not completely destroyed may receive periodic or routine maintenance for strengthening and to make them passable. For low volume roads, thin surfacing and where necessary re-gravelling may be recommended. Depending on several factors like security,

availability of labour and extent of road damage, some may be rehabilitated using equipment while others could use labour intensive methods. The labour-intensive methods would be vital in providing short term employment to communities and improve their livelihood, but to also impact basic skills to the people of road rehabilitation techniques and hope they can use these to maintain the roads. For civil works that require specialised equipment, e.g. pavers, bull dozers etc, depending on availability of skills, they may be packaged into appropriate contracts for competitive national bidding to support the local construction industry. Sophisticated works requiring foreign skills would be packaged for international competitive bidding. To reduce duration of procurement and ensure client value and contractor

responsibility for the quality of works, contracting modalities like design and build, and output and performance-based contracting may be considered.

All projects packaged for rehabilitation and reconstruction of roads and bridges will require adherence to standard procedures and technical requirements for road construction applicable to the Sudan or the region. This will ensure that the building-back-better concept is properly captured for resilience in the sector. To achieve this, and for efficiency, a consulting firm may be engaged to provide the client services as a technical consultant to scope and package projects, provide the implementing agency with support in carrying out reviews of designs and analytical deliverables, and monitoring of civil works construction.



11. ENERGY & ELECTRICITY

SUMMARY

The River Nile flood affected the Sudan electricity generation, transmission, and distribution networks. At the national grid, the generation level in Garri 1, 2, 3 and 4, power stations have been partially damaged. Additionally, some off-grid power generation station e.g. Elnihood in West Kordofan region is affected. The estimated total damage is USD 7,048,304 USD, which can be broken down, at generation Level is USD 318,182, transmission level is USD 125,574, regarding the distribution, the damage level was estimated by USD 6,604,548.

The losses at the generation level is USD 18,564,993, plus the losses of electricity sales for different consumer categories, i.e. residential, commercial, governmental, agricultural, and industrial, which are not yet up to now being accurately estimated.

Total recovery needs are estimated at USD 582.9 million. In the short term the total recovery needs estimate is USD 7,071,031 US Dollar. In the medium term the recovery estimated needs is USD 155,820,699 which include rehabilitation of all existing thermal power generation plants at Garri, Khartoum North, and Kosti at national grid level, and, isolated power station at off-grid and also completion of Garri 3, and Port Sudan Gas Turbine as well. In long term, the planned power generation at Garri 3, and Port Sudan gas turbines are to be converted to combined cycle plants of this costing USD 420,000,000.

PRE-DISASTER AND SECTOR CONTEXT

With an installed capacity of 3,200 MW as of 2018, the Sudanese power system is the fifth largest in Sub-Saharan Africa. It is mixed of hydro 48% and thermal 52% in terms of installed capacity; and hydro 52%, thermal 46%, and imports 2% in terms of energy generation. Sudan's power system performs at average or higher levels compared to other systems in the region.

Transmission and distribution losses in Sudan is low at 20% (15% distribution, 5% transmission). Bill collection rate stands at 94% due to the quality of commercial management and the universal installation of pre-payment energy meters. Sudan's performance is average by regional standards, but there is room for improvement. The system's quality of electricity service delivery is also fairly good by regional standards. The system's average interruption frequency index (SAIDI) measures the duration of outages for a typical customer, while the system average interruption frequency index (SAIFI) measures the number of outages per year. In Sudan SAIDI is 9.18 hours, and SAIFI is 10.14, putting the country in the first quartile in Africa for both indexes, but placing it significantly below the international average of 5.5 hours, and 6.4 respectively.

TABLE 11 - 1: Summary of the flood damages and losses to the Railway Sector

Sub-System	Name of plant	Number of units	Installed capacity, KW	Electricity generated, GW			
				FY 2017	FY 2018	FY 2019	FY 2020
Power generation							
Hydropower							
	Merwai Dam	10	1,250,000				
	Setit & Atbra	4	320,000				
	Roseries	7	280,000				
	Sinnar	2	15,000				
	Jabal Awalia	28	30,400				
	Griba	5	17,800				
Thermal power							
IN GRID STPG	Garri 1&2	12	381,200	1,325.46	1034.51	1,257.07	1,281.44
	KNPS	12	530,000	661.34	1,494.11	1282.48	610
	Garri 4	2	110,000				
	Kosti	4	500,000				
Thermal power							
OFF GRID STPG							
	Port Sudan	7	45,000				
	Nyala	21	37,500				
	Elfashir	17	31,280				
	Elgenena	5	9,650				
	Elnohood	9	14,200				
	Elobaied	4	12,700				
	Kadugli	7	6,400				
	Eldain	7	12,100				
	Zalingi	6	4,600				
	Alfula	4	4,000				

TABLE 11 - 2: Operational Baseline in Electrical Sector

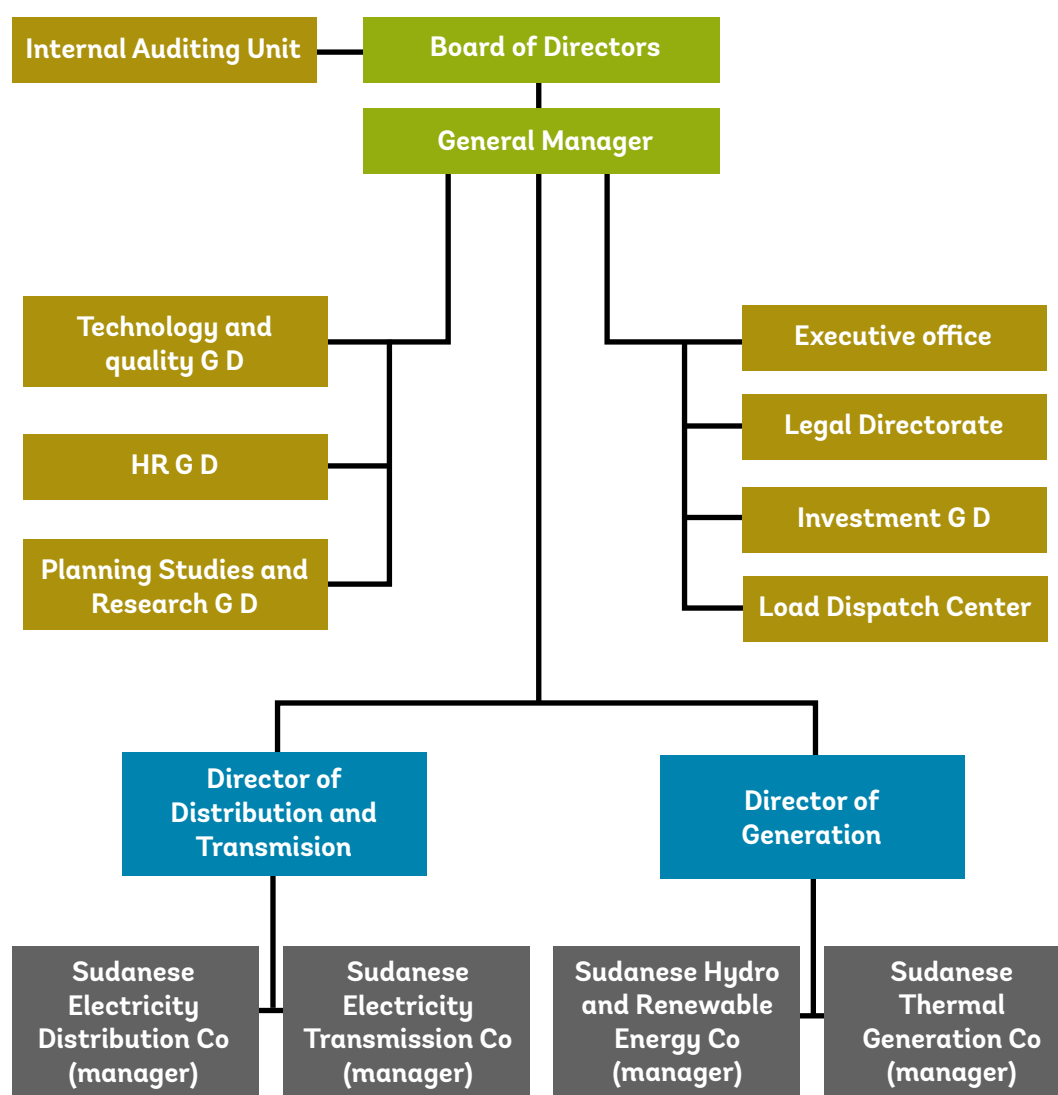
Sector		Actual values				Forecasted values	
		2017	2018	2019	2020	2021	2022
Sales of electricity, GWH /year							
	Residential	7,352.51	8,027.10	8,027.10	8,688.71	9,404.852	10,180.02
	Industrial	2,003.38	1,795.20	1,795.20	1,943.164	2,103.324	2,276.684
	Commerce	1,568.31	1,329.50	1,329.50	1,439.08	1,557.692	1,686.08
	Agriculture	873.88	1,002.40	1,002.40	1,085.02	1,174.449	1,271.25
	Others	1,188.54	1,545.10	1,883.30	2,038.526	2,206.545	2,388.413
	TOTAL	12,986.62	13,699.30	14,037.5	15,194.5	16,446.86	17,802.45
Rates of Electricity Sales, US\$/GWH							
	Residential	2,145.64	2,566.40	2,566.40	2,777.928	3,006.891	3,254.725
	Industrial	429.19	2,808.60	2,808.6	3,040.091	3,290.661	3,561.884
	Commerce	1,059.83	1,635.40	1,329.5	1,439.08	1,557.692	1,686.08
	Agriculture	152.36	379.4	379.4	410.6709	444.5193	481.1575
	Others	658.38	921.1	975.9	1,056.336	1,143.401	1,237.643
	TOTAL	4,445.40	8,310.90	8,059.8	8,724.106	9,443.164	10,221.49

Before 2020 floods, Sudan had one of the largest power systems in SSA with 3,500 MW of electricity generation capacity with hydro and thermal sources. Most of the electricity access are provided for urban and relatively rich segment of population. Electricity access in Kordofan and Darfur regions are particularly limited.

The electricity sector is governed by a cabinet decree issued in 2016 (decree

468/2016). This decree established the Sudan Electricity Holding Company (SEHC), which owns the affiliated companies for Electricity Distribution (SEDCO), electricity transmission (SETCO), electricity thermal generation company (STGC) and Sudan Hydro Generation and Renewable Energy Company (SHGRC).

FIGURE 11 - 1: The administrative structure of the Electricity Holding Company through to the general departments of the company



The electricity service in Sudan is based on two main systems. The first system is the national grid that supplies mainly central, eastern, northern, southern and parts of the western Sudan. The second system is the off-grid system, which is composed of isolated small-scale diesel power plants that supply remote towns or regions. Those not connected to a grid rely on biomass as heating energy source and few of them have diesel-fired generators for electricity supply. According to the Sudanese Electricity Holding Company statistics, around 32% of the population have been able to benefit from the grid electricity services at about 238.4 kWh as average country's per capita electric energy consumption.

The urban population is benefitting from a substantially higher level of electricity access than rural populations. The strategy of the Holding Company is to concentrate on the household sector and hence to provide access to electricity to 75-80% of the population by grid and 25-20% off-grid solutions to achieve universal access by 2031.

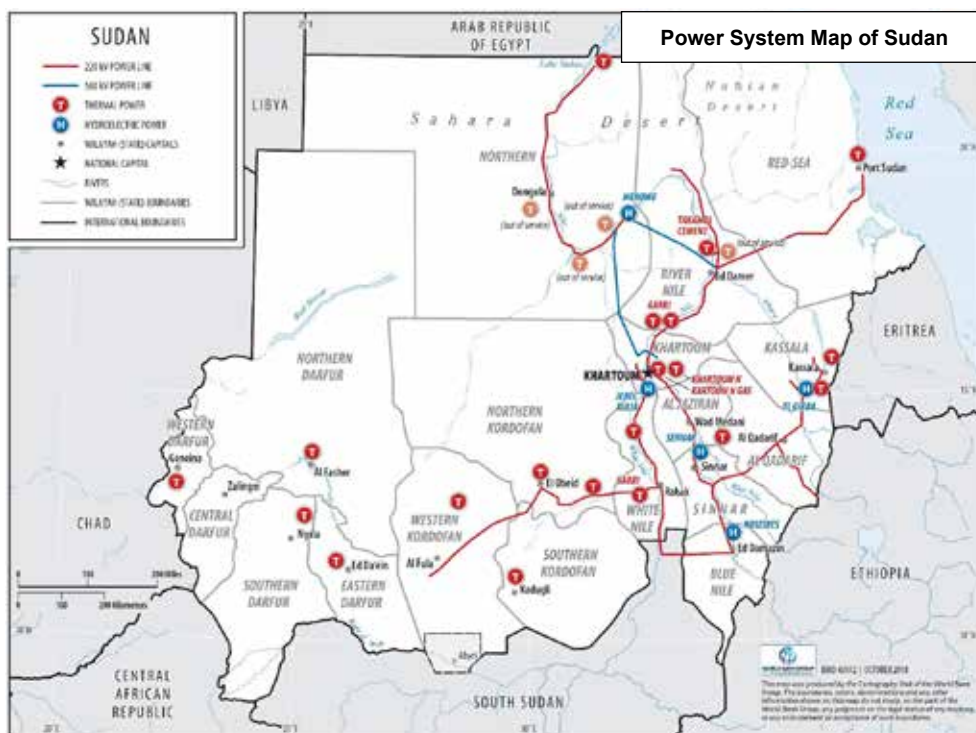
The share of electricity generated by hydropower plants has been significantly higher than from thermal power generation stations. By the end of 2018, Sudan had a total of 3,466.94 MW of generation capacity connected to the national grid of which 1,907 MW hydro and 1,559.94 MW thermal. The

average contribution of hydro power has been about 68% of all power fed to the grid between 2013 and 2017. The total installed capacity from Off-Grid plants is approximately 187.3 MW, of which 75 MW IPP (Independent Power Production) in Darfur region. This bring the total installed capacity in Sudan grid connected and off-grid plants to 3,654.24MW. Additionally, there is 150 MW rentals in the Red Sea states.

Sudan also imports power from neighbouring Ethiopia to meet part of its

domestic demand. The annual average imports between 2013 and 2017 has been approximately 450 GWh, which is 3.6% of electricity energy generated locally. Sudan's transmission grid consists of 965km of 500KV transmission lines power, 5,984km of 220KV transmission lines and 1,057km of 110KV, as illustrated in Figure 11-2, which shows the current transmission lines. It is clear that the current national grid covers most of the middle part of Sudan, some parts of the north, and some parts of the south with no connection to the western parts.

FIGURE 11 - 2: Sudan's Power Grid



POST-DISASTER EFFECTS FOR THE SECTOR

Overview of effects

The River Nile floods affected the infrastructure of the electricity sector. Parts of the thermal generation in Garri 1 & 2 power plants, and parts of the distribution network in the states including 16 out of 18 states of the Sudan were damaged.

As for thermal generation power plant, Garri 1 & 2, where the River Nile flooded the main river water intake barge and the pre-treatment water facility, about 13 Km away from the power plants, resulted in damages in two forwarding water pumps. Originally, there are four forwarding water pumps, two operational and two backups as standby. The damage has not affected the overall operation of the power plants, but the power

plant has been left without backup pumps, which increases the outage risk in case of any of the operational pump failure.

The distribution network has multiple damages in 16 out of 18 states estimated to cost amounts to over SDG 266 million, which could be summarized as follows: 125 transformers (SDG 126 million), 1,246 polls (SDG 41.5 million), 8,506 energy meters (SDG 46 million) and 10,940 different transmission network items (SDG 34.5 million).

The distribution network damages lead to supply interruption to the affected areas, which leads to electricity sales losses which in return also affect the local population by the loss of electricity services and increased risk of electric shocks at the flooding time. Table 10 3 summarises the data of damage in Electrical Sector, Table 10 6 for Estimated Damage Cost in Local Currency SDG and USD in Electrical Sector.

TABLE 11 - 3: Damage in Distribution, STPG and Transmission Lines Data

Name of plant	Number of units	Installed capacity, KW	Replacement Cost in 2020 (SDG)
Distribution			1,453,000.56
Distribution transformer	125		
Concrete poles	1,927		
meters	8,506		
others	10,940		
medium voltage fuses	11		
LV cables	120		
MV cables	25		
aluminium conductor	81,720		
stay set	22		
STPG			
Garri 1 &2	12 Unit		
River Side for Garri Complex	2 Sets		
Booster Pump	2 pumps		
Alnihood Thermal Station	2 units		11,250,000
Transmission Lines			
a. Atbara-PortSudan 220KV*	2 Towers	200,000.0	150,094.0
b. Managil - Maringan 110KV*	5 Towers	140,000.0	6,551,623.0
c. ALGamoia - Jebel Aulia 220KV*	3 Towers	500,000.0	204,869.0

TABLE 11 - 4: Estimated Damage Cost in Local Currency SDG and USD

Damage	Estimated Damage Cost	
	SDG	USD
Sudanese Thermal Power Generating Company		
On – Grids Thermal Plants: Garri 1 & 2 Power Stations (River Side & intakes water Plants):		
Damaged Cables Replacement for intake pumps	6,000,000	109,091
Cooling Water and General Pumps house sealing cables holes	250,000	4,546
Off-grids Power Station - Alnihood Power Station:		
Embankment, panels, and drainage maintenance	11,250,000	204,545.454
Total cost of damage (STPGC)	17,500,000	318,181.82
Sudanese Electricity Distribution Company:	SDG	USD
Khartoum & States Distribution		
Stations and transformers (125);	126,467,138.62	2,299,402
Energy Meters (8,506)	64,034,885.72	1,164,270
Poles (1,927)	41,511,207.40	745,157
Others: (10,940)	34,516,800.00	627,578
Total cost of damage (SEDCO)	266,530,031.74	4,846,000.58
Medium voltage fuses (11)		
LV cables (120)		
MV cables (25)	96,720,110.00	1,758,547
Aluminium conductor (81,720)		
stay set (22)		
Sudanese Electricity Transmission Company	SDG	USD
Atbara-Port Sudan 220KV* Towers (2)	150,094.0	2,729
Managil - Maringan 110KV* Towers (5)	6,551,623.0	119,120
ALGamoia - Jebel Aulia 220KV* Towers (3)	204,869.0	3,725
Total cost of Damaged Transmission Lines	6,906,586 SDG	125,574
Total cost of damage (SETCO)	363,250,140	6,604,548
Total Cost of Damage in Electricity Sector	387,656,727.7	7,048,304.14

TABLE 11 - 5: Losses and Needs

	Losses SDG	Losses USD
	Public	Public
Itemized list of Losses due of MW Generating Cost in Garri 1 & Garri 2		18,547,320.43
Itemized list of Losses: Garri 1 & 2		
Embankment		17,672.73
Total Losses		18,564,993.16

MACRO-ECONOMIC AND HUMAN IMPACT

It is estimated that approximately thousands of people are without power due to the flood. The data provided indicate that loss of power exposed many to the various risks due to darkness and affected women and children's sanitation, hygiene, and security. Several small and medium enterprises and home-based work and basic social service institutions have been disrupted, resulting in loss of income. For the less populated areas, the recovery may take longer thereby causing further hardship. Delay in re-establishing services, potentially means an increase in the use of fuel wood contributing to further environmental degradation

RECOVERY NEEDS AND STRATEGY

The main urgent recovery needs could be summarized in the replacement cost of the damaged generation, transmission and distribution network repairs and replacement to the totally damaged items. The cost to meet the immediate needs for the power sector is USD 5,113,363 covering direct damage suffered by power stations. The basic recovery strategy for the energy sector is as follows:

First Priority: Restore basic services. Due to the heavy rain, the power plants (Garri 1 & Garri 2) have been affected by the floods, water entered inside steam CWP's (Circulating Water Pumps) Motor, consequently the following equipment were burned:

- Circulating Water Pump's motor
- Auxiliary transformer No. 2
- Auxiliary transformer No. 2, incoming 10.5 KV switch
- 6.3 KV 8 panels, 26.3 KA, VC B Switch Board,
- Lots of cables
- 6.3 KV BUS DUCT
- Ball Bearing of the burned motor

The above-mentioned damages equipment needs repair and rehabilitation. The steps that took place to restore the continuation of the power generation:

- Bypass Auxiliary transformer No. 2 because it was burned.
- Turbine N.2, has been operated with auxiliary transformer No. 1 without backup (operational Risks)
- The Cable connecting generator G2 to the main transformer was burned. Cable joint repair was burned.
- The voltage transformer (PT) was burned, it has been repaired the PT to resynchronize Gas turbine No.2.

Also, some off-grid power station have been damaged, e.g., Elnihood power station, which has been restored back.

The transmission system has also been affected, i.e. 220 KV, towers between Atbra and Port Sudan, five 110KV tours between Mangil and Maringan, three 220KV tours between Algamouia and Jabel Awalia.

The distribution network has also been affected, i.e. 125 transformers, 8,506 energy meters, 1,246 poles carrying aluminium conductors, and some other ancillary equipment have been damaged at Khartoum state and other outer states of Sudan.

Second Priority: Rehabilitate thermal power generation facilities

All thermal power generation facilities have not been maintained for the last two years, and they should be rehabilitated, i.e. Garri 1,2 & 3 Khartoum North (Alsheed Mohmoud Sherif) Steam Power Station, and Kosti Steam Power Station. Also, steam diesel power stations in Darfur need to be overhauled and maintained. The completion of the construction of Garri 3 Gas Turbine and Port Sudan Gas Turbine power station. The total estimated cost for this second stage is USD 155,820,699

Third Priority: Combined cycle plants

The new Gas Turbine at Garri 4, and Port Sudan are to be converted to combined cycle plants. The estimated cost of this long term stage is about USD 420,000,000.

Recommendations for DRR and Building Resilience in Sector

1. Isolation of cable entrance and exit to stop water entry to the cable channels and restoration of lighting for the cable channel at Garri Power Plant Complex;
2. Heightening and reinforcement of the protection embankment of Garri 1, 2 & 3 power plants, and regular maintenance to avoid future disaster of flooding;
3. Provision of electric and diesel pumps of suitable capacities to meet future emergency needs at Garri Power Plant Complex;
4. Coordination with Khartoum Refinery Company to take necessary precautions for future expected floods for the whole Garri complex, including the power stations and refinery;
5. Take necessary action to ensure the safety of the bridge between the barge and the river water station feeding water to Garri Power Plant Complex;
6. Installation of security cameras at the river water treatment station and barge and connect them to the control room of Garri power stations complex for monitoring;
7. Avoiding expected flooding routes for future transmission lines and sub-stations;
8. Careful selection of future power stations and substations sites.

TABLE 11 - 6: Short, Medium & Long-term Recovery Initiatives and Costs

	Item	Description	Cost	
			SDG /Euro	USD
Short term	Power Generation	Garri 1, 2 & Elnihood		318,182
	Transmission	Towers		125,574
	Distribution	Khartoum & States		6,604,548
	Precautions work	For the next flooding		22,727
	Total for Short-term			7,071,031
Medium Term	Garri 1&2	Services	23,866 Euro	32,545
		Transformers	173,757 Euro	236,940
		Panels & Cables	62, 127 Euro	84,719
		Switch Board, 6.3 KV, BUS DUCT	270,018 Euro	368,206
		Total of Tender	529,767 Euro	722,410
		Total of reducing Future Risks	21,545.45 Euro	29,380
		Additional Operating Cost before restoration	23,866 Euro	32,545
		Total Tender		784,335
Medium Term	Garri 3: Embankment for floods Route			36,364
	Rehabilitation of Khartoum North		2,000,000 SDG	11, 000,000
	Rehabilitation: Garri 1, 2 & 4			36,000,000
	Rehabilitation of Kosti			19,000,000
	Siemens Gas Turbines			100,000,000
	Total for Medium term			155,820,699
Long Term	Siemens combined Cycle			420,000,000
	Total for Long Term			420,000,000
Total				582,891,730

Note: The above table shows the cost in SDG & Euro converted to USD as the official exchange rate

12. WATER, SANITATION & WATER RESOURCES MANAGEMENT

SUMMARY

This report broadly covers damages and losses for the water sector, which includes Water supply, Sanitation and Hygiene (WASH), as well as water resources infrastructure (monitoring equipment) and hydraulic infrastructure/ disaster management infrastructure such as embankments, dykes, small dams and haffirs.

594,676 people were directly impacted due to damages and losses related to water infrastructure (both WASH and Water Resources Management (WRM)) across the 18 states of Sudan. The damages and losses included damage to water supply infrastructure, sanitation (septic tanks, latrines, etc) and hygiene (handwashing facilities, ablution facilities, etc). For WRM, damages included destruction of various types of hydrological monitoring stations and equipment. It also included damages and destruction to embankments, dykes, small dams, and water harvesting structures (haffirs). Breach of small dams and dykes not only destroyed many livelihoods that impacted personal assets, agricultural land, livestock etc. The damage to Boot Dam in Blue Nile State killed 6 people and displaced nearly 100,000 people from their homes.

The total cost of damages is estimated at USD 240 million and losses to all water related infrastructure are estimated at USD 87.5 million. An estimated USD 359 million is needed to restore damaged infrastructure, restore services, and ensure rebuilt infrastructure is more resilient to

future flood disasters. This cost does not cover losses in terms of revenue or indirect losses such as loss of work time due to illness contracted from water-or-excreta-borne diseases, etc.

Temporary or permanent loss of water supply services due to destruction of infrastructure contributed to additional strain and economic burden on households who had to rely on purchase of water from water trucks or bottled water. Further, contamination increased in some areas due to presence of stagnant water and poor vector control. In some areas contamination of water sources was observed due to cross contamination and penetration of pollutants into groundwater.

Recovery efforts are aimed at short, medium- and long-term interventions and include building more resilient water infrastructure, increasing water resources monitoring as well as institutional measures. Proactive measures such as flood forecasting and early warning, operation and maintenance of existing infrastructure and policy measures are required to ensure active mitigation measures are place rather than delayed emergency response.

PRE-DISASTER AND SECTOR CONTEXT

The pre-disaster condition and data was triangulated from the National Simple Spatial Survey Method II (S3M II), which was carried out in 2018. The S3M II revealed that Sudan made reasonable progress in increasing access to BASIC⁵⁴

⁵⁴ Basic water supply is defined as: from improved water source with a collection time not more than 30 minutes for a round trip including queuing.

water sources from 68 percent to 73.7 percent of which 40.5 percent have access to household (HH) or compound network connected BASIC water supply. There are an estimated 35,716 water facilities (rural: 30,651, urban: 5,065) in the country that produce around 2,810,248 cubic metres of improved water supply per day (rural: 695,063, urban: 2,115,185).

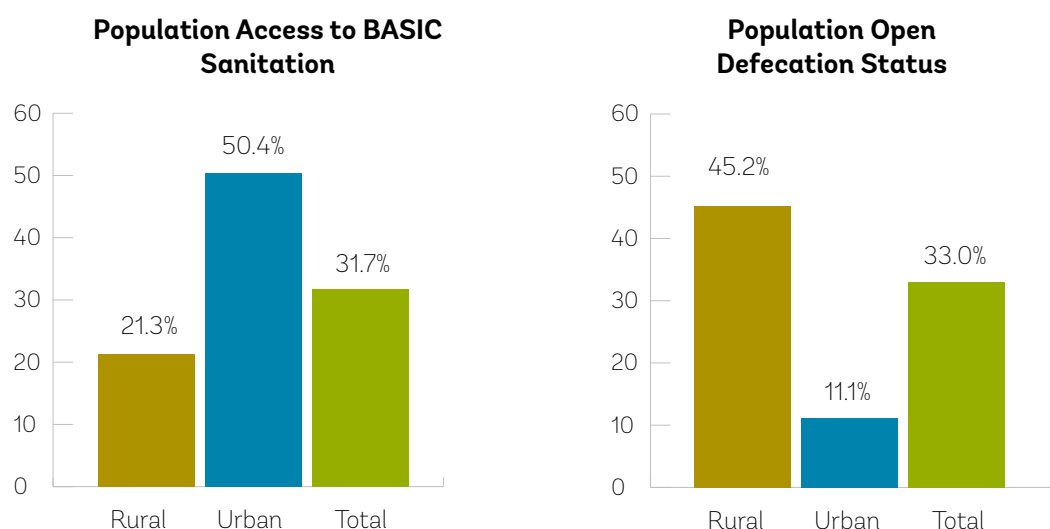
For Sanitation, 68.3 percent of the population (rural: 22,299,210; urban: 7,508,148) have access to BASIC sanitation facilities.⁵⁵ It is estimated that 33 percent of the population still practices open defecation. Figure 12-1 highlights sanitation coverage in rural and urban areas. Most households across the country have traditional pit latrines that sometimes can be unsafe, vulnerable to collapse and contribute to groundwater contamination. In major urban centres, a higher percentage of households have safely managed sanitation in the form of septic tanks where excreta are safely disposed in situ or transported and treated off-site.

Water resources monitoring tools provide a wide range of hydro-meteorological services for numerous sectors and play a key role in providing flood early warning information. Rainfall and hydrological

monitoring stations are operated and maintained by several agencies or directorates that are subscribed to the Ministry of Irrigation and Water Resources (MoIWR). The Nile Water Directorate of MoWIE maintains gauges across the Nile River System. As of 2019, only 25 hydrometric stations in the Nile system were functional, whereas more than 50 stations are not operational. The Groundwater and Wadis Directorate maintains 48 different stations along various seasonal streams and wadis, the majority of which are also not functional; while the Sudanese Meteorological Agency maintains all rainfall monitoring equipment. The Nile Waters Directorate has a Flood Early Warning System (FEWS), which is used for flood forecasting. There are many shortcomings of the current FEWS, including: (i) does not capture all Nile tributaries and seasonal streams; (ii) relies on inadequate network of in-situ monitoring stations; (iii) outdated modelling tools and framework; (iv) not adequately linked to flood risk mapping.

Water harvesting and flood protection structures in the form of small dams, haffirs, embankments and dykes play a significant role in enabling water security for multiple users (farmers, pastoralists,

FIGURE 12 - 1: Population access to BASIC sanitation and ODF Status
(Source: 2018 S3M)



⁵⁵ Basic sanitation refers to the use of an improved sanitation facility, which is not shared with other households.

communities, etc). These structures also play a dual role of flood protection. These facilities are constructed and maintained by numerous entities at federal, state and locality level. These structures are developed and maintained by numerous entities at federal, state, and local level. There is no consolidated knowledge base on the location and status of these structures. Mandates for operation and maintenance are unclear, which leads to neglect and mismanagement. There were at least more than 2,000 haffirs and small dams in the country,⁵⁶ which is expected to have further increased as a result of 'Zero Thirst Program' implemented by MoIWR.

According to the Sudan SDG 6 Plan, solid waste management (SWM) is the responsibility of households, Mahalias and Administrative Units (municipalities), cleaning corporations (in some states) and private sector. Only urban centres have some form of SWM. Most communities burn waste, dump in unofficial sites or in storm water drainage. Safe medical waste disposal is limited. Interstate transportation of medical waste is prohibited. There is only one privately-owned autoclave facility in Khartoum,

which is contracted out by the state ministry of health to safely dispose of medical materials. This machine currently only operates at 30% of its capacity while unsafe disposal through burning and dumping with municipal waste is widely practiced in the rest of the country.

POST-DISASTER EFFECTS FOR THE SECTOR

Damages on Infrastructure and Physical assets

Flood damages to water infrastructure included: (i) urban and water supply facilities; (ii) household sanitation facilities; (iii) water resources and meteorological monitoring stations; (iv) embankments, water harvesting structures and small dams; and (v) solid waste management facilities. Damage to water supply infrastructure were recorded in water treatment facilities in several cities, small dams, haffirs and groundwater boreholes. The most extensive damage was documented in Khartoum State, where the a 50,000 m³ treatment plants serving Bahri South locality (Broshab, Samrab, Hatab, Nabta, Dardog) was destroyed. Full damage was also documented in Blue Nile State, where Boot Dam breached. This dam had a reservoir capacity of 5 million m³ and provided water supply to 100,000 people. It also served as primary source of water supply for tens of thousands of heads of livestock and small-scale irrigation. This breach displaced nearly 80,000 people, resulted in the death of 6 people and injury to many others. Further, damages to water supply infrastructure occurred in 11 states with extensive impact in Gezira, Blue Nile, Sinnar, White Nile, West Kordofan. The assessment was able to gather information on predominantly urban areas with information from state water corporations. Information on damage to small rural water schemes was sporadic and based on accessibility and information from local officials.

Table 12-1 summarizes the available data on water supply and sanitation damages.



⁵⁶ Ministry of Irrigation and Water Resources. Technical guidelines for the Construction and Management of Improved Haffirs. 2009.

TABLE 12 - 1: Summary of Damage to Water and Sanitation Infrastructure

No	State	Infrastructure	Q. CD	Q. PD	No	State	Infrastructure	Q. CD	Q. PD
1	Khartoum Jebel Aulia, Dar E Islam, South Omdurman, North Omdurman and, North Bahri localities; 29 administrative units	Rivers, lakes, ponds or dams wells Large and small filtration systems Latrines Housing sector Waste management sites	Not Known 1 Not Known 3687 3841 1	1 1 4400 5805	9	White Nile All state	Rivers, lakes, ponds or dams Latrines Housing sector Educational facilities	4 338 5588 4	2073
2	Blue Nile Tadamon and Bau localities; 7 administrative units	Rivers, lakes, ponds or dams Latrines Housing sector Educational facilities	1 349 >322	5 456 13	10	River Nile All state	Rivers, lakes, ponds or dams Latrines Housing sector Educational facilities	1 631 2700 5	1036
3	North Darfur Kebkabiya locality; 2 administrative units	Boreholes, hand-dug wells Pumping stations-motor, wind, Latrines Housing sector Educational facilities	500 1 7013 2205 6	21 8513 19	11	West Darfur All state	Waste management sites Housing sector	5659	8095
4	East Darfur Ellalet locality; 3 administrative units	Rivers, lakes, ponds or dams Pumping stations-motor, wind, Latrines Housing sector	1589 535	3 1	12	Algararif All State	Housing sector Educational facilities	2311 23	4461
5	Sinnar Elsuki locality; 4 administrative units	Rivers, lakes, ponds or dams Boreholes, hand-dug wells Latrines Housing sector	1 2 243 748	1	13	Kassala All state	Housing sector Educational facilities	4291 11	3470
6	Northern Alabbah and 4 other localities	Piped distribution systems Latrines Housing sector	542	1	14	Red Sea All state	Boreholes, hand-dug wells Housing sector Educational facilities	2 2082 16	8058
7	North Kordofan Sheikan, Um Rawaba, Um Dam, Sodary and, West Bara localities; 30 communities	Storm and runoff collection Housing sector Educational facilities	20,000 Km 1969 1	6854 9	15	South Darfur All State	Latrines Housing sector Educational facilities	55 24 2	3463
8	Gezira Total 6 localities; 20 Administrative units	Rivers, lakes, ponds or dams Boreholes, hand-dug wells Piped distribution systems Latrines	5 9 7.2 Km 1748		16	Central Darfur All State	Latrines Housing sector Educational facilities	195 1899 10	1216
17	South Kordofan	Latrines Housing sector	62 425	215	17	South Kordofan All State	Latrines Housing sector	62 425	215
18	West Kordofan	Rivers, lakes, ponds or dams Latrines	1 1131	1	18	West Kordofan All State	Rivers, lakes, ponds or dams Latrines	1 1131	1

The largest damage in terms of sanitation facilities occurred in the aging storm drainage system in North Kordofan. As indicated in Table 11 1, thousands of household latrines and sanitation facilities were destroyed. Full count of household infrastructure is documented in the housing chapter of the assessment.

Damages to water resources monitoring included damage and total loss to 50 gauges. Most of the damaged gauges were manual. 5 gauges along the Nile were automated stations that were partially damaged. The damage was estimated to range between US\$ 5,000 and US\$ 15,000 depending on the type of monitoring equipment.

Damage to waste management facilities took place in the dumping site in Tuti island inside Khartoum, where the site was flooded. Incidents where waste material rested in stagnant waters, including medical waste, have been observed throughout.

Losses in Production and Access to Goods and Services

As per the primary survey and the inter-agency rapid flood assessments conducted in August 2020, many people faced challenges in accessing drinking water⁵⁷. People in Khartoum⁵⁸, mentioned the presence of a high ratio of salinity making the available borehole water non-potable, forcing HHs to pay for drinking water with the cost of 150 SDG/barrel. Besides, many households also faced challenges in accessing water temporarily owing to loss of jerry cans, washing basins, and buckets. Those who were displaced from their homes and were staying with relatives, neighbours or at nearby schools, were able to access some drinking water during those days. Others complained about increased turbidity in water, which could be caused by contamination and may become a cause for water-borne diseases.

Table 12-2 provides impacts and the estimated number of affected people across the states derived using baseline information on types of drinking water sources, the population affected in each of the states⁵⁹, and effects information from the primary survey (for 6 states) and rapid flood assessments (for other states):

TABLE 12 - 2: Impacts related to drinking water

Key risks for most vulnerable social groups	Estimate number of impacted social groups in most affected geographies ⁶⁰
1.1. Drinking Water	
1.1.1. HH affected by worsened water quality (in terms of colour, taste, or other contamination) (this can have second-order implications on health and water-borne diseases discussed in the health section of this chapter)	1.31 million HH (Sinnar = 207.6 thousand, Khartoum = 202.8 thousand, River Nile = 186.5 thousand)
1.1.2. HH affected due to increased prices of drinking water (those who relied on tanker and bottled water earlier) (temporary impact but may result in coping mechanisms such as borrowing money and increasing debts that may have long-term implications)	485.5 thousand HH (Blue Nile = 141.7 thousand, Red Sea = 102.6 thousand, Khartoum = 75.1 thousand)
1.1.3. HH affected due to lack of physical access to drinking water (it may have been a temporary impact but has led to coping mechanisms such as reducing consumption of water, borrowed money, etc. which may have long-term implications)	1.699 million HH (Khartoum = 525.8 thousand, River Nile = 276.9 thousand, Sinnar = 263 thousand)

⁵⁷ HAC & UNOCHA Rapid Flood Assessment Reports August 2020

⁵⁸ Norwegian Refugee Council, "Rapid Assessment Report - Impact of Floods and Torrential Rains on Um Dawwn Ban Locality Eastern Nile Bank , Khartoum North" (Khartoum: NRC, 2020).

⁵⁹ FAO and Transitional GoS, "The Sudan 2020 Flood Impact Rapid Assessment."

⁶⁰ Northern state is not included in this assessment due to lack of information available on the flood impact. West Kordofan, Central and East Darfur also have significant data gaps, and therefore are not as well represented here.

Impacts due to affected sanitation and drainage facilities

As per the primary survey (qualitatively corroborated by the Inter-agency rapid flood assessments in Aug 2020), 64% respondents raised the issue of damaged sanitation facilities, including those who previously had access to improved sanitation. This can have immediate and mid-term implications on water contamination related to disease outbreaks. Owing to poor solid waste management, 60% households experienced an increase in mosquitoes and bad smells, 46% experienced blocked drains, 41% experienced health and safety issues, and 33% faced blocked roads and access issues. 33% respondents indicated being forced to shift to open defecation, while another 48% respondents indicated shifting to shared sanitation facilities (mostly women while men shifted to open defecation), thereby potentially increasing their risks of contracting COVID-19. 10% of respondents also indicated rationing toilet times to either too early in the morning or late at night, with women facing safety issues. 7% faced issues of access, 4% indicated having female family members who faced safety issues, and 3% indicated safety issues against animals (snakes, scorpions, etc.).

Destruction of water resources monitoring equipment such as gauges limited the government's capacity to forecast and adequately orient flood early warning efforts. Loss of these equipment also limited the capacity to provide valuable data on availability of water resources for other productive uses such as reservoir operations (for power generation) and

irrigated agriculture. Loss of data from these tools limit the availability of information that can be used in feasibility and engineering studies to inform development of infrastructure such as roads, irrigation schemes, water supply (for domestic and livestock purposes), etc.

Water harvesting structures and flood management structures such as small dams, haffirs, embankments play a dual role of harnessing resources that can be scarce during the dry season and providing protection during the rainy season. As such, destruction of these facilities increased vulnerability of impacted communities to water scarcity during the upcoming dry months.

Governance and Decision-Making Processes

There are limited arrangements for coordination for preparedness for flood disasters. The Civil Defence Act 2005 established the National Council for Civil Defence (NCCD), but the NCCD did not activate any form or preparedness or take proactive measures to mitigate against the devastating impacts of these floods. For instance, flood early warning bulletins and forecasts were issued for selected areas of the Nile River (primarily Blue Nile). Although forecasts were issued by the Sudanese Meteorological Authority and the Ministry of Irrigation and Water Resources (MoIWR), no preparedness actions were taken by relevant stakeholders. In areas outside of the Nile Basin or areas with malfunctioning monitoring equipment, no detailed forecasts were issued.

TABLE 12 - 3: Summary Table of Damage and Loss for Sector

	Damage & Loss (USD)		
	Public	Private	Total
Damages	223M Infrastructure and assets: Water supply, Solid waste and, Physical assets	17M Infrastructure and assets: Sanitation facilities	240M
Losses	>1.5M Service delivery and access: Higher water supply operation and distribution 4.5M Governance: Disruption to admin functions and, Damage to documentation	81.5M Service delivery and access: Decrease in income and, Increase in products	87.5M



Cross Cutting Issues

In Khartoum, the requirement for temporary latrines continues to be a pressing matter to meeting the sanitation needs of affected families, including the refugee community. 27,000 individuals in Dar el Salaam IDP camp and communities in Bahri who reported the use of a neighbour's latrines and open defecation. In South Omdurman, a large component of the stranded population consisted of child, elderly, and women groups.

In North Darfur, more than 60% of the affected population are IDPs, most of whom lost their WFP ration cards to the flood. Women-headed households made up 20% of the affected population. In East Darfur out of the 3,200 affected individuals, 25 families are IDPs, 20 have been displaced, women lead 63. In the Northern state, most of the affected population are children (40%), women (20%) and, elderly and disabled (6%).

RECOVERY NEEDS AND STRATEGY

Recovery Needs and Prioritization

- Improve water and sanitation infrastructure and services;
- Transparent turn-around policies and programs and improved accountability;
- Build sector institutional capacity and address fragmented governance framework;
- Improve water harvesting initiatives including adequate O&M for existing infrastructure;
- Provision of sustainable energy sources for operation and maintenance;
- Improved flood early warning and forecasting capacities.

TABLE 12 - 4: Short, Medium & Long-term Recovery Initiatives and Costs

	Item	Description	Cost (USD)
Short term	Install damaged infrastructure		240M
	Recover loss services and goods		93M
	Piped water	Design and implement sustainable and decentralized water, storm and drainage networks, with water treatment capabilities	
	Flood forecasting and early warning	Improve flood preparedness and early warning and approaches.	
	Environmental Impact Evaluation	Carry out an EIA to understand the effect of ground water pollution due from sanitation facilities such as latrines and septic tanks	
	Flood management infrastructure	Assess vulnerability of existing flood infrastructure and put in place adequate O&M to reduce future breaches and damages. Carry out feasibility studies for additional multi-purpose water harvesting and flood management structures for medium- and long-term investments	
Medium Term	Build resilience in water supply service delivery	Development and implementation of contingency plans for water supply service delivery	10 m
	Water harvesting	Put in place mechanisms to carry out adequate O&M of water harvesting and flood management structures; including training and capacity building of local government and communities	15m
Long Term	Transparent policies and accountability measures	Policy and strategy approval; preparation and training to ensure clear roles and responsibilities for water related sectors	1m

Implementation Arrangements

There is a need to understand the lack of proactive measures taken by the NCCD and propose an integrated modality for the government of Sudan to address DRR. This should include institutional arrangements that outline decision making and coordination

efforts at all levels; financing modalities; technical guidance and oversight. Many of the proposed interventions require coordinated implementation between multiple sectors and multiple levels of government. Clear roles and responsibilities need to be defined to ensure accountability and sustainability of proposed interventions.



CROSS CUTTING SECTORS



DISASTERS RISK
REDUCTION



EMPLOYMENT
LIVELIHOODS
& SOCIAL
PROTECTION



GENDER



GOVERNANCE



ENVIRONMENT



HUMAN IMPACT
ASSESSMENT

13. DISASTER RISK REDUCTION

SUMMARY

The assessment of the Disaster Risk Reduction (DRR) cross-cutting sector shows that Sudan could significantly benefit from improving its institutional structure for DRR, which currently is fragmented with partially overlapping responsibilities between the government entities tasked with civil defence and those leading the humanitarian response. As a legal and governance arrangement for disaster risk management is not yet in place, government efforts focus on disaster response with limited capacities for disaster prevention and preparedness. In this regard, the lack of land use planning regulations and early warning systems has proven to be one of the major shortcomings in managing disasters in Sudan.

In terms of flood-related damage and losses, the assessment found that no direct impacts on DRR-related infrastructure and assets (e.g. warehouses, fire stations) were recorded, as these were located outside of flood-affected area. However, in the course of the flood response to affected communities, water pumps and other equipment was damaged or destroyed beyond repair. The analysis clearly showed that the agencies tasked with immediate flood-response were in many cases insufficiently equipped to provide the necessary assistance to the affected communities.

As far as recovery needs are concerned, the analysis of the DRR cross-cutting sector assessment suggests the adoption of a Build Back Better approach to enhance the disaster resilience of the affected communities. To mitigate impacts and losses from future flood events, both structural and non-structural measures need to be put in place as

part of a comprehensive recovery effort. On the basis of hydraulic studies and detailed risk assessments, embankments around vulnerable areas, especially the greater area of Khartoum, need to be rehabilitated and made more robust to withstand future flooding. Where possible, controlled flood retention measures should be installed to store flood waters and decelerate flood discharge. Non-structural measures, such as flood risk mapping, hazard-informed land use planning and early warning systems need to be put in place to prevent settlement growth in flood-prone areas and improve the disaster readiness of at-risk communities.

Importantly, the overarching institutional structure and governance arrangements for DRR should be revisited to provide an enabling framework which supports the transition towards a more preventive, forward-looking approach of disaster risk management in Sudan. The Sudan National Disaster Risk Reduction Strategy 2016-2030, set forth by the National Council for Civil Defence (NCCD) and the United Nations Development Programme (UNDP), provides a guiding document for re-defining the roles and responsibilities of authorities involved in DRR and prioritizing actions for more effective management of disasters risk.

A Disaster & Emergency Risk Management Authority as a permanent strategic federal body could take a leading role in the implementation of the this reports overall recovery strategy that was developed under this RPDNRA (see Section 20 of this report) as well as in coordinating national, regional and international efforts in the field of disaster risk management. The establishment of this authority, which was still under consideration by the Government of Sudan at the time of this assessment, would aim to support

the current efforts to manage disasters and emergencies, and would benefit from the experiences of humanitarian aid and emergency committees to deal with the COVID-19 pandemic and the effects of torrents and floods.

PRE-DISASTER AND SECTOR CONTEXT

Disaster Risk Context

Sudan is highly prone and vulnerable to natural hazards and climate-related shocks.⁶¹ According to the latest World Risk Report, Sudan is among the countries with the highest vulnerability to extreme natural hazards, including droughts and floods. As indicated in the table below, Sudan is not just prone to hydro-meteorological hazards, but also biological hazards (e.g. epidemics) and man-made hazards, especially accidents, which were actually accounted for the highest number of human fatalities between 2005-2015, according to an official Disaster Topology by Sudan's National Council of Civil Defence. Although hazard exposure is not as high as in other countries, Sudan's disaster risk is compounded in particular by low coping and adaptive capacities.⁶² Several indices moreover rank Sudan among the most vulnerable

countries in the world to climate variability and change. With the projected increase in temperature and variability in precipitation, climate-related shocks are expected to become more frequent and intense. In addition, reduced pasture and water for livestock, loss of arable land and reduced crop yields and water supply, are likely to increase regional ethnic and social conflict over land and resources. Already, climate variability over the past few decades has put stress on the region's rainfed agriculture and pastoralist systems, the dominant livelihoods in rural areas.^{63,64}

As most of the country falls within the Sahelian belt, Sudan is periodically affected by droughts⁶⁵. The most severe droughts in recent history occurred in 1967-1973 and 1980-1984 while successive years of drought between 1985-1993 led to severe food shortages. According to the international disaster database EM-DAT, in the past fifty years (1970-2020) droughts affected over 27 million people in Sudan. The devastating droughts in the early 1980s resulted in a severe famine which affected over 8.4 million people and left dead an estimated 150,000 people and 7.8 million heads of livestock⁶⁶. Climate change and desertification are exacerbating the

TABLE 13 - 1: Number of fatalities per type of event (2005-2015)

Event Type	Number of Fatalities
Accident (including traffic-related)	1,676
Epidemic	1,151
Rains	483
Fire	91
Flash Flood	78
Flood	50
Thunderstorm	20
Windstorm	2
Explosion	1
Total	3,552

Source: Republic of the Sudan/UNDP, n.d Sudan Disaster Loss and Damage Database. Sudan Risk Profile (2005-2015).

⁶¹ Republic of the Sudan/UNDP, n.d. Sudan Disaster Loss and Damage Database. Sudan Risk Profile (2005-2015).

⁶² Bündnis Entwicklung Hilft/Ruhr University Bochum, 2020. WorldRiskReport 2020.

⁶³ USAID, 2016. Climate Change Risk Profile Sudan. Fact Sheet.

⁶⁴ Scheffran et al., 2014. Violent climate or climate of violence? Concepts and relations with focus on Kenya and Sudan.

⁶⁵ It is observed from the table above that drought is not included as there were no deaths reported during the study of this table as the study was conducted during the period from 2005 -2015 where no drought disaster has occurred

⁶⁶ CRED, 2020. EM-DAT. The International Disaster Database.

risk of drought. With arid and semi-arid lands covering an area of 1.78 million sq. km (about 72 % of the country's total area⁶⁷), Sudan is the largest country most seriously affected by desertification in Africa. About 69,000 sq. km of

agricultural productive land are considered drought prone and desertification is recognized as one of the most serious environmental threats affecting land productivity in Sudan.⁶⁸

Emergency preparedness for response in refugee areas of East Sudan

Sudan hosts one of the largest refugee population in Africa, in addition to 2.6 million⁶⁹ internally displaced population due to conflict and floods. Following military confrontations in the Tigray region in northern Ethiopia, 60,660 individuals have arrived at border points in east Sudan since early November 2020, of which 31% are children and 5% are above 60 years, the most vulnerable population groups. The refugees are mainly located at Kilo 26 in Kassala and at Um Rakouba and Tunyabda in Gedaref⁷⁰ in East Sudan. At the time of writing, the on-going crisis is still evolving as more than 700 refugees are arriving per day.

Kassala, Gedaref and Sennar are flood prone regions as between 2016-2019, the average number of flood-affected population was over 37,000 and 20,000 in Kassala and Sennar respectively⁷¹. This influx has further strained natural resources as trees were cut for camps and cooking needs. The environmental degradation coupled with limited capacity of exposed population and climate change makes emergency preparedness for response an imperative. Access to refugee camps can be constrained during rainy season, as refugee camp areas do not have all-weather roads, adding another layer of risk. Disaster risk reduction including emergency preparedness in East Sudan requires strategic and operational interventions at several levels.

East Sudan, hosting refugee require an emergency preparedness plan for response, which is based on sound risk and vulnerability analysis. The plan will include contingency for providing essential services to refugees in case of limited or no access to camps due to flooding. Volunteers of refugee camps shall be catalogued and capacitated for providing essential services in case access to outside is cut off.

Community-based response and flood early warning dissemination mechanism need to be put in place, as community is the first responder and early warning saves life. Awareness generation on simple Do's and don'ts related to floods is vital. It is important to develop awareness material in language understood by the refugee and awareness approach should be inclusive. It is important to emphasize that the emergency preparedness for response is informed of the special needs of women, children, and elderly.

Structural measures to reduce risk in refugee camp area are also important. Plantation in the refugee area neighbourhood by engaging refugee volunteer and host community will have double dividend in terms of creating livelihoods and environmental benefits. The community facilities for refugee camps and emergency shelters should be analysed from flood risk lens. The appropriate measures such as strengthening community facilities and shelter through additional material and technical know-how, creating structures/drainage for rainwater flow, and relocating shelter from flood zones will mitigate risk. The projected increase in temperature for Sudan is in the range of 0.5°C- 3°C by 2050, which entails increased intensity of drought. There has been reported increase in frequency of floods, and unpredictability of rainfall is projected to increase across the country⁷². It is equally important to establish/strengthen systems for response coordination, recovery, and long-term risk mitigation across sectors at national and sub-national levels. It includes setting up inter-ministerial coordinating bodies, inclusion of risk reduction measures in sector policy and plans and creating techno-legal regimes for risk management.

⁶⁷ Saad et al., 2018. Combating Desertification in Sudan: Experiences and Lessons Learned

⁶⁸ National Council of Civil Defense/UNDP, n.D. Sudan National Disaster Risk Reduction Strategy 2016-2030.

⁶⁹ Humanitarian Needs Overview, 31 July 2020.

⁷⁰ UNHCR, Ethiopia Situation- Daily New Arrivals Update: Sudan Eastern Border, 2 February 2021.

⁷¹ UNOCHA, Sudan Flood Snapshot 2016-2019, 18 March 2020.

⁷² USAID, Climate change risk profile: Sudan, August 2016.

Riverine and flash floods are recurrent and damaging hazards, especially in the Nile river basin. Sudan is a part of the Eastern Nile region that is characterized by high variability in river flow. A significant proportion of the annual surface run-off volume of the Eastern Nile, contributing over 86 % of the total River Nile flow, occurs in only three months between July to September. During high rainfall periods, major rivers in the region often give rise to large-scale riverine flooding, while heavy rain and flash flooding also affect non-Nile states.⁷³ According to EM-DAT, during the past fifty years floods affected more than 8.4 million people and reportedly left 2,766 people dead. In 1988, the largest flood event in Sudan's modern history with record Nile river levels, destroyed thousands of homes and displaced over one million people. EM-DAT figures moreover indicate that the frequency and intensity of floods in Sudan increased in recent years: since 2000, major floods have been recorded in almost every year, which on average affected about 250,000 people and left more than 140 people dead.⁷⁴

Institutional Structure for Disaster Risk Reduction

Sudan does not have a comprehensive law that governs DRR activities. Legal affairs related to DRR are scattered in around 25 sectorial laws, while the Civil Defence Act 2005 is considered the pinnacle law. In case of a disaster or a threat to national security, the Civil Defence Act prevails against any other law that might be contradictory to it. Moreover, it establishes the National Council for Civil Defence (NCCD), the highest organ for disaster management, with specific duties and responsibilities.⁷⁵ The second most important DRR related law is the Voluntary and Humanitarian Work Act (2006), stating that the main humanitarian objectives of the organization is the provision of urgent

relief to citizens affected by natural and manmade disasters, including reconstruction of economic and social infrastructure and building of local capacities.

Sudan could significantly benefit from improving and streamlining its institutional structure for disaster risk management (DRM) and disaster risk reduction (DRR). In the absence of a legally binding regulatory framework⁷⁶ there is an overlap in responsibilities and ambiguous mandates between the different institutions tasked with DRR and DRM. Horizontal coordination (between federal ministries and line departments) and vertical coordination (across the different levels of government) is weak, compromising effective communication and government action in both disaster preparedness and response. Under the democratic transition, which began in 2019 following the overthrow of long-term President Omar al-Bashir, legal and institutional reforms are being developed to put in place a more effective and forward-looking approach in DRM/DRR.

The National Council for Civil Defence (NCCD), constituted in 2013, represents the highest political organ for DRM. The Minister of the Interior is the chairperson for NCCD, while the Civil Defence Department is the executive institution. The membership of the council is composed of cabinet ministers of line ministries and other DRR related stakeholders as such the National Security and Intelligence body and all state governors. The Civil Defence Act does not confer any real power to the Council whereas it gives all the powers to the Minister of Interior as the head of the Council, including the power to declare any area as national emergency area. Nonetheless, the NCCD is the main decision-making body during emergencies and adopts the disaster management policies for the country. Main duties

⁷³ ibid

⁷⁴ CRED, 2020. EM-DAT. The International Disaster Database.

⁷⁵ International Federation of Red Cross and Red Crescent Societies, 2019. International Disaster Response Law (IDRL) in Sudan.

⁷⁶ The Sudan National Disaster Risk Reduction Strategy (2016-2030), prepared by the NCCD in cooperation with UNDP, has been passed by the Council of Ministers but not formally adopted by the Government.

and responsibilities of the NCCD are (i) coordination of plans and civil defence operations between different authorities at the federal level; (ii) approval and monitoring of national plans for Civil Defence; and (iii) approval of annual budgets for intervention activities. The general directorate for Civil Defence⁷⁷ has the following mandate: (i) organization of Civil Defence operations and issuing necessary directives; (ii) delegation of power to state governors; (iii) appointment of committees to manage Civil Defence operations; and (iv) declaration of specified areas as disaster area.

A Central Operations Chamber, linked to NCCD and comprised of technical experts, is responsible for implementing decisions and policies endorsed by the NCCD. Chaired by the State Governor and linked to the Central Operations Chamber, the main functions of the Chamber are as follows:

- Collect and provide information on affected areas and determining whether it should be declared a disaster area;
- Provide immediate access to disaster-affected areas and mobilize specialized teams and recovery units;
- Evaluate and analysing the disaster situation and develop suggestions for disaster response and recovery;
- Raise disaster and risk awareness, and inform voluntary and humanitarian work, in co-ordination with other bodies;
- Provide training in disasters management, at all levels and in co-ordination with other bodies;
- Initiate projects, mobilize resources, and co-ordinate with foreign bodies to facilitate their support
- Follow-up and evaluate all programs of voluntary and humanitarian work in the Sudan.

The Humanitarian Aid Commission (HAC) facilitates operations of the humanitarian actors in Sudan and acts as the coordinating body in response to emergencies. As a member of NCCD and with a representation at both federal and state level, HAC is the only institution responsible for coordinating humanitarian efforts in Sudan. It's an established norm that each and every organization has to sign a technical agreement with HAC, this agreement binds all organizations who are intending to implement any project in any sector to get that agreement signed between the concerned line ministry, HAC and the organization after having closely examined all procedural measures.

As part of the ongoing democratic transition in Sudan, the Ministry of Labour and Social Development (MoLSD), as the chairing institution of the Humanitarian Aid Commission, has been mandated to lead the response to the 2020 flood disaster. On September 4, Sudan's Security and Defence Council declared a three-month, nation-wide state of emergency and designated the country a natural disaster zone. The emergency proclamation was decided in a meeting of the Security and Defence Council chaired by Abdel Fattah al-Burhan, chairman of the Transitional Sovereign Council. The Sovereignty Council established a High Flood Coordination Committee to mitigate and address the impact of the floods of 2020. The committee is headed by the Ministry of Labour and Social Development and includes all relevant ministries, the states, and coordinating authorities as well as local, regional, and international response organizations. The Government's Humanitarian Aid Commission (HAC) has activated and is leading a National Flood Task Force to coordinate the response with all partners. Government institutions, UN agencies, NGO partners, and the private sector are providing life-saving assistance to people affected⁷⁸. Moreover, an Emergency Coordination Operation Centre (EOC)

⁷⁷ The General Directorate of civil defence is a department concerned directly with firefighting, rescue operations and many other aspects of civil protection. Moreover, it is one of the components of the NCCD, the director of the directorate of the civil defence is himself the rapporteur of the NCCD.

⁷⁸ UNOCHA, 2020. Sudan: Floods, Nationwide State of Emergency Flash Update No. 6, as of 6 September 2020

has been established in September to improve the management of the response to emergency incidents through effective coordination between major relevant entities. The EOC has been the technical secretariat leading this Rapid Post Disaster Needs and Recovery Assessment.

According to data collected from NCCD, Sudan has the following DRR related

infrastructure and assets:

- Fire Stations: 120, distributed across the 18 states.
- Ambulance vehicles: 233, distributed across the 18 states.
- Towing pumps⁷⁹ (Size 8): 202, distributed across the 18 states.
- Camps⁸⁰: 11 camps were initiated for 2020 floods. Details as below:

TABLE 13 - 2: Baseline Data

State	Locality/area	No of Camps
Khartoum State	Elqobba, Wad Ramly, Elthumaniat Um Dawan Ban, Ellamab, Awlya Mountain	6
Red Sea State	Tokar, Elshidiab	2
East Darfur state	Kebkabia	1
Sinnar state		2

POST-DISASTER EFFECTS FOR THE SECTOR

While the floods have affected water resources and meteorological monitoring stations, embankments, water harvesting structures, and small dams, as mentioned in the Water and Sanitation Section of this report, the floods have not had a severe impact on the immediate DRR-related assets such as warehouses or fire stations. The Civil Defence directorate has not been affected as it is located in a rather safer area where flood waters were not able to cause any damage to its properties. Moreover, almost all equipment used by the National Council of Civil Defence is safely stored away from flood-prone areas. However, heavy machinery used in all intervention operations is taken from the armed forces as they are part of the National Council of Civil Defence. The armed forces⁸¹ are member of the National Council for Civil Defence. The Corps of Engineering are fully equipped with heavy machinery such as trucks, forklifts, and back loaders and so on that can intervene in different disaster situations. The only damage that is reported thus far, are in equipment used during rescue operations which are detailed in Table 13-3.

TABLE 13 - 3: Summary Table of Damage and Loss for Sector

Items	Total Damage (SDG)
8 inch pumps	2,750,000
6 inch pumps	528,000
4 inch pumps	660,000
Flashlights	150,000
Power generator	990,000
Rescue boat	4,400,000
Total	9,478,000

⁷⁹ Towing pumps discharge water out of flooded buildings

⁸⁰ These are camps that were set up temporarily by the civil defence department in vulnerable areas as a means to intervene quickly and easily where needed.

⁸¹ In the event of large-scale disasters, the national armed forces, can be obliged to support recovery effort and provide heavy machinery.

Losses are not applied for this sector regarding the nature of its activities and operation system, yet what has been damaged should either be compensated or rehabilitated in order to resume the service provided by NCCD in the next years.

RECOVERY NEEDS AND STRATEGY

Although the National Council of Civil Defence didn't report heavy losses due to flood disaster on DRR-related infrastructure and assets, the following recovery needs were identified:

- Pumps are critical for discharging water from flood-affected areas. The different sized pumps must be repaired or replaced so they are ready for use in case of another disaster.
- Flashlights are used during rescue at night to enable rescuers to see victims. Flashlights which got damaged during flood interventions should also be replaced.
- Power generators are critical for civil defence operations in areas where there is no electricity. Generators used during interventions and which are now no longer functioning should also be replaced.
- Rescue boats proved to be in acute shortage during flood disaster. As some remote areas were not easily accessible without boats, damage boats need to be replaced and an adequate number of boats needs to be made available in order to reach flood victims.

Recommendations for DRR and Building Resilience in Sector

From an institutional perspective, there is urgent need to streamline responsibilities and put in place a governance arrangement for disaster risk reduction. The sector analysis has shown that the

two principal governmental bodies dealing with disaster emergencies in Sudan, i.e. NCCD and HAC, are taking a reactive approach to disasters and a change in mandate and institutional structure is needed to shift towards a more proactive and forward-looking approach in disaster risk reduction. In this regard, the Sudan National Disaster Risk Reduction Strategy 2016-2030 proposes a reorganization of the existing National Council for Civil Defence (NCCD) into the National Disaster Risk Reduction Council (NDRRC) with changes in its responsibilities and composition.⁸² In the meantime, the EOC has been leading the overall coordination for the implementation of this Rapid Post-Disaster Recovery Needs Assessment for the floods in 2020 and continues to work in the following phases of recovery planning and its implementation.

In terms of strengthening Sudan's disaster resilience and mitigate future risks, the analysis of the loss and damage incurred by the seasonal floods highlights that a combination of structural and non-structural measures is needed, based on the principles of Building Back Better (BBB).⁸³

1. *Flood Protection:* Construct and reinforce embankments along the riverbank line to protect settlements, residential areas, farms, and other vulnerable areas. (Re)construction efforts for river embankments should be based on scientific analysis and cost-benefit assessment. In light of the large flood damage in Khartoum – located at the confluence of the White and Blue Nile – urban areas with a high concentration of people and physical assets are in urgent need of protection against recurrent flooding.
2. *Relocation:* Where the instalment of flood protection measures is not feasible, settlements including residential buildings that are

⁸² Sudan National Disaster Risk Reduction Strategy, 2016 - 2030, page 3

⁸³ Building Back Better (BBB) is an approach to post-disaster recovery that reduces vulnerability to future disasters and builds community resilience to address physical, social, environmental, and economic vulnerabilities and shocks. Recovery within a BBB framework gives impacted communities the chance to reduce risk not only from the immediate hazard but from threatening hazards and conditions as well.

frequently affected by flooding should be considered to be relocated to flood-safe locations. Relocation measures need to be carefully planned based on a participatory process involving the affected households and communities.

3. *Risk Assessment and Mapping:* Scientific assessments of flood risk (i.e. hazard, exposure and vulnerability), including maps, are a pivotal source of information for disaster risk management decisions. Such assessments should be mandated and made publicly available for areas most heavily impacted by the recent floods. In addition, assessments should also include the prevalent disaster types in Sudan, such as droughts, and, where possible, consider the changing nature of these disaster risks due to human activities (e.g. urbanization) or climate change.
4. *Hazard-informed Land Use Planning:* To prevent the further encroachment of settlements into flood-prone there is urgent need to develop hazard-informed approaches in land use planning. This entails i) a better understanding of the hazards, as well as the exposure and vulnerability to these hazards, vulnerability (see above), ii) a closer alignment of land use laws and ordinances with flooding and other natural hazards, as well as iii) their enforcement and enactment, to e.g. ensure quality assurance for resilient building of houses, schools and commercial buildings.
5. *Early Warning Systems:* Establishing multi-hazard early warning system is a critical component in disaster risk management. They allow authorities and communities at risk to detect hazards at an early stage and to take the necessary precautionary measures to prepare for and mitigate potential disaster impacts.
6. *Emergency Preparedness and Contingency Plans:* The recent floods illustrated the importance of disaster preparedness. In order to improve the coordination within and across the different levels of government and to ensure effective decision-making processes, emergency preparedness and contingency plans should be developed for disaster prone regions. Regular trainings and simulation exercises are needed to ensure their proper implementation in the event of a disaster.
7. *Disaster Risk Reduction Governance:* The realization of the above measures demands a functioning DRR system with capable authorities. In addition to improving and institutionalizing DRR governance arrangements, this entails mainstreaming DRR in development projects to ensure that international support is also leveraged to increase the disaster resilience of the people of Sudan. To this end, the relevant authorities need to be trained and capacitated, so they are able to initiate, coordinate, and monitor the respective tasks in disaster risk management.
8. *Community Engagement:* Build local capacities, of community members, organizations, and local governments to better understand and respond to future emergencies.

TABLE 13 - 4: Table of Short, Medium & Long-term Recovery Initiatives and Costs

	Item
Short term	Replace equipment and material that was damaged during flood interventions (pumps, flashlights, generators, rescue boats etc)
Medium Term	Conduct disaster risk assessments (including maps) Develop emergency preparedness and contingency plans Prepare to set up an early warning systems Improve the technical capacities of DRR authorities
Long Term	Reorganize and institutionalize a DRR governance system

Implementation Arrangements

Currently, the establishment of a Disaster & Emergency Risk Management Authority as a permanent strategic federal body is being considered by the Government of Sudan to coordinate national, regional, and international efforts in the field of disaster risk management. Beyond leading implementation of the overall recovery strategy that was developed under this RPDNRA (see Section 19 of this report), the establishment of this authority will support the current efforts to manage disasters and emergencies, and will benefit from the experiences of humanitarian aid and emergency committees to deal with

the COVID-19 pandemic and the effects of torrents and floods.

This body will work to institutionalize the efforts made in the context of dealing with the recent flood disaster, which witnessed a measure of success in activating the mechanisms of damage assessment, estimating losses, defining needs and formulating recovery plans through this assessment that was implemented with the participation of 15 Ministries and over 13 international organizations coordinated by the Emergency Operation Centre (EOC) operating under the Higher Committee for Floods Mitigation (see draft decree in the Annex of the Disaster Risk Reduction sector report).

14. EMPLOYMENT, LIVELIHOODS & SOCIAL PROTECTION

SUMMARY

The floods have deeply impacted the labour market and livelihoods for the Sudanese population; their overall income loss has been estimated to be around SDG 6,051.66 million (USD 108.93 million). Approximately 60% of affected communities (597,689 farming and pastoral households) are with the highest proportions observed in the Darfur States, Kordofan States, Gedarif and Blue Nile. The livestock sector was severely impacted by the floods with a loss of more than 108,000 heads of livestock, particularly sheep, goats, poultry, and cattle, belonging to about 20,521 households. Horticulture, seeds, tools, equipment, machinery and agriculture and irrigation-related infrastructure were also either lost or damaged in the floods. The floods also dealt a severe blow to the already COVID-19 affected trading, micro and small manufacturing MSMEs; about 68,000 enterprises in Khartoum State were affected by floods. Of these, a rapid survey of 31,500 enterprises estimated income loss for the workers in these units was about SDG 1,916 million (USD 34 million). They are now in dire need of assistance for survival, and the affected populations have resorted to distress coping mechanisms such as borrowing money and selling productive assets to access food. Levels of debt are escalating, and affected populations need to access cash as soon as possible to repay their debts. An increasing number of workers in the formal economy are also engaging in informal work to supplement their incomes being eroded due to spiralling inflation.

The budgeted short-term (3-6 months) livelihood recovery needs, linked to the respective productive and social sectors, amounting to SDG 92,961 million (USD 1,673 million) are summarized in Table 13.1. Besides these, there is a need to roll out the flagship Sudan Family Support Program (now in pilot stage) or Thamarat – a cash transfer program managed by the Transitional Government of Sudan and international partners – as an immediate response to the crisis that has been unfolding in the country.

Other longer-term recovery suggestions include effectively implementing active labour market programmes for skill development and imparting vocation training. The MSMEs can also benefit if: (a) social security measures (including health insurance) could be promoted for their workers; and (b) preference for local procurement from MSMEs by government agencies is initiated. Promoting the activities of community colleges in universities and linking them to community service centres can also be a priority area.

PRE-DISASTER AND SECTOR CONTEXT

Sudan's population is estimated at 43,849,260 and is predicted to increase to 57.3 million by 2030. About 64% of the country's population lives in rural areas. The country's economy is highly dependent on agriculture and allied sectors which contribute around 39% to the nation's GDP, constitute a source of livelihood for about 65% of the population, and employ about 50% of the labour force.⁸⁴ Despite being a country largely

⁸⁴ Sudan: First State of Environment and Outlook Report (Oct. 2020); ISBN: 978-92-807-3795-0

covered by desert and semi-desert, natural resources are the backbone of the economy. The crop production is diversified; it includes cereals (sorghum, millet, wheat, rice and maize, oilseeds (sesame, groundnuts and sunflowers), industrial crops (cotton and sugarcane), fodder crops (alfalfa, fodder sorghum and Rhodes grass), pulses (broad beans and pigeon peas) and horticultural crops (okra, onions, tomatoes, citrus, mango, and others).

In 2011, the secession of South Sudan had a significant impact on Sudan's economic growth, inflation, and employment opportunities. Prices of cereals, which started to surge in late 2017 driven by the removal of wheat subsidies, reached near-record levels in July 2019 in most markets across the country. Prices of wheat, mostly imported and mainly consumed in urban areas and in Khartoum, were 60% higher than one year earlier and almost four times the October 2017 levels. Despite a satisfactory outcome of the 2018 cropping season, information from the Crop and Food Supply Assessment Mission (CFSAM) in 2018 showed that market availability remained low, unable to meet the local demand leading to even higher prices. Traders reportedly also hoarded their agricultural produce, regarded as a more reliable form of savings compared to the fast-weakening local currency.

The Integrated Food Security Phase Classification (IPC), as of August 2019, estimated that 5.8 million Sudanese people (14% of the total population) were experiencing crisis or emergency levels of food insecurity (IPC Phase 3 and above). Of these, one million people were facing emergency levels of acute food insecurity (IPC Phase 4) and 4.8 million people were in Crisis (IPC Phase 3). The three states with the highest number of people in IPC 3 and above

were Khartoum, South Darfur and South Kordofan. These were followed by White Nile, Kassala, Red Sea, and North Darfur, with more than 400,000 people in each state in at least IPC 3 levels. Devaluation of the Sudanese Pound exerted upward pressures on prices, including fuel, wheat, and agricultural inputs. Smallholder farmers and vulnerable households will most likely be unable to purchase food for their families, as well as agricultural inputs to resume their farming activities. With limited livelihoods resources, cash and assets, peoples' ability to access food continues to be hindered.⁸⁵

Labour Market

According to the Sudan Labour Force Survey 2011, the labour force participation rate (LFPR) for males in Sudan (rural and urban) was 70.8%, compared to 28.9% for females. For both males and females, the rural workforce participation rate (WPR) is higher than the urban rates. However, compared to the LFPR, the WPR rates for both men and women is quite high at 78.31% and 67.89% respectively. Generally speaking, the labour market in Sudan is characterized by⁸⁶

- a decreasing proportion of people with stable jobs;
- increasing overall unemployment rates;
- transformation of the structure of labour resources; and
- rising internal and external labour migration, including among youth and professionals.

Employment creation and investments in skills are pre-conditions for equitable income generation, improved living, and decent work. However, challenges to creating a vibrant labour market in the country arises from the fact

⁸⁵ OCHA January 2020, Humanitarian Needs Overview, Sudan

⁸⁶ ILO January 2014, A Roadmap Toward A National Employment Policy for Sudan

TABLE 14 - 1: Employment Profile

Category	Male			Female			Total (Male + Female)
	Urban	Rural	Total (Urban + Rural)	Urban	Rural	Total (Urban + Rural)	
Population (in '000)	5,502.34	9,974.09	15,476.43	5,240.43	9,228.9	14,469.33	29,945.76
Total Labour Force (in '000)	2,344.9	2,344.9	4,689.8	883.1	1,610.5	2,493.6	7,183.4
Total Workforce (in '000)	1604.2	1,836.3	3,440.5	495.2	1,197.6	1,692.8	5,133.3
Total Unemployed (in '000)	740.7	508.6	1,249.3	387.9	412.9	800.8	2,050.1
Labour Force Participation Rate % (2011 Survey)	66.8	73.3	70.8	26.1	30.7	28.9	50.5
Workforce Participation Rate %	68.41	78.31	73.36	56.08	74.36	67.89	71.46
Unemployment Rate %	31.59	21.69	26.64	43.92	25.64	32.11	28.54

that only 40% of children at the age of secondary education are enrolled in schools. To make matters worse, the gross enrolment rate is declining since 2018. Literacy is particularly low among young women; about 45% of women between 15 – 24 years are illiterate, with different levels across states (Common Country Assessment, 2016). Less than 2% of the Sudanese workforce holds vocational training or technical education certificates (Sudan Labour Force Survey 2011), confirming the feeble contribution of formal Technical and Vocational Education and Training (TVET) to skills development.

POST-DISASTER EFFECTS FOR THE SECTOR

The flood impacts compounded an already dire humanitarian and economic situation in Sudan, characterized by conflict-related instability and COVID 19 pandemic.⁸⁷ The current situation is marked by crippling

shortages of basic commodities, bread, fuel and extended power outages and soaring inflation. Present estimates from OCHA show that more than 9.6 million people, almost a quarter of the entire population of Sudan, are severely food insecure and classified under IPC scales 3 and 4 during the lean season, from June to September 2020. This marks a 65% increase in the number of food insecure persons vis-à-vis the same period of 2019, and also the highest number of food insecure persons in the recorded IPC analysis of Sudan.

Agriculture and allied sectors

According to FAO, an estimated 2,216,322 hectares of the rainfed planted area was flooded, representing 26.8% of cultivated areas in the 15 assessed states.⁸⁸ The production loss due to crop damage by floods was estimated at 1,044,942 tonnes in the rainfed areas and 50% of

⁸⁷ FAO, 2020. The Sudan 2020 Flood Response: an overview by the FAO

⁸⁸ FAO 2020. A joint Flood Impact Rapid Assessment with the Government of Sudan, September 2020.

Sorghum – the main staple food in the country – has been damaged. Post-harvest losses also had a major impact on farmers' profitability. Approximately 60% of affected communities are farmers with the highest proportions observed in the Darfur States, Kordofan States, Gedarf and Blue Nile. The small farmers usually produce bulk of the staple food and the floods have severely affected the entire agricultural belt in Sudan. A total of 597,689 farming and pastoral households have been affected by the floods and heavy rains. This number includes 527,968 farming households in the rainfed areas; 49,200 farming households in the irrigated sector; and 20,521 pastoral households. Women play a significant role in agriculture, with 80 per cent of farming households having at least one woman involved in harvesting on average.⁸⁹

In addition to taking place in the middle of the main agricultural season, these floods

are reportedly the worst in decades. Among the hardest hit are the six states of Gedarf, Blue Nile, Kassala, Khartoum, River Nile, and Red Sea, while serious damage has also been reported in North Darfur, Gezira, South Darfur, West Kordofan and Sennar states. Effects of the floods on agriculture in the six worst affected states are provided in Table 14-3 below.

The livestock sector contributes to the livelihoods of at least 26 million people. The sector contributes a significant 60% to the estimated overall value added by the agricultural sector, making it a more important contributor to the country's GDP (average of 20-22% contribution) than crop farming (average 11% contribution). The livestock sector was severely impacted by the floods with a loss of more than 108,000 heads of livestock, particularly sheep, goats, poultry, and cattle, belonging to about 20,521 households. North Darfur,

TABLE 14 - 2: Effects of floods on agriculture in the hardest hit states

	Gedarf	Blue Nile	Kassala	Khartoum	River Nile	Red Sea
Number of people in the flood-affected region	159,435	1,140,370	309,230	4,499,423	1,556,859	842,655
Total number of people engaged in agriculture	95,661	798,260	207,184	1,348,527	934,111	505,593
% of population engaged in agriculture	60	70	67	30	60	60
Total planted area damaged (ha)	1,067,721	617,419	109,048	8,517	39,956	12,131
% of the damage on planted area	44	34	30	28	25	25
Agricultural landownership (HH%)	43.4	48	28	7	22.7	30.3
Farm animal / livestock ownership (HH%)	51	62.9	44.9	13.8	51.9	44
Animal-drawn cart ownership (HH%)	16.3	14.2	9	5.6	11.8	1.9

Source: FAO Sept 2020 Flood Impact Rapid Assessment and baseline data Human Impact Assessment

⁸⁹ OCHA, 2020. Humanitarian Needs Overview, Sudan, January 2020.

Blue Nile and Sennar states registered the highest losses. Damage to the forestry and fishery subsectors was also reported, particularly in Blue Nile, Sennar, Gezira and Gedarif states.

Horticulture, seeds, tools, equipment, machinery and agriculture and irrigation-related infrastructure were also either lost or damaged in the floods. With additional damage to irrigation systems, many farmers risk missing the start of the upcoming agriculture seasons, starting in October 2020 and March 2021, respectively. The replacement of agricultural inputs and tools, rehabilitation of irrigation schemes, as well as provision of support to livestock, fishery and forestry subsectors is crucial to ensure that affected populations can continue with their agricultural activities in the upcoming seasons.

Loss for Micro and Small Enterprises

The industrial sector of Sudan is dominated by Micro, Small, and Medium Enterprises (MSME) and there are few large industries and enterprises in the country. Among the MSMEs, 80% are informal enterprises of which many are family-based enterprises. Even within the formalized economy, 98% of firms are medium and small enterprises employ less than 200 workers and have informally employed workers as well. Overall, about 65% of the labour force is engaged in informal work.⁹⁰ Most of the workers (employed either formally or informally) by micro and small enterprises, were hit hard by COVID-19 measures.

For the MSME sector, focus is given to Khartoum State as it hosts the largest industrial complexes in Sudan and provides the basic components of the industry, including markets, transportation, telecommunications, and other services. It contributes about 15.8% of gross national income covering sectors

such as Food Stuff Industry, Edible Oil and Soap, Leather and Footwear, Spinning and Weaving, Printing, Publishing and Packing, Pharmaceuticals and Perfumes, Petrochemicals, Flour and Animal Production, and Engineering Industry. The food sector is considered the mainstay of the industrial sectors in the country because of its importance in providing food and its linkage to the agriculture sector, which is the cornerstone of the Sudanese economy. Manufacture of oils and soap is another vibrant sub-segment within the MSMEs. However, the lack of employment opportunities, poverty, limited resources, lack of experience, skills and knowledge have been serious obstacles for the last several years.⁹¹

Findings from the COVID-19 socio-economic impact study of April 2020⁹² showed hospitality and transportation to be the most affected economic sectors due to restrictive measures. The transportation sector is heavily affected by the closing of inter-state traffic and limits on intra-city movement, which is further exacerbated by the fuel shortages in the country. The tourism sector also witnessed a near decimation of its incomes as Sudan's land, sea, and air borders remain closed to passenger traffic. Both these sectors employ a large number of workers mostly on a daily wage basis.

The floods have dealt a severe blow to the already COVID-19 affected trading and manufacturing MSMEs; the micro and small enterprises in Khartoum state were the worst affected. According to the estimates by Ministry of Industry Government of Sudan, about 68,000 enterprises in Khartoum State have been affected by the floods, and now in dire need of assistance. A rapid survey was conducted by the Union of Small Industries and Handicrafts in Sudan to understand the losses to the micro and small enterprises, showing that the estimated income loss for the workers in

⁹⁰ UNDP (Apr. 2020). COVID-19 Socio-Economic Impact Assessment for Sudan

⁹¹ UNDP (Aug 2010). Socio-Economic Study of Business Opportunities and Support Services for DDR Participants in Khartoum State

⁹² UNDP (Apr. 2020). COVID-19 Socio-Economic Impact Assessment for Sudan

TABLE 14 - 3: Estimated income loss of Micro and Small Enterprise workers in Khartoum

	Estimated number of enterprises affected	Estimated number of workers affected	Estimated number of prod. days affected	Average daily wages (SDG)	Livelihood income loss in SME sector (million SDG)
Agriculture, Horticulture, and allied sectors	2,600	26,000	90	200	468
Light manufacturing and repair shops	12,000	70,000	60	200	840
Small retails, trade services	10,000	20,000	60	200	240
Transportation and Logistic Service providers	1,400	2,800	30	200	17
Restaurants and eateries	2,000	12,000	60	200	144
Const. material product. units, brick-kilns	1,500	10,000	90	150	135
Other sectors of activity by SMEs and informal enterprises	2,000	4,000	90	200	72
Total Khartoum	31,500	144,800	-	-	1,916

Source: survey by the Union of Small Industries and Handicrafts in Sudan

these units was about SDG 1,916 million (USD 34 million). The findings of the survey are summarized and presented in Table 13 4 below.

The lockdown measures impacted women involved in daily trade and casual labour, including domestic workers. Though in recent years women's participation in informal economic activities have been growing in the urban areas (especially in food and beverage sales), the restrictions notably reduced flow of construction and transport workers as customers for the tea sellers and impacted them economically.

Overall income loss calculation

Table 14-4 provides a rapid estimate of the income loss during the 2020 Floods in Sudan. The states have been grouped into three categories based on the area's contribution to the total GDP of Sudan which has been taken as USD 18.9 billion for 2019.⁹³ The number of days lost for all affected areas were assumed to be 90 work-days (given the duration of the floods), and accordingly the income loss was estimated to be around USD 108.93 million.

⁹³ The GDP of Sudan was USD 18.90 billion in 2019, according to official data from the World Bank and projections from Trading Economics, see <https://tradingeconomics.com/sudan/gdp#:~:text=GDP%20in%20Sudan%20is%20expected,according%20to%20our%20econometric%20models>

TABLE 14 - 4: Income loss calculation (initial rapid estimates)

	High GDP contributing State (Khartoum)	Middle GDP contributing States ⁹⁴	Middle GDP contributing States ⁹⁵	Total
Baseline Population in '000 (2008-2009)	5,274	11,681	13,938	30,893
Projected Population in '000 (2019-2020)	5,802	12,850	15,332	33,984
Number of affected population in '000 (Source: OCHA)	102.58	357.23	366.18	825.99
State share in GDP (assumption)	40%	42%	18%	100%
State GDP in million USD (estimation, 2019-2020)	7,560	7,938	3,402	18,900
Per Capita State GDP in USD (estimate)	1,303	618	222	556
Number of days lost (estimate)	90	90	90	90
Income loss in million USD (estimate)	33.42	55.19	20.32	108.93

RECOVERY NEEDS AND STRATEGY

The affected populations have started to engage in distress coping mechanisms such as borrowing money and selling productive assets to access food.⁹⁶ Levels of debt are escalating and affected populations will need to access cash as soon as possible to repay their debts. COVID-19 restrictions on the economy has further reduced the Government's ability to mobilize taxes and continue maintaining already meagre expenditures on basic services, including access to food, especially for the most vulnerable strata of the population (e.g., youth and women). There is a likelihood of worsening food security and livelihoods need if the underlying causes remain unresolved. An increasing number of workers in the formal economy are also engaging in informal work to supplement their incomes being eroded due to spiralling inflation. High levels of food price inflation are also creating basic food access problems for the urban poor. The General Framework for the Program of the Transitional Government in Sudan,

as indicated in its priority areas, have committed to enhancing the role of youth of both sexes and expanding their opportunities in all areas. Accordingly, as a mid-term strategy intervention, the UPSHIFT Program is being promoted with the aim of engaging every disadvantaged young person into quality education, training, or employment by 2030.

Initial experience in the agriculture sector Findings from FAO's flood assessment show that job opportunities such as casual agricultural labour – considered one of the most important income-generating activities for the rural population – have already diminished and will probably decrease even further during the upcoming harvest season. Consequently, a lack of job opportunities in areas such as farm labour and agri-food processing and marketing will have a significant impact on the livelihoods of many vulnerable women. Cash-for-Work (CfW) programs are critical to rehabilitate affected areas and allow for income generation (e.g. restoring irrigation systems, repairing roads, rehabilitating *hafirs*, shallow wells, removing debris from agricultural land).

⁹⁴ Sennar, River Nile, Kassala, Al-Gadafif, Al-Gezira, White Nile, and Blue Nile

⁹⁵ North Darfur, Northern, Red Sea, Northern Kordofan, Western Darfur, Southern Darfur, West Kordofan and Abyei

⁹⁶ FAO, 2020. A joint Flood Impact Rapid Assessment with the Government of Sudan, September 2020.

Through a small-scale intervention, FAO procures and distributes one donkey cart per household to the most vulnerable households (more than 50% women-headed households). Some beneficiaries reported this intervention to be very good, as donkey carts have a big role in village activities. These carts are used to move people to collect and carry firewood and water, as well as to transport children to school if it is far from the village. Donkey carts also generated income for their owners; beneficiaries reported earning SDG 500 a day from allowing villagers to use their carts during each of the weekly market-days. Thus, this livelihood

asset serves the twin purpose of income generation and family utility.

Suggested measures (immediate and medium term)

The immediate recovery interventions in the flood affected areas of Sudan can be made possible through the Employment Intensive Investment Program (EIIP) and could be the preferred way ahead. The recovery suggestions in Table 14-5 takes cognizance of such possibilities and proposes some immediate and medium term EIIP interventions.

TABLE 14 - 5: Livelihood recovery suggestions - Agriculture, Livestock, Fishery, Housing, Water Resources, MSME Sector (immediate and medium term)

Damage/Loss	Immediate Requirement	Recovery plan	
		Immediate (3-6 months)	Mid-term (6-12 months)
527,968 farming households in rainfed areas affected (FAO, Sept 2020)	Cash-for-work / employment programmes are considered critical to rehabilitate affected areas and allow for income-generation	Employment creation: Removal of debris; Demarcating boundaries; Construction of homestead land; Repairing roads/canals	Micro-credit through formal institutions for small farmers and vulnerable households; Purchase seeds and tools/ implements; Build community SHGs; Entrepreneurship and start-up business training - local resource base (women SHGs to be promoted)
1,044,942 tonnes of produce damaged. Sorghum constitutes 50% percent of the damaged crops	Provision of storage facility for agri-products and vegetables; Take steps to reduce mold infestation.	Employment opportunities in storage construction sites; Facilitate sale of the remaining produce in the local markets	Facilitate sale of agricultural products from the flood affected areas; Promote seed banks Facilitate linkage with agro-based industries
104,000 ha of irrigated area damaged which is 19.4 % of total cultivated area	Restoring irrigation systems for 49,200 farming households	Employment opportunity in restoration work using local resource; Replace irrigation pumps, power generators	Support farmers through restoration of irrigation facilities for summer 2021 harvest
20,521 pastoral households affected more than 108,000 heads of livestock	Restocking of livestock -sheep, goat, poultry, and cattle /7-15 animals per HH as per FAO	Provide livestock along with required doses of vaccination; Feed for the livestock; Facilitate sale of animal products; Slaughter slab construction; Provide animal carts	Develop cooperatives for production and sale of products

Damage to forestry	Rehabilitate and improve riverine forests	Forest land to be reforested; Training for local youth (both sexes) for undertaking afforestation drives, particularly in Blue Nile, Sennar, Gezira and Gedarf	Integrated forest management through local youth (including girls/women) to be implemented
Water Resources assets damaged	Rehabilitation of water harvesting structures including shallow wells, <i>hafirs</i>	Restoration of indigenous water harvesting techniques; embankments through local labour	Flood water obstruction; retention and conservation are crucial for successful cropping and runoff farming
Housing	Construction of dwellings (<i>only in Khartoum 44% HH are concrete buildings, rest are Gotiayas of straw & mud</i>)	Training on masonry work for local employment	SSB / SCEB production training
Fishery: inland fishing capacity -8,500 boats and 10,000 fishers (FAO, Fisheries and Aquaculture Sector Review, Nov. 2018)	The vessel types are sharoaq, feluka and murkab al hadeed - small wooden open canoes, each boat adapted to fishing conditions. Most fishers use oar-powered 5-6 m traditional boats.	Replacement of canoes and fishing gears - gill nets, seine nets, hooks and line, traps used for inland fishing	Reach target of previous annual production from inland fisheries to 35,000 tonnes (FAO, 2018)
MSME sector 68,000 enterprises affected (Ministry of Industry, Sudan)	Horticulture, small retail, transport, and logistics providers, brick making & other informal activities affected in Khartoum State	Ensure wage for informal workers engaged in the MSME sector and firm level financial support for micro enterprises. Initiate registry of all firms (informal & formal). Retention of jobs in small manufacturing units.	Skill training and micro-credit facilities to enhance entrepreneurial activities. Collaboration between Ministry of Labour and Business / Employers' Associations to ensure social protection (including health insurance) for employees.

Recovery budget estimates
The budget estimates for immediate / short-term needs (3-6 months) have been drawn up based on the recovery intervention suggestions (Table 13-6). The key considerations for the recovery budget are discussed below, and the recovery budget estimate workings are subsequently presented in Table 14-6.

Considerations for recovery budget
The agricultural labour opportunities have declined in the aftermath of floods. Hence, the recovery plan lays emphasis on increasing Cash-for-Work employment opportunities which can fulfil the dual objective of ensuring income for agriculture labour force and activating necessary restoration works in the flood

affected areas. Labour intensive work includes removal of debris, clearing of rainfed agricultural land, restoration of roads and drainage systems, as well as health and sanitation facilities in the affected areas. Similarly, restoration works related to irrigation system is another area recommended for cash for work intervention. This will enable sustainability of the agricultural sector dependent on irrigation for the next cropping season (see Proposals 1 and 2 in Table 14-6).

The livestock sector employs directly or indirectly about 40% of the population and contributes valuable animal protein to the diets of all of Sudan's people.⁹⁷ As a large number of pastoral households have been affected, the recovery strategy

⁹⁷ American Journal of Transportation and Logistics (ISSN:2637-6172) (escipub.com)

needs to align with their recovery needs. In consultation with the agriculture sector, the provision for restocking of animals for households, their feed and cost for immunisation has been estimated as part of livelihood recovery measures in this chapter (see Proposal 3 in Table 14-6).

Recovery interventions, leveraging local experiences with the objective to restore the flood-affected riverine forest areas, seek to move the affected regions towards a sustainable ecology. From an ecological point of view, some forest tree species stabilize sand dunes in the fragile system in the semi-desert region, ameliorate soil through nitrogen fixation, and provide natural ecosystems for wildlife and conservation of biodiversity. It is thus proposed that local youth (including girls) be engaged to work on drainage systems for stagnated ingresses of flood waters, restoration, and maintenance of forest cover. The provision for training such youth (about 15 days) to supplement the efforts of the Forestry sector is thus budgeted in this chapter (see Proposal 4 in Table 14-6).

Another important area of intervention is restoring water bodies, which have been destroyed by the floods. Construction of *hafirs* and shallow wells is essential not only for development and maintenance of watercourses, streams and watersheds, regenerating the sources of water for households, but also provides labour market opportunities for the affected workers to generate income thus reactivating impacted labour markets (see Proposal 5 in Table 14-6).

Production of 'green' building materials such as Soil Stabilized Bricks (SSB) / Stabilized Compressed Earth Blocks (SCEB) is another area that needs to be actively supported. There is an abundance of local raw materials and brick-making remains an important activity for the housing sector. However, up-skilling of traditional masons is needed before any large-scale work on production of SSB/ SCEB and on-site masonry using these materials are taken up by the housing sector. Thus, incremental supporting efforts for training of masons as a part

of 'green' recovery strategy has been budgeted as an important intervention in this chapter (Proposal 6, Table 14-6).

Livelihoods of small-scale fishers have been affected along the river Nile and many of them have reported missing fishing gears and canoes. In such a situation, assistance is proposed for fisher households to replace their lost / destroyed equipment. It will help restoring their livelihood. Thus, the provision of basic fishing gears and canoes have been estimated as part of recovery plan (see Proposal 7 in Table 14-6).

While recovery plans for the MSME sector in Khartoum State need to be holistic to cover skill development, market linkage, price stability and national policy, an immediate subsistence-level wage support (daily SDG 150) is needed for workers in 20,000 of the most affected MSMEs. At the same time, enterprise recovery measures are equally important to sustain production and continue to provide livelihood opportunities to the workforce. It is thus proposed that SGD 100,000 be provided as working capital assistance to the most affected 20,000 enterprises as immediate recovery support to enable them to sustain through the crisis. This process may be based on tracking of informal businesses through a registry, be it through the locality or the business association as a first step. The enterprises may be identified and registered through a collaborative effort of Business / Employers Association, Ministry of Labour and Ministry of Industry (see Proposal 8 in Table 14-6).

Besides this, the MSMEs can also benefit if: (a) social security measures (including health insurance) could be promoted for their workers by enrolling them in government programmes with participation from insurance firms as deemed appropriate; and (b) preference for local procurement from MSMEs by government agencies is initiated by linking it to employment generation. These initiatives could be appropriately structured through dialogues with social partners enabled through a multi-agency platform(s).

TABLE 14 - 6: Livelihood recovery budget for immediate / short-term measures

Budget proposals: Agriculture, Livestock, Fishery, Housing, Water Resources, MSME sector									
#	Sector	Activity	Job description	No. of HH / Enterprises targeted	No. of Beneficiary	Daily wage rate / cost per HH / Beneficiary	Inputs required	Cost by Expense Head	Total Cost for 06 months [in '000 SDG]
1	Agriculture	Cash for Work in rainfed areas	Removal of debris, demarcate boundaries, repair roads, drainage & sanitation	12,000 (2,000 per State for 06 States)	12,000 (one per HH)	SDG 150 per HH / Beneficiary	Tools and implements / Bricks / Cement etc.@ SDG 1,000 per HH (Lumpsum)	Wages: 150*12,000*180 =SDG 324,000,000 Inputs: 5,000*12,000 =SDG 60,000,000	384,000
2	Agriculture	Cash for Work in irrigated areas	Restoring Irrigation System	12,000 (2,000 per State for 06 States)	12,000 (one per HH)	SDG 150 per HH / Beneficiary	Tools and implements / Bricks / Cement etc.@ SDG 1,000 per HH (Lumpsum)	Wages: 150*12,000*180 =SDG 324,000,000 Inputs: 5,000*12,000 =SDG 60,000,000	384,000
3	Pastoral HHs	Restocking of livestock: 7-15 animals per HH (as per FAO)	Sheep, Goat, Poultry and Cattle	5,000 HHs (covering 6 states)	5,000	SDG 1,000 per sheep (SDG 3,000 per HH) / Female-head HH and pastoral camps @ SDG 1,000 per HH	Purchase of Livestock and Feed & Vaccination / Pastoral camp	Cost of Livestock: SDG 3,000 * 5,000 HH = SDG 15,000,000 Cost of Feed and Vaccination: SDG 1000 * 5,000 HH =SDG 5,000,000	20,000
4	Riverine Forest	Training of Youth (men & women)	Restoration work affected by floods in Blue Nile, Sennar, Gezira and Gedarf	1,000 youth	1,000 (covering 4 sates)	SDG 1,000,000 per training for 35 participant batch @ each batch for 15 days training	Venue & Resource persons	Lumpsum cost of SDG 1 million per training inclusive of DSA @ SDG 150 per participant i.e. 150*15*35 =SDG 78,750	28,000
5	Water Resources	Rehabilitation of water harvesting structures (shallow wells, hafirs)	Construction of shallow wells	500 each state for 06 worst flood affected states	30,000 Hafirs	SDG 9,900,000 for each Hafir	Tools, raw materials etc.	Wages: 30% of cost i.e. SDG 2,970,000 / hafir For 30,000 hafirs: SDG 89,100,000 (only wages component considered in this chapter)	89,100,000
6	Housing	Training on green brick making for masons	SSB / SCEB production training	500 (covering 06 states)	500 workers in construction sector	45 days training for batch of 20 semi-skilled masons	Raw materials & equipment's	Lumpsum cost of SDG 1 million per training inclusive of DSA @ SDG 150 per participant, i.e. 150*15*35 =SDG 78,750	500,000
7	Fishery	Provision of fishing gears for inland fishery	Replacement of canoes and fishing gears - gill nets, seine nets, hooks and line, traps for inland fishing	1,000 HHs (Number of fishers per boat ranges between 2-3, FAO 2017)	1,000	SDG 5,000 per Fisher HH	Nil	Cost for purchase of fishing canoes and gears: SDG 5000 per HH	5,000

Budget proposals: Agriculture, Livestock, Fishery, Housing, Water Resources, MSME sector									
#	Sector	Activity	Job description	No. of HH / Enterprises targeted	No. of Beneficiary	Daily wage rate / cost per HH / Beneficiary	Inputs required	Cost by Expense Head	Total Cost for 06 months [in '000 SDG]
8	MSME (Khartoum State)	Wages for workers in the MSME sector	Horticulture, small retail, transportation, brick making & other informal activities	68,000 enterprises affected	20,000 enterprises	SDG 150 for each worker in each of the affected MSME	Nil	Wages: 150*20,000*180 =SDG 540,000,000	540,000
		Firm Recovery	Support to micro-enterprises through tracking and registry	20,000 micro and small enterprises	20,000 enterprises	SDG 100,000 for each affected MSME	Registry of small and informal enterprises*	Recovery assistance: SDG 100,000*20,000 =SDG 2,000,000,000	2,000,000
Total recovery assistance budget for the above proposals (Sudanese Pounds/ US Dollars)								SDG 92,961,000,000/ USD 1,673,298,000	

Need to roll out a flagship Social Protection programme (now in pilot stage)

The main source of protection against social risks in Sudan is acquired by the individual through his or her income. The Sudan Family Support Program (SFSP) or Thamarat – a cash transfer program managed by the Transitional Government of Sudan and international partners – is an immediate response to the crisis that has been unfolding in the country. The initial pilot phase was launched on 11 October 2020, aiming to reach 20,000 households in two peri-urban areas of Khartoum. Currently, this phase is gradually being carried out. As of 26 November, nearly 9,400 individuals have been enrolled in the program of which about 1,800 families have received cash transfers, including 500 who received cash for the second time. However, there is a need to scale up safety net programs by targeting the most vulnerable households. A long-term policy intervention is needed while effective implementation of well-designed social protection programmes is crucial to

increase the disaster risk resilience of the vulnerable population in the country.

Other longer-term suggestions

Developing skills and imparting technical and vocation training are key components of active labour market programmes. However, over several decades, government funding for the TVET sector has been inadequate. Increasing allocations to meet TVET expansion and quality needs are necessary by designing and implementing sustainable financing mechanisms for the TVET sector. It will be meaningful to formulate policies and funding strategies by adopting labour responsive approaches to longer-term recovery measures. In the area of social welfare and development, promoting the activities of community colleges in universities and linking them to community service centres is a priority area for the Transitional Government. Research projects on socio-economic parameters could be another area of strategic intervention through university students as part long-term recovery measures.

15. CULTURE

SUMMARY

This report covers a mission carried out to Sudan by UNESCO⁹⁸ to assess damages caused to Sudan's historical sites, monuments and archaeological materials including on its world heritage properties. These damages have been caused by floods from the rising Nile, the uncharacteristically heavy rains in 2020 and rising ground water that have become common in many places in the country including in the capital city Khartoum and the adjacent sister city of Omdurman. This disaster has impacted many world heritage and other Sudanese heritage sites. These included the archaeological sites of the royal city in the world heritage property at Island of Meroe, Teseen mosque in Khartoum, Nile Museum in Khartoum and pressing groundwater rise problem in Nuri and Kerma, in addition to other sites found to need urgent attention and support for conservation. Sudan has lost many archaeological and heritage sites as a result of the construction of dams in the Nile, despite the past salvage made through the efforts of UNESCO, the international community, and the Sudanese government.

To better protect Sudan's cultural sites against disasters it is recommended to put in place a national policy on disaster risk management that covers heritage resources. This policy can then be domesticated where applicable by mainstreaming it in the management plans for the various sites. It is noted that there are structures, bodies and professionals engaged in the area of flood mitigation, especially those working in the area of water and irrigation. However, there is a strong need to strengthen the inter-institutional cooperation.

To tackle the challenges in heritage protection there is a need to study and determine the impact of groundwater on archaeological monuments and sites as a basis for developing coordinated flood management strategies, policies and laws, and innovative flood solutions. Since communities are crucial to heritage making and heritage conservation it is also recommended to establish a national flood risk management network, which works to increase coordination between relevant stakeholders.

PRE-DISASTER AND SECTOR CONTEXT

Sudan is a culturally diverse country with a remarkably rich archaeological heritage. Through the millennia Sudan has served as a zone of contact among the peoples of Sub-Saharan and Central Africa, the Mediterranean and the Arab world. It served as a corridor for the movement of people and ideas.

Within the last 20 years, there are notably several international collaborations in the field of archaeology, which had contributed in changing the image of ancient Sudan and emphasized its role in antiquity as a cradle of civilizations and highlighted the beginning of civilization in Sudan in the 10th millennium B.C.

A book on ancient history would be incomplete without a chapter on Sudan. Sudan had spread its heritage to the public through implementation of many international exhibitions in various museums, which show the great attention attained toward heritage. The Sudanese government has become more aware of the role which had been played by our rich heritage.

⁹⁸ The mission was carried out by Dr. George Abungo, at the request by the state party of Sudan to UNESCO and with the support of the UNESCO Heritage Emergency Fund

The culture sector in Sudan is mandated to the Ministry of Culture and Information. This ministry has a dedicated undersecretary for culture affairs, whose responsibilities include the National Corporation for Antiquities and Museums (NCAM), the National Council for Cultural Heritage, National Languages Promotion, and the National Council for Culture and Arts, in addition to other culture related national bodies. Also, at the state level, the culture sector is managed through dedicated ministries in each state and there is coordination directly between national and state level agencies through the Ministry of Federal Governance.

Relevant national legislations to the culture sector include the Ordinance for the Protection of Antiquities of 1999, which prescribes the procedures to be followed for the protection, investigation, study, and dissemination of information concerning archaeological sites, structures, and moveable antiquities (Ali, 2019). Other relevant legislation is the 2009 National Tourism Law. Additionally, efforts for Sudan to sign the UNESCO 1970 convention were successful recently, and there are further efforts to sign the 2001 Convention for Underwater Heritage. Sudan is a signatory since 2008 of the UNESCO convention for Safeguarding Intangible Culture Heritage and there are registered world heritage sites within the 1972 convention, in addition to many sites registered within tentative list for World Heritage Sites and other sites registered nationally for protection.

Despite all these efforts the policy of the government of Sudan need to further encourage the work of the international scholars to reinforce and strengthen this cooperation with foreign missions for the protection of archaeological sites.

The protection of archaeological sites is one of the most important duties of the National Corporation for Antiquities and Museums because these sites represent the importance of shaping the ancient history of Sudan, and a set of factors that affect the survival of archaeological sites overlap, and it is necessary to work

to remove these factors in order to ensure that Sudanese archaeological sites receive the required protection.

Archaeological sites

Archaeological sites are the remnants of the ancient human life represented in humankind's dwelling, burial place, places of worship and everything related to daily life and beliefs. Monumental or architectural archaeological sites include various residential purposes (e.g. palaces and houses), religious sites (e.g. temples, churches, monasteries, and mosques), funerary sites (e.g. various cemeteries), commercial sites (e.g. markets and various commercial stores), and defence sites (e.g. forts and castles). Each of these sites has its own separate and connected tools and arts.

The following archaeological sites are the most important at the present time, including tourist sites, which represent tourist attractions that generate income from hard currencies: Naqa, Musawwarat es sufra, Begrawiya Pyramids, the Royal City of Al-Bajrawia (Nile River), Jebel Barkal, Al-Kurru, Nuri, Sanam Abudom, Dir Al-Ghazali, Old Dongola, Al-Kawa, Karma, Tumbos, Sesebi, Sulb, Sadenga, Sai Island (North) and Swakin (Red Sea).

Intangible Cultural Heritage

The data of 2011 on ethnic and linguistic diversity shows that in Sudan still exist around 70 ethnic groups speaking more than 63 languages. In 2016, the Ministry of Culture established the National Council of Cultural Heritage and Promotion of National Languages (NCCH), with representation in all 18 Sudanese states, to safeguard the intangible cultural heritage and to promote the national languages. From 2018 to 2020 a project on Developing National Capacities in Safeguarding Intangible Cultural Heritage in Sudan has been implemented by UNESCO and NCCH through support from the Department of Culture and Tourism in Abu Dhabi. As a result of the project more than 160 culture managers and experts have been trained, a 10 year strategy

has been developed for Safeguarding Intangible Cultural Heritage in Sudan, in addition to inventorying Sudanese living heritage, where a list of 35 heritage items has been registered in national list and application has been made for Sudanese Toub for UNESCO International Living Heritage list.

Cultural and Creative Industry: Poultry making and traditional bricks making industry are mainly based around the Nile in Khartoum state, Al Jazeera state, Northern state, and other states. Additionally, most festivals and wedding ceremonies organized in Khartoum and other states are held on halls or in open yards. The cinema sector is progressing but still there are limited number of cinemas in Khartoum, and as a result of December 2018, there has been an era of street walls paintings by many artists. The theatre sector is declining, and the National Theatre requires rehabilitation from water leakage and rising water level as it is near the Nile (nearly every year it is flooded).

Tourism sector: The tourism season is usually from October to April (6 months). The tourism sector has rich potential but still faces many challenges relevant to basic tourist infrastructure even though there has been support for World Heritage Sites from Qatari Sudanese project and from UNESCO on Community Based Tourism as an option where there are not enough hotel rooms, in addition to tourist guides regulations and guidelines and initiative under discussion to develop national a Tourism strategy.

Vulnerabilities

Factors of encroachment on archaeological sites:

- Human factors: Despite the importance of implementing development projects, the lack of prior coordination with the National Corporation for Antiquities and Museums when these projects, including mining and urban development projects, are carried is a

severe threat leading to the destruction of archaeological sites.

- Agricultural projects: Agricultural projects sometimes expand in archaeological heritage sites and could lead to the loss of heritage sites. In addition, agricultural projects near heritage sites irrigated from the Nile are suspected of causing rising groundwater problem as in the case of Nuri Pyramids and Kerma.
- Urban planning: Increasing urbanization and the increase in urban populations in particular in Khartoum state (the capital) threat archaeological sites, examples include (Hajj Youssef Square 1), Old Sennar and Omdurman Nile Street (Khor Shambat).
- Natural encroachments: Weathering caused by the winds carrying sand particles weaken the sandstone that constitute the material of archaeological buildings in Sudan. Unfortunately, it is considered one of the weakest types of sandstone and archaeological buildings constructed from this type of stone are affected, such as the pyramids and other buildings in Al-Bagrawiya, Nuri, Barkal and al-Kawa. Also, earthquakes that occurred in previous times and their remaining effects on the cracked side of Jebel Barkal facing the Nile, pose a threat to the temples located below the mountain. Additionally, flash floods and Nile floods pose a risk to many archaeological sites in Sudan.
- Other threats: Lack of coordination and fragmented responsibilities in heritage protection poses a threat to Sudan's archaeological sites Establishing joint committees to manage archaeological sites is needed and (especially the World Heritage sites, the sites of Jebel Barkal and Meroe Island) with responsibilities of raising awareness among local communities and visitors on the value of heritage archaeological sites and to manage sustainably tourism and other activities on the sites.

POST-DISASTER EFFECTS FOR THE SECTOR

Many world heritage and Sudanese heritage sites, in addition to other archaeological sites has been largely impacted by the disastrous floods, acknowledging that ancient Sudanese civilizations were mostly near the Nile, including the two world heritage sites (1) The archaeological sites of the Island of Meroe and (2) Gebel Barkal and the Sites of the Napatan Region.

The prioritized threats to archaeological sites because of 2020 floods according to UNESCO/NCAM mission in November 2020 include (1) Meroe Island (royal city, pyramids, Meroe City, Amun Temple and Naga Site), (2) Teseen Mosque, (3) Protection of Tabo temple, (4) Conservation of Fossil Forests of El-Kurru, (5) Groundwater Research in Nuri and Kerma, (6) Backfilling of the trenches at El-Kurru site, (7) Preservation of the Nile Steamers of the Nile Museum, and (8) Restoration of the Tabiyeh (Mahdia Fortification). Additionally, many people lost their living heritage as a result of floods that have taken their homes and led them to live in shelters and therefore losing their indigenous knowledge and living heritage gained through years of practice, as shown by the collapse of the Boot dam in Blue Nile, that could lead to the loss of indigenous languages and practices as local communities moved from their original homes.

In summary, according the National Corporation for Antiquities and Museums, the following provides an overview of the main archaeological sites affected by the flooding in Sudan:

River Nile State

The River Nile State is located north of Khartoum State and holds the Meroe Island World Heritage Sites, which are known by Meroe island and consist of 5 sites (Begrabiya Pyramids, Royal City of Marawi, Naga and Musswarat AL Suffra) and also include several others important heritage sites (Wad Banga, Mawis,

AbuErtila, Alhass etc) that represent the remains of Kush ancient kingdom.

The Royal City of Meroe

Separately from the Royal Burials at Begraweya but forming part of the Island of Meroe world Heritage property is Royal city of Meroe. This is an expansive site that is by all means significant. It comprises a complex of activity areas within and outside the city walls with the most dominant feature being the large Amun Temple located just on the outside wall of the city.

The floodwater that came to the site in Meroe adversely affected the royal bath and the objects in it. This was the first time that water is known to have entered the royal bath in memory. It would appear that because there was stagnant water in front of the building a long time it seeped its way from underground. At the highest point the water measured 38 centimetres and went down to 20 centimetres in November 2020. The statues that were located on the bath had colours but after being covered by water the colours started to fade away.

The staff worked very hard moving the pieces, cleaned and dried using different combinations to ensure that the colours were retained in the statues. The heavy statues are reported to have lost colour where water entered. The treatment was first made in the bath place and then items were then relocated to safer places from the site. Despite the efforts of the staff there was damage due to unplanned operations and lack of end-to-end disaster risk management plan.

Khartoum State

Al Hajr Mosque

Al Hajr Mosque in the Teseen Village where there is an old stone and daub mosque reckoned to date between 400 to 1000 years old. The mosque has been protected by the Khartoum state government due to its ancient status as one of the oldest mosques in Sudan. The recent floods

FIGURE 15 - 1: Floodwater going into the bathhouse as staffs try to protect the site with sandbags (Source: NCAM)



arising from the levels of the swelling of the Nile has had serious impact on the physical condition of the mosque. As a result of the impact of floods, rain as well as high winds, the shelter that had been put on top of the heritage site by the Khartoum state government to protect it partially collapsed causing destruction to the mosque rather than its protection. This was in addition to the inflow of water inside the mosque that resulted in structural damages with collapse of a section of the southern corner of the mosque and cracks on various parts of the walls including the quibla wall. Most of the structure is however still intact and can be rescued and successfully conserved.

The Tabiyeh and Gate of Omdurman Mud built fortresses/ war shelters called the Tabiyeh located on the Nile banks and used by Al Mahdia Sudanese army to fight the British-Egyptian forces. The most well preserved and popular are the Omdurman Tabiyeh used for siege of Khartoum in 1884. As they are made of daub/earth and dung, and are exposed to rainfall, there is a renovation regime that takes place every two years to ensure their survival. However, a number of these Tabiyeh as well as the only remaining gate (of the original three) of the Omdurman have faced challenges with rising water levels either from the Nile or as a result of human made interventions (road building in particular) that has interfered with natural flow in and flow out of water, leading to large accumulations of water near these sites. Thus, the Tabiyeh

in Omdurman and Tutti were badly affected by the unexpected Nile flooding in September 2020. With accumulated water around them, there is serious danger of losing these heritages as they are made of mud and bricks, and thus could be vulnerable to stagnant water and the new micro-environment that are being created around them.

FIGURE 15 - 2: Partial collapse of Tabiyeh due to floods (Source: NCAM)



Blue Nile State

Boot Dam

The collapse of Boot Dam in Blue Nile state endangered the indigenous knowledge for communities there, in addition to other displaced communities because of floods in Sudan.⁹⁹ It cost about USD 100,000 to conduct Living Heritage inventorying project that include documentation of living heritage threatened and to strengthen communities in safeguarding their living heritage.

Northern State:

Nuri Royal Burial

Nuri site is part of the Jebel Barkal and Napatan region World Heritage Property and is located between two Wadis or dry riverbeds that during the rainy season do hold water. It is one of the most impressive sites with magnificent concentration of pyramids. There are in total about 76 pyramids ranging in sizes with the largest one belonging to the famous Kushitic King Taharqo. The pyramids are

in different state of conservation with some experiencing serious wind and sand erosion while others are still quite intact. The pyramid of King Nastasen suffers from underground flood and water can be seen even on the stairs leading to the entrance of the chambers. It is not clear what damage the stagnant water has caused to the burial chambers of the other pyramids, as they are all sealed. However, there is no doubt that in the long run the presence of water will be injurious to these monuments and may result in collapse. The situation at Nuri seems quite complex as it is said that it hardly rains here and so the danger is not from the rainwater but the underground floods that have been caused by the establishment of new irrigation water channels from the Nile that serve new irrigation schemes nearby.

El-kuru Site

This site is part of the larger Jebel Barkel and Napatan Region world heritage property. Well maintained with numerous burials, it contains the tombs of earlier burials in the history of the Sudanese Kushitic kingdoms.

FIGURE 15 - 3: Inside a burial Chamber in one of the El-Kurru tombs (Source: NCAM)



⁹⁹ Note: Culture Sector Team continued receiving additional information about from other branches of Sudan Culture which could not be added to this sector report because of time limitations.

There is no underground flooding neither is it affected by rain or the rising level of the Nile. Actually, there is a living town between the site, the farms, and the Nile. The only visible and past threat was the water entering the temple on the site whose level is below ground level. A wall was built that directs the water elsewhere and there is no more threats to the temple or site even from flush floods during rainy season. It is important to note that the town wall was located towards the river just past the present town boundary

and adjoining the irrigated date palm farms. The wall has been excavated and stone masonry exposed also showing a gatehouse. It is reported that during the high floods this stonewall area was under water. There is a danger that it may waste away with time.

RECOVERY NEEDS AND STRATEGY

Based on the consultations the work to be carried out should be in the order below:

TABLE 15 - 1: Overview of Recovery Needs and Costs

No	Heritage Site	State	Activity	Budget USD	Budget SDG
1	Establishment of Research Group	All	<ul style="list-style-type: none"> Multi-disciplinary Research Group by Ministry of Higher Education 	100,000	5,500,000
2	Meroe Island	River Nile	<ul style="list-style-type: none"> Sand removal from pyramids site Master Plan for Meroe city Protection wall in Nagaa 	42,050	2,312,750
3	Hajr Teseen Village Mosque	Khartoum	<ul style="list-style-type: none"> Flood protection Drainage system Archaeological Investigation 	36,500	2,007,500
4	Nuri	Northern	<ul style="list-style-type: none"> Groundwater research 	50,000	2,750,000
5	Kerma	Northern	<ul style="list-style-type: none"> Groundwater research 	10,000	550,000
6	El Kurru	Northern	<ul style="list-style-type: none"> Backfilling of trenches 	1,241	68,266
7	Nile Museum	Khartoum	<ul style="list-style-type: none"> Preservation of the Nile Steamers of the Nile Museum 	88,548	4,870,140
8	Tabiyeh	Khartoum	<ul style="list-style-type: none"> Restoration 	5,850	321,750
9	Boot Dam	Blue Nile	<ul style="list-style-type: none"> Research and Capacity Development on Indigenous knowledge for local communities 	100,000	5,500,000
Total				434,189	23,880,406

There is one overarching recommendation that has implication on the future understanding of the challenges and their solutions.

Recommendation 1: Multi-disciplinary Research Group by Ministry of Higher Education

1. Recommend for the setting up of an interdisciplinary/ research committee by the Ministry of Higher Education that will look at the question of floods, both river induced and underground, and its effects on heritage and others
2. The team will be jointly coordinated by the Ministry of Higher Education and UNESCO Khartoum
3. Costs for this interdisciplinary/ research group under the Ministry of Higher Education will be used to cover for transport (vehicle hire and petrol), per diem, meetings and field survey, procurement of materials, data collection, data analysis, and recommendation preparation and write up

The top three recommendations for recovery¹⁰⁰ are as follows:

PRIORITY NUMBER 1: MEROE ISLAND

1a. The Pyramids

Recommendation:

1. Removal of newly accumulated sand dunes from the immediate surroundings of the pyramids as well as from inside the offering chapels with their unique reliefs.
2. Documentation of the site and its monuments to assess, the state of their preservation after the shutdown and after summer rains and storms (photographical documentation, comprehensive report, and assessment on necessary protection measures).

3. Control and monitoring of tourists and monuments.

1b. The City of Meroe

Recommendation:

1. A Master Plan aimed at providing more protection to the site is urgently needed.
2. The plan will incorporate both research work (preparation of a catalogue or file for all features at the site by collection of all available documentations, and preparation of work plan), and fieldwork (survey and mapping, surface cleaning, fencing, and opening pathways) to presentation.

1c. Naga Site

Recommendation:

1. A trench is to be dug on the three sides of the Hatur temple to create a semi-island feature to temporarily hold water during the rainy season.
2. The water flow towards the temple will be redirected elsewhere by constructing a wall about 70 cm high all along the eastern part of the archaeological area where the Lion and Hathor temples are located.
3. The wall would follow the same pattern constructed at el-Kurru, that is a cement structure covered by stone.
4. During rains, little movable wooden walkway could be put over the channel for people to walk into the temple compound or the temple could be reached through the direction of the Lion temple that will have no trench around.
5. The long-term recommendation involves the possibility of putting up a water trough but only after

¹⁰⁰ See Annex of the Culture sector report for a full list of recommendations

a proper study to determine what microenvironment may be created and what effects it may have generally on the heritage within the property.

PRIORITY NUMBER 2: TESEEN MOSQUE

2a. The Mosque and its surrounding

Recommendation:

1. It is recommended that in order to solve this, an underground tank be constructed where the water will drain to as part of the solution as well as serving as a water catchment and management strategy for the locals.
2. Concurrently to be undertaken with the restoration and protection work should be an archaeological investigation that should establish the date of the mosque and gather other data that will contribute to its proper understanding and appreciation.

This work is considered of immediate urgency as the mosque could collapse if nothing is done and the budget is provided below

PRIORITY NUMBER 3: GROUND WATER RESEARCH IN NURI AND KERMA

3a. Ground Water Research at Nuri

Recommendation:

1. It is recommended that before any action is put in place as a solution that a thorough study is carried out by a multi-disciplinary team of

experts to determine the cause of the underground flooding in this area and recommend a lasting solution.

2. The team could be the same as that set up under the auspices of Ministry of Higher Education but should include professionals of relevant subjects from the local universities, local persons with traditional knowledge system of water behaviour over the years as well as representation from the regional government.
3. The study should also look at issues of microenvironment creation through new developments and their effects on heritage.
4. Part of the recommendation of such a study would be expected to cover the implementation of end-to-end Disaster Risk Management planning.
5. It would also ensure that both EIA and HIA studies are carried out before major developments are put in place including those of water extraction and use.

3b. Ground Water Research at Kerma Recommendation:

1. It is recommended that this is one of the areas where the interdisciplinary team looking at among other things the problem of underground floods should research and provide a recommendation to address the challenge.
2. The Deffufa because of the materials used of earth and daub are in eminent danger if these challenges are not addressed soon enough and so this is an urgent a must exercise.

16. GENDER

SUMMARY

An estimated 206,000 women of reproductive age are living in temporary flood shelters with minimal protection. UNFPA estimates that some 20,000 pregnant women are among the affected. Of them, an estimated 3,000 will experience pregnancy complications, requiring life-saving sexual and reproductive health services. More than 2,000 women were expected to give birth in the coming months. In addition to urgent health needs, displaced women face limited settlement options, and financial difficulties as a result of job loss. They also face increased risk of gender-based violence, with limited services threatened by damaged facilities and networks.

Protection

Conflict in many regions in Sudan have increased the impact of insecurity on women. This has impacted greatly on human security for women. Rape and other forms of gender-based violence are alleged to be widely prevalent, although the extent cannot be determined because of lack of comprehensive data and under reporting. Women get raped when they leave the IDP camps in search of water and firewood. They also get raped during clashes between tribes as part of the means of warfare. Accountability for such offences has been challenging for a multiplicity of factors such as low police presence outside urban areas, inadequate training of the police especially in investigation of gender based crimes, absence of forensic facilities and cultural norms that stigmatize victims of sexual offences. The low presence of women in the police force also makes it difficult for women to report. The lack of justice and accountability for gender based crimes has led to impunity of the commission of these offences.

In addition to urgent health needs, displaced women face increased risk of gender-based violence and limited services to prevent or respond to such violence. Sudan's unprecedented flooding has dramatic consequences on gender-based violence. Flooding means that economic livelihoods were destroyed and that disproportionately affects women. Stress means more domestic violence. Local health services that respond to victims are interrupted and support networks are disrupted. Though protection needs are rising, services to support survivors of gender-based violence are minimal. In more than 90 per cent of the country's localities, these services are absent. UNFPA and partners have activated networks to provide community protection and referrals to services for survivors of violence in North, South and West Darfur, as well as in Blue Nile, Khartoum and Kassala. Despite these efforts, addressing gender-based violence in Sudan remains a challenge. Access to affected populations and areas has been disrupted and the ongoing economic crisis has raised operation costs.

UNFPA has helped to rehabilitate 16 emergency obstetric and newborn care facilities in seven regions of Sudan, support that can mean the difference between life and death for displaced pregnant women. Reproductive health kits were pre-positioned in advance of the flooding and UNFPA had supported the rehabilitation of 16 emergency obstetric and newborn care facilities in seven states as part of its contingency planning. UNFPA also supported the distribution of more than 20,000 dignity kits, which contain hygiene supplies including soap and sanitary napkins, as well as information about where to find essential support.

The mobile clinics have reached some 25,000 people with consultations and

information. Mobile clinics were deployed to affected areas to provide vital health services – particularly reproductive health care and information. The rapid response maintained the supplies and services in maternal hospitals and health facilities as in Gezira and North Darfur States where clean delivery bags were provided in the mobile clinics. Today, referral services for women in need of emergency obstetrics services are functioning in 12 states.

Food Security

Mainstreaming Gender enhances the relevance and quality of food security programs and maximizes the impact of interventions. Furthermore, it contributes to the appropriate targeting of beneficiaries and enables sector partners to avoid any harm. Identifying protection threats will enable to harmonize food security activities in order to address, mitigate or reduce these threats. Similarly, the sector will enhance gender mainstreaming in food security and livelihoods interventions.

Food security and livelihoods programs and interventions will provide safety, dignity, and protection. Responses should be designed in a way to decrease protection risks. Vulnerable people may include women, girls and boys, people with disability and older people. e.g. while women contribute significantly to agriculture, they often have limited ownership of land or agricultural tools when food is limited.

The assessment findings by FAO show that job opportunities such as casual agricultural labour–considered one of the most important income-generating activities for the rural population–have already diminished and has decreased even further during the harvest season. Consequently, a lack of job opportunities in areas such as farm labour and agri-food processing and marketing have a significant impact on the livelihoods of many vulnerable women. There is need for external robust support from resource partners to respond to the needs of affected communities especially women

by providing immediate emergency livelihood support and medium-term interventions to strengthen the resilience of female headed households and devise preparedness and preventive measures for flood management. The high impact of natural hazards and disasters on agriculture calls for enhanced gender mainstreaming of disaster risk reduction and resilience building within the agriculture sector to strengthen the livelihoods and food security and nutrition.

Water, Sanitation and Hygiene

Crisis affected population should be targeted for access to basic water services. Interventions should ensure drinking water from an improved source with collection time not more than 30 minutes for a roundtrip, including queuing. People targeted with improved basic water services will benefit from these activities, including maintenance and rehabilitation of handpumps, water yards, protected wells, and hafirs. The new installations should consider girls and women's engagement for site identification not to have to travel far to unsecured places to fetch water, which causes protection risks.

Crisis affected population should gain access to adequate (basic, limited, or communal based on context), secured, and gender-appropriate sanitation services. Interventions should ensure the use of flush/pour pit latrines, ventilated improved pit latrine (VIP), pit latrine with slab, composting toilet where possible. Partners should ensure that the communal latrines are gender segregated.

PRE-DISASTER AND SECTOR CONTEXT

Gender rights and equality represent fundamental areas for change in Sudan as the country emerges from three long decades of political oppression, in particular the suppression of women's rights. The context remains uncertain however, with the persistence of poor

human development indicators, inequality and regional instability, and new threats posed by climate change. Over a third of households in Sudan are estimated to be poor, with a quarter falling below the extreme poverty line (AfDB, 2018). Significant regional disparities exist in terms of the prevalence and scope of poverty, and the western, southern and Red Sea states are shown to be the most deprived regions. Following the secession of South Sudan in July 2011, Sudan has struggled with the loss of about three quarters of the country's oil revenues (World Bank, 2015). After years of poor investment, basic services are now strained and there is a growing economic crisis that is leading to 'worsening food insecurity, deteriorating healthcare, and other needs across Sudan' (OCHA, 2020). This is further exacerbated by the health crisis and socio-economic consequences of COVID-19. UN Women highlights violence against Women and Girls (VAWG) as prevalent and a 'critical hindering factor' for human development and peace building in Sudan.¹⁰¹

Trends in educational participation

Today there are an estimated 7.9 million school aged children in Sudan (aged 5-13 years)¹⁰² and there is increasing participation in school, but progress remains uneven. In 2019, almost 30 percent of primary school-aged children remained out of school (2.5 million children). School access has improved markedly since 2009 but the Millennium Development Goals (MDG) of universal basic education remains a 'major challenge' for Sudan, with basic level education as well as secondary level education exhibiting some of the lowest retention profiles in the region (MoE, 2019).¹⁰³ A total of 8 percent of the current school generation are unlikely to ever attend school.¹⁰⁴

The proportion of out-of-school girls is higher than boys in basic level education. In 2016-17, at basic level (compulsory)¹⁰⁵ the Gross Enrolment Rate (GER) was approximately 73 percent (75 percent for boys, and 71 percent for girls). There is little change in GER since 2009 (72

TABLE 16 - 1: Key Educational Indicators in Sudan

Participation in Education Services	National
Gross Enrolment Rate (Basic Level)*	75 % Male 71 % Female
Basic School Attendance**	77.4 % Male 75.5 % Female
Gross Enrolment Rate (Secondary Level)*	35 % Male 41 % Female
Secondary School Attendance**	27.4 % Male 29.4 % Female
Education Gender Parity**	0.98 (Primary) 1.07 (Secondary)

* 2017 estimates (MoE 2019)

** MICS 2014 (CBS and UNICEF, 2016)

¹⁰¹ <https://africa.unwomen.org/en/where-we-are/eastern-and-southern-africa/sudan>

¹⁰² <http://uis.unesco.org/en/country/sd>

¹⁰³ <https://www.unicef.org/sudan/education> In 2014, UNICEF indicated that Sudan had one of the lowest levels of school attendance of primary aged children in the Middle East and North Africa Region (MENA). This included 490,6735-year-olds that should have been in pre-primary (50%), 1,965,068 primary school-aged children (37% of total population of primary school-aged children) and 641,587 lower secondary school-aged children (40% of secondary school-aged children) (UNICEF, 2014).

¹⁰⁴ <https://www.unicef.org/sudan/education>

¹⁰⁵ Basic education lasts eight years and targets children between the ages 5-13 years. Providers include the Government and private entities (MoE 2019).

percent) although there is considerable difference in GER between the states. The gender gap remains small in the majority of states (slightly higher levels of boys than girls). Exceptions include West Darfur and West Kordofan with a more marked gender gap.¹⁰⁶ In North Darfur and Gezira, boys' enrolment was shown to be higher (92 percent in both states) than girls' enrolment (89 percent and 84 percent respectively). In Gadarif, levels of primary-level GER are lower (70 percent of boys and 65 percent of girls). The age of enrolment is reducing, with the majority of children now attending school from 5 years of age. Interestingly, there is a growing participation in pre-school¹⁰⁷ across Sudan; with little disparity between boys and girls (although girls may have slightly higher rates of participation than boys) but still significant disparities between the states, and between rural and urban areas.¹⁰⁸ Excluding khalwas, the GER for pre-school (optional) stands at 42.8 percent (2015-16), putting Sudan ahead of countries such as Tunisia and Ethiopia (gender indicators are not given).

Trends in utilization of maternal health services

Over the last three decades, Sudan has actually made significant progress on the ground in terms of advancing some dimensions of maternal and child health.¹⁰⁹ While Sudan did not meet its health-related MDGs, several key health indicators have improved, including

a decrease in Child Mortality, and an increase in delivery by a skilled birth attendant. Several challenges remain, including a lack of progress in neonatal mortality and child nutrition, an unmet need for contraceptives and a high fertility rate, low institutional delivery, and significant rates of maternal mortality (World Bank, WHO, UNICEF and JICA, 2018).

The Maternal Mortality Ratio remains high (311 per 100,000 live births¹¹⁰) despite progress, and Sudan is still far from meeting the 2015 MDG target of 134/100,000. Maternal under-nutrition is also very high in Sudan; and up to 62 percent of mothers are under-nourished, with the highest percentage observed in the eastern Red Sea state.¹¹¹ Maternal deaths disproportionately affect certain groups, including poor women, rural women, and nomads (Badawi and Folcio, 2019). High numbers of maternal deaths in some parts of Sudan reflect various inequities in access to health services, socio-cultural barriers (inhibiting health-seeking behaviour), low levels of education¹¹² and poverty. Maternal health is also linked to FGM/C and cultural practices that lead to early marriage and childbearing. The large proportion of deliveries still take place outside of health care facilities and are conducted by traditional birth attendants who are not professionally trained. Other factors influencing maternal health include the prevalence of sexual-transmitted diseases,

TABLE 16 - 2: Key Maternal Health indicators

Maternal health and WASH indicators	National (MICS, 2014)
Births attended by skilled health personnel (women aged 15-49 yrs)	77.5 %
Antenatal care (at least once by skilled health personnel)	79.1%
Contraceptive prevalence (married women aged 15-49 yrs)	12.2%

¹⁰⁶ For example, in West Darfur, there is a 22 percentage point gap between boys and girls (86 percent and 64 percent).

¹⁰⁷ This level covers two years and targets children aged 4-5 years. The pre-primary programmes are provided by Government and private institutions with 'significant effort' also contributed by the community (MoE 2019).

¹⁰⁸ Excluding khalwas (religious schools), it is indicated that almost half of children (aged 4-5 years) in rural areas had some experience in pre-school (49 percent of boys and 53 percent of girls), while over 80 percent of children (aged 4-5 years) in urban areas had experience in pre-school (80 percent of boys and 83 percent of girls).

¹⁰⁹ <http://www.emro.who.int/sdn/sudan-events/all-eyes-on-maternal-health.html> Accessed 22 Sept 2018

¹¹⁰ http://www.who.int/gho/maternal_health/countries/sdn.pdf?ua=1 Accessed 22 Sept 2018.

¹¹¹ Federal Ministry of Health, Sudan National S3M, 2013 in Badawi and Folcio (2016)

¹¹² <http://www.who.int/news-room/fact-sheets/detail/maternal-mortality>

particularly as result of polygamy and migration.¹¹³ In most cases, maternal deaths may be attributed to easily and treatable birth complications, and many women struggle to access adequate maternal care.

The utilization of skilled birth attendants (with midwifery skills) for delivery care has shown positive trends (77.5 percent of births are attended by skilled health personnel); however, quality of care remains variable especially in rural areas. Sudan has still one the lowest rates of family planning use in sub-Saharan Africa and fertility rates remain significant (the Total Contraceptive Prevalence Rate is 12.2 percent, and the Fertility Rate is 3.57 per woman). Key barriers to maternal healthcare include a lack of access to adequate facilities and trained staff, the high costs of services and medicines, and the persistence of local customs and beliefs that discourage the use of reproductive health services.

Trends related to water, sanitation, and hygiene (WASH)

WASH is recognized as playing a fundamental role in public health and hence sustainable development, highlighted as Sustainable Development Goal 6 (SDG 6). Access to safe water and sanitation are considered basic human rights, as articulated in 2010 by the United Nations General Assembly. Poor WASH is the main cause of faecally-transmitted infections (FTIs), including cholera and diarrheal disease, cited as the second leading cause of morbidity and mortality among children under the age of five and the leading cause of death in sub-Saharan Africa (UNICEF, 2016).

There have been concerted efforts in strategy and policy development, and service delivery in the education, health, and WASH sectors over the past decade. In 2019, almost a third of primary school-aged children still remain out of school (2.5 million children). School access and participation (including in pre-school)

has improved markedly since 2009, but progress remains uneven and gender disparities are prevalent. In 2016-17, the proportion of out-of-school girls was higher than boys at the basic level of education (the Gross Enrolment Rate (GER) was approximately 75 percent for boys, and 71 percent for girls). Gender gaps are also observed at secondary and tertiary levels, but at these levels, larger numbers of girls are enrolled than boys, indicating greater dropout by boys. Gender, geography, and wealth are key determinants of access to, and participation in, quality education in Sudan. Non-participation of girls may be attributed to a mix of inter-related factors, including the persistence of negative community cultural attitudes towards girl's education, early marriage, movement in nomadic families, domestic chores, and distance from home to school, especially in conflict-affected areas. Poor school facilities and learning environments, and a lack of female teachers also deter girls' participation.

While there are positive trends in WASH in Sudan, only two thirds of the population has access to improved drinking water and less than a third has access to improved sanitation, falling well below SDG targets of universal access. Yet access and services vary widely between the states and population groups. Poor access to water and unhygienic conditions, and widespread open defecation are compounding health and nutrition vulnerabilities across all states (OCHA, 2020), especially risks during the global Covid-19 pandemic; and influencing women and girls' safety and access to basic services.

WASH remains a fundamental dimension of family health, and reproductive, maternal, neonatal and child health (RMNCH). Access to WASH has significant socio-economic impacts, particularly for women and girls, as they may suffer the 'loss of productive and leisure time from the drudgery of water hauling and other WASH-related domestic labour; the exclusion from full participation in schools due to the lack of WASH

¹¹³ <https://www.unhcr.org/protection/health/43293e0b2/sudan-trying-stem-spread-hiv-aids.html> <https://www.fmreview.org/sites/fmr/files/textOnlyContent/FMR/24/28.htm>

facilities; urinary tract infections arising from delayed urination or reduced water intake to cope with a lack of access to sanitation facilities; and the loss of dignity and threat of sexual assault due to the lack of toilets, both in times of stability and crisis' (UNICEF, 2016). In particular in rural households, women, and children (especially girls) are often responsible for domestic chores, including the daily fetching of water for household consumption. Meanwhile, Safe WASH in health care facilities is critical for maternal and newborn health. The integration of WASH services and good practices into health facilities and improving access to WASH within communities has been shown to decrease both morbidity and mortality of women and children.¹¹⁴ In realizing the right to WASH, the UN emphasizes the importance of 'well resourced, capable institutions delivering services' alongside healthy behaviour.¹¹⁵

Trends in labour and employment overview

The Sudanese population remains primarily engaged in the agricultural rural economy, particularly women. There are major gender distortions in the labour market, as two thirds of women remain outside of the labour force altogether, and there are distinct geographic inequalities. Socio-cultural factors still play a major role in influencing women's access to, and participation in livelihoods, business, credit and services, and natural resources such as land and water. Women's rural livelihoods are further affected by environmental stresses, due to climate change and land degradation.

The most recent national survey on the workforce indicated significant gender inequality in access to, and participation in the labour force and employment in Sudan (Sudan Labour Force Survey (SLFS), 2011). Women were reported to face high levels of exclusion and do not participate in

the labour market on an equal basis to men. Women's labour force participation is characterized by sector bias and vulnerable employment. Yet variations exist among states, between rural to urban areas, and across age groups.

Labour force participation

Only half of the working aged population (15-64 years)¹¹⁶ is economically active¹¹⁷, including less than a third of working-aged women. Drawing on the SLFS data (2011), ILO estimated that just over half of the population aged 15-64 years remains economically active, including 70.8 percent of males and 28.9 percent of females (ILO, 2014). Notably female participation was reported to have increased from the 1990 survey (18 percent of females aged 10-64 years). There are slightly lower levels of participation of both men and women (10-64 years) in urban areas (56.9 percent of males and 22.6 percent of females). Labour force participation among men increases with age up to the age range of 45-49 years (91.8 percent), and then declines. Among females, the highest level of labour force participation is in the age group 35-39 years (28.7 percent).

The eastern states report extremely low labour force participation of women (15-64 years), in particular rural areas of the Red Sea (6.7 percent) and Kassala (2.7 percent) whereas men's participation in these areas is above the national average. Youth and young people (15-29 years old) make up 51 percent of the working age population (15-64 years). Over seven out of ten working age women, and just three out of ten working age men (this rises to five out of ten men in rural areas) are economically inactive (not participating in the labour force). The majority of inactive people fall in the age range of 15-24 years, with the main reason cited to be full-time schooling for men and 'home-making' for women (ILO, 2014).

¹¹⁴ The Partnership for Maternal, Newborn and Child Health (2014)

¹¹⁵ <https://www.unwater.org/water-facts/water-sanitation-and-hygiene/>

¹¹⁶ According to the standards of the Sudanese Central Bureau of Statistics, the labour force in Sudan actually includes the population 10 years old or more, and is estimated at 9.3 million (age 10-64 years and over). The ILO re-calculated the rate for the population aged 15-64 years.

¹¹⁷ Labour force: refers to the economically active population who participates, or want to participate, in the production of goods and services during the reference period. It includes both the employed and the unemployed (SLFS 2011)

TABLE 16 - 3: Key Indicators for Gender in the Economy

Participation in economy	National (SLFS, 2011)
Labour force participation rate (15-64+ yrs)	50.5 % 70.8 % male 28.9 % female
Employment rate (15-64+ yrs)	41.1 % 61.4 % male 19.6 % female
Employment in agriculture	47.0 % 41.4 % male 63.5 % female
Employment as professionals, directors, or technicians	9.9 % 8.3 % male 14.7 % female
Youth employment (15-24 years)	20.4 % 28.9 % male 11.4 % female

There are low levels of employment, particularly among young women (15-24 years). The ILO estimated that 41.1 of the population aged 15-64 years are employed, including 61.4 percent of males and 19.6 percent of females, with higher levels in urban areas (ILO, 2014). Once again for males (10-64 years), employment increases with age, peaking at the age group of 45-49 years (96.9 percent). The highest level of participation among females occurs in the age group 24-30 years (38.6 percent). Unemployment among youth (15-24 years) is notably twice as high as that among the rest of the labour force, and is particularly high among young women (ILO, 2014).

Gender and employment profile

Gender influences the choice of employment by sector, particularly in rural areas. The ILO (2014) estimates that about 65 percent of 'prime age workers' (aged 25-54 years old) are engaged in the informal sector (including agricultures, mining, trades), and 20 percent of youth (15-24 years). The SLFS survey (2011) indicates that half of the labour force is engaged in agriculture (47 percent), including 41.4 percent of economically active men and 63.5 percent

of economically active women (rising to 82.2 percent in rural areas). The service sector is the second largest employer, especially wholesale and retail trade (12.1 percent) and transportation and storage (7.7 percent).

Trends in gender and enterprise

The ILO estimated that there were approximately 600,000 registered micro, small and medium enterprises (MSMEs)¹¹⁸, employing less than 1.5 million workers (about 20 percent of total jobs) in Sudan (ILO, 2014). The majority of the businesses (75 percent) are micro enterprises, and employ, on average just two workers. Most workers and MSMEs are in the informal economy, which accounts for a significant share of employment in Sudan (World Bank, 2016).

As a result of rural to urban migration, the informal economy has experienced rapid growth, particularly in Khartoum, and is attracting greater participation of women. Informal sector enterprises include both subsistence and unofficial enterprises (ILO, 2014). Subsistence activities are typically carried out by poor, unskilled and uneducated workers, and include petty trading, home-based activities and crafts, car repair, and traditional food making and

¹¹⁸ Ahmed Abou El-Yageid, Sudan's Small and Medium Enterprises, Thematic Paper prepared for the ILO/UNDP project "Sudan: Support to the development of a National Employment Framework", September 2013

beverages. Although less publicly visible than in other African countries, women tend to occupy designated areas within the open marketplace. Challenged by little experience and access to credit, women's petty trading ventures and businesses typically remain micro or small. They are also constrained by restricted mobility and a lack of networks. Unofficial enterprises may be owned by both poor or wealthy entrepreneurs, and can include activities such as carpentry, bakeries, garment making and pottery.

Women tend to remain in traditional female-dominated sectors, for example in small-scale retailing, services, or home-based business. There is limited participation of women in apprenticeships and a persistence of gender-segregated crafts (ILO, 2014). In Gadarif, GIZ emphasized the lack of advocacy on the diversification of women's roles and the promotion of women's engagement in vocational sectors, including in electrical work, mechanics as well as technology.¹¹⁹ According to a study of more educated, middle-class Sudanese female entrepreneurs, female businesses in the SME sector may be concentrated in the small-scale retailing and services industries (Welsh, Memili, Kaziak, & Ahmed 2013). In the sample of 89 female-owned SMEs, retailing comprised 32 percent of women's businesses, followed by 19 percent in food-related activities, 10 percent in design businesses, and 10 percent in tailoring businesses. Female entrepreneurs in this study reported higher than average earnings (3,000 USD), with some earning four times the amount.

Self-employed women from all social classes encounter a number of social and economic challenges that influence business participation and development. As highlighted by SIHA (2012), these include social constraints related to the family and/or religion; access to capital and credit, a lack of awareness of relevant laws and regulations (for

example the obtainment of a licence or paying taxes); and harassment and abuse in the workplace. Women also struggle with weak procurement facilities and a lack of transport to move goods. Young women entrepreneurs in Khartoum elaborated on the various socio-cultural constraints including family pressures and obligations, gender discrimination in the marketplace, price inflation of goods and services (related to transport services and raw materials) and limited 'business' networks.¹²⁰

Trends in gender and wage employment
Gender dynamics are implicated in women being less likely to earn a wage (in family work) or receive equal and fair remuneration (in formal employment). The majority of employed workers are wage earners, representing 40.2 percent of the work force (44.1 percent for males, and 28.4 percent for females). Self-employment is the second most common type of work, incorporating 37.4 percent of the workforce (40.2 percent for males, and 29.1 percent for females). Meanwhile, 15.7 percent of the work force is engaged in family work without a wage; this includes less than 10 percent of working men but over a third of working women. In terms of wage incomes, there is a gender pay gap of 47 percent in the 2011 SLFS survey; and this was fairly constant across rural and urban areas (World Bank, 2015). The wage gender gap is present in all sectors, but at varying degrees. An estimated 35 percent of women earn less than the monthly poverty line, compared to just 16.5 percent of men.

Gender and vulnerable employment
Over 50 percent of those employed in Sudan are in 'vulnerable employment'¹²¹, with uncertain job security, remuneration and benefits; and this includes over 40 percent of workers, in particular those with low educational attainment (ILO, 2014). Women are indicated to be at greater risk than men (66 percent of the female labour force, compared to 48 percent of the male

¹¹⁹ Key informant interview with GIZ, Gadarif, Nov 2019

¹²⁰ Workshop with women entrepreneurs at Orange Corners Programme, Khartoum, Nov 2019

¹²¹ Vulnerable employment is the share of self-employed (without employees) and contributing family members in total employment (ILO, 2014). See also, http://ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_631497.pdf

labour force). Higher labour participation by men accounts for their over representation in vulnerable employment (male workers represent 70 percent of those in vulnerable employment, or almost 4 million workers). The less favourable treatment of women in employment, in terms of lower pay and benefits, remains a serious concern in Sudan (Badawi and Folcio, 2016). Harassment of females in the workplace is also significant leading to 'mental and psychological distress', with physical harassment of women particularly high in informal or casual jobs such as market trade and street vending (ERT, 2014). Focus groups in Khartoum highlighted that such urban harassment has been exacerbated by a lack of institutional protection and laws that support women workers.¹²² Insecure employment is higher in the rural areas, and in the agricultural sector, which accounts for the highest incidence of unpaid work.

Trends in gender and sector participation: infrastructure and services

The service sector (40 percent of workers) and industry (15 percent of workers) are the largest employers after agriculture, accounting for almost 58 percent and 2.6 percent of the GDP respectively¹²³. The industrial sector has decreased rapidly from 2010 levels due to the decline in oil production and related processing activities (ILO, 2014). While the service sector has a slight gender imbalance (44.5 percent of employed men compared to 35.5 percent of employed women), industry is almost completely dominated by men (15.7 employed men, and just 3.8 percent of employed women). In terms of extractives, gold is fast emerging as a leading export commodity, employing an estimated 1 million workers¹²⁴, with the workforce composed primarily of younger men under the age of 45. Women

(and children) are described as 'visible minorities' in gold-mining activities.¹²⁵ Manufacturing has notably increased from the expansion in sugar and cement processing; but this has not boosted sector employment with the lack of a skilled workforce preventing diversification into 'new and value-added product areas' (World Bank, 2015).

Women face discrimination in certain lines of professional work but have been active in lobbying for change. In particular, women have struggled to enter employment as land surveyors or oil engineers since many companies argue that they will not be able to protect them.¹²⁶ The less favourable treatment of women in careers, pay and benefits remains a serious concern in Sudan including discrimination in promotion, as male candidates are promoted ahead of more suitable female candidates (Badawi and Folcio, 2016; ERT, 2014). Active campaigning by women's organisations has been successful in removing a number of barriers to female employment in certain sectors. Women now occupy professional positions both in politics and education (including as university professors or teachers in primary and secondary schools).¹²⁷ In contrast, there have been regressive trends in female employment in the judiciary. A bias towards hiring men exists and there are only a few female judges in appeal courts, and they were notably employed before the Islamization process started.¹²⁸

As a result of commitments under the Doha peace agreements and efforts in reconstruction, the construction sector has continued to grow, and presents labour opportunities. In road projects, petty trading tends to proliferate along the route leading to increased livelihood opportunities, often for women. Yet there remain heightened risks of sexual assault for women traders, without local

¹²² Focus Group Discussion, Government representatives, Khartoum, Nov 2019

¹²³ <https://www.cia.gov/library/publications/the-world-factbook/geos/su.html>

¹²⁴ <https://unctad.org/meetings/en/Presentation/17OILGASMINE%20Mohamed%20Sulaiman%20Ibrahim%20S4.pdf>

¹²⁵ <https://unctad.org/meetings/en/Presentation/17OILGASMINE%20Mohamed%20Sulaiman%20Ibrahim%20S4.pdf>

¹²⁶ Equal Rights Trust and SORD, In Search of Confluence. Addressing Discrimination and Inequality in Sudan, 2014.

¹²⁷ Equal Rights Trust and SORD, In Search of Confluence. Addressing Discrimination and Inequality in Sudan, 2014.

¹²⁸ Equal Rights Trust and SORD, In Search of Confluence. Addressing Discrimination and Inequality in Sudan, 2014.



protection measures and a structured environment. Internationally supported programmes on infrastructure can promote the development of Public-Private Partnerships (PPP) with the inclusion of female contractors.

In recent years, there has been increasing attention to access to alternative energy (such as solar) to accelerate local development and gender empowerment in Sudan.¹²⁹ This represents a potential sector for both women's employment and enterprise. Yet due to women's limited access to assets and participation in household decision-making, women are often unable to access regular financing schemes for relevant equipment (ENERGIA, 2011), necessitating tailored micro-financing programmes. In regions such as Darfur, there have been several solar energy projects for example, the installation of Solar Photovoltaic (SPV) systems in community service centres to support schools, health clinics, streets, police stations, women centres and water pumping (UNDP, 2016). At a grassroots level, NGOs such as CARE have also sought to facilitate the dissemination of

improved cook stoves and have trained women in innovative technologies such as the production of 'green' charcoal (Ritchie, 2018).

Gender Based Violence (GBV) remains a highly prevalent and persistent phenomenon facing women and girls in Sudan. The most common forms of GBV include harmful traditional norms and practices related to female genital mutilation or cutting (FGM/C), early and forced marriage, and physical and sexual violence (including Intimate Partner Violence (IPV)). Yet there is significant variation between states, and between urban and rural areas. Conflict and disaster-affected communities are the most vulnerable population groups, in particular nomads, pastoralists and IDPs.

POST-DISASTER EFFECTS FOR THE SECTOR

The country remains prone to natural disasters including seasonal flooding. In 2020, Sudan experienced the worst floods in a hundred years. By October, close to 900,000 people were affected

¹²⁹ https://www.sd.undp.org/content/sudan/en/home/ourwork/environmentandenergy/successstories/Solar_Energy_in_Sudan.html

in all 18 states. In addition to destruction to infrastructure, floods affected almost 600,000 farming and pastoral households (2.9 million people), of whom 42 per cent are female-headed, and resulted in the flooding of about 2.2 million hectares of land (representing 26.8 percent of cultivated areas in the 15 assessed states) and loss of 108,000 heads of livestock, belonging to more than 20,000 households.

Extreme levels of food insecurity are expected to persist in many of the states. The flooding experienced in Sudan from July to September has contributed to an increase in food insecurity. In the rainfed agriculture areas, around 2.2 million ha of the planted area was flooded, representing 26.8 percent of cultivated areas in 15 states. Gedaref was the most affected state in terms of damage to planted area with more than 1,067,721 ha of cultivated land washed away due to floods and a total loss of crops. Blue Nile is the second most affected state with 617, 419 ha damaged, followed by Sennar and Kassala states with 112,579 ha and 109,048 ha respectively.

Agriculture

FAO in the Sudan jointly with the Ministry of Agriculture and Natural Resources and Ministries of Production and Economic Resources conducted a rapid assessment in mid-September to document the impact of the floods on farming and pastoral communities which showed that 252,000 female headed households are severely affected. Preliminary results of the assessment estimate that the floods have affected almost 600 000 farming and pastoral households (2 988 445 people), of whom 42 percent are female-headed, and resulted in the flooding of about 2.2 million ha of land and loss of 108 000 heads of livestock, belonging to 20 521 households. In addition to limiting movement and access to farms and agricultural inputs, the floods have also led to the loss of fishing gear and destruction of aquaculture farms; loss of agricultural inputs, tools, and pumps; and destruction of agriculture and livestock service facilities. Affected

farmers have already begun to adopt negative coping mechanisms including borrowing and selling productive assets to access food and ensure they have seeds for the upcoming agricultural seasons. So far, about 22 percent of affected localities have received assistance from the Government, humanitarian actors, and non-governmental organizations. Further assistance is needed urgently, and additional funds are required to maintain livelihood interventions and provide necessary emergency and recovery support.

The agriculture sector plays a key role in the country's economy, accounting for about 30 percent of the GDP. At least 55 percent of the total population (of whom 42 percent are women) in the flood-affected states are engaged in and rely on agriculture and livestock rearing for their livelihoods. Job opportunities such as casual agricultural labour – considered among the most important income-generating activities for those in rural areas – have already diminished due to the floods and are expected to further deteriorate during the imminent harvest season. Food prices are expected to rise and availability and access to food continues to be limited due to both COVID-19 related containment measures and the floods. This will worsen the food security of Sudanese farmers, particularly smallholders and vulnerable households who cannot afford to purchase food for their families or agricultural inputs to resume farming. The effects of the flooding in combination with the various shocks and threats, including desert locusts, faced by the Sudanese population has left many exposed to increased vulnerabilities and food insecurity. Without urgent livelihood assistance, already vulnerable populations are at risk of falling into more severe phases of acute food insecurity.

Education

The Education Sector has identified 2.9 million (45% of boys and 55% of girls) disaster-affected school-aged children in need to access quality basic and secondary school education. These include

686,928 internally displaced, 244,830 refugees, 187,853 returnees, and 1,803,781 non-displaced vulnerable children. Of these children in need, 2.2 million (1.21 million girls and 990,000 boys) should be supported through the Education sector. Gender, age, disability, and protection specific needs are all addressed in the Education Sector strategy. In localities with a historically low rate of female enrolment in school, a gender analysis is yet to be conducted so that girls will be provided with specialized support to return to school or to remain in school.

Food Security and Livelihoods

Overall, women and girls have experienced a worsening of existing inequalities and disproportionate secondary impacts of floods, compared to men and boys. A total of 49% of men and 51% of women have been affected. This is even worse for other marginalized groups such as persons with disabilities and those in extreme poverty. In Sudan, women have always been active in agriculture and food security, constituting 17% to agricultural labour force. The findings in North Kordofan confirm that women contribute 74% to the monthly agricultural income, 65% to total income, 62% to the labour work, and 65% to the household activities. The removal of the obstacles that women face after the floods could increase their contribution to and enhances their livelihood through empowerment that improves their access to resources and credit.

The informal sector is particularly impacted by the floods, and estimates show that women make up 50 percent of this workforce. This has affected household income and even longer-term impact on women. The response should consider prevailing market conditions, availability of financial services and food products in the markets; the preferences of the affected population; cultural and gender dynamics; accessibility, safety, and security of beneficiaries.

Water, Sanitation and Hygiene

Crisis-affected population should have access to hygiene promotion services. Affected people should receive hygiene promotion messages, including handwashing with soap through household visits, campaigns, and media coverage. Partners should also address the needs of girls and women of the newly displaced population with menstrual hygiene supplies. Women in a protracted situation should be introduced to women's groups, led by the protection sector, to receive training on access to menstrual health management (MHM) supplies and soap.



RECOVERY NEEDS AND STRATEGY

The issues faced and processes required to ensure that community-based disaster risk reduction activities are sensitive to, and inclusive of, gender and diversity, are similar to those required for disaster response and recovery programming. Consultation with a socially and economically representative cross-section of affected men and women is essential for effective targeting, as is their participation in decision-making. A gender analysis of the situation of both men and women can help in developing interventions that better meet their different roles and needs and are mutually reinforcing in increasing the overall safety and resilience of the household and community. The creation of an enabling environment may also be required to support this work

According to the International Federation of Red Cross and Red Crescent (IFRC), women and girls, children, elderly, migrants, people with disabilities and with underlying conditions have experienced heightened vulnerability due to the flood and the ongoing COVID-19 pandemic in Sudan. Protection, Gender, and Inclusion (PGI) will be mainstreamed throughout the intervention to ensure communities dignity, access, participation, and safety. All sectors will meet the international Minimum Standards on Protection, Gender and Inclusion in Emergencies and be assisted through the integration of these by focal points at state level that will monitor and propose actions to assure them a) to undertake a series of in-house trainings and orientations to ensure the teams have an understanding of how protection can be approached at all levels; b) acknowledge that women, girls, men and boys with diverse ages, disabilities and backgrounds have very different needs, risk and coping strategies, the operation will pay particular attention to protection and inclusion of vulnerable groups and on gender and diversity analysis; c) gender roles will be considered when setting up distribution time and date as well as in

health and hygiene promotion activities.

Appropriateness of relief items

- a) Gender and culture-specific needs should be taken into consideration when designing relief packages. Women and men should be consulted on the contents of relief supplies to ensure they are suitable and to avoid costly waste, preferably as part of disaster preparedness planning for the pre-stocking of relief items. Women and older girls also have particular sanitary needs that should be taken into account. Relief packages need to contain supplies for menstrual blood absorption that are in line with what women would normally use (sanitary pads and clean strips of cloth) and should include underwear for women and girls. As women tend to be reluctant to approach men regarding their personal hygiene requirements and can be easily embarrassed or humiliated during the distribution of sanitary and undergarment supplies, it is generally preferable that males are not involved in their distribution.
- b) Similarly, pregnant, and lactating women have special needs for ensuring adequate milk production and for other crucial nutrients and vitamin supplements that can be incorporated into family or mother and baby assistance packages. Addressing health issues: Flood relief efforts need to pay attention to specific female health needs. Often, pregnant women have lacked access to obstetric care and have miscarried or delivered babies under unsanitary and unsafe conditions. The availability of female and male medical personnel is particularly important. This is especially true when cultural norms may not allow women to be examined by male physicians, and when women's mobility may be restricted.
- c) Ensuring the safety and security of those displaced by the floods is also a key priority. Displaced women and girls face heightened risks of unwanted and high-risk pregnancies and rape. Those affected by floods

also frequently face a higher exposure to contagious diseases including HIV/AIDS. Condoms, reproductive health kits and midwifery kits, along with reproductive health information are key post-disaster needs.

- d) Domestic violence and alcohol abuse prevention counselling should be incorporated into the provision of post-disaster psychosocial services whenever possible. Increased rates of alcoholism and alcohol-related violence are frequent in flood affected areas and assistance with related services. Men may also need counselling to help them cope with changes in gender roles, i.e. caring for young children after the loss of their spouse. Sports programmes for men and women may also be helpful in relieving tensions.

Ensuring appropriate safe shelter, human settlements and water and sanitation

- a) Shelter and human settlement planning needs to take into account the socio-cultural and economic needs and preferences of both men and women, as well as safety considerations. Following the Sudan floods, the threat of physical and sexual violence has increased. Ensuring the safety and security of those displaced by floods is also a key priority. Displaced women and girls face heightened risks of unwanted and high-risk pregnancies and rape. Those affected by the floods also face a higher exposure to contagious diseases including HIV/AIDS. Condoms, reproductive health kits and midwifery kits, along with reproductive health information are key post-disaster needs.
- b) The location and set-up of shelters can affect both the perceived and actual safety of those displaced by a disaster. Locating shelters close to the original home whenever feasible provides extra safety due to intimacy with the shelter's physical surroundings, in addition to the

broader benefits of facilitating earlier rebuilding and recovery. Encouraging communities to stay together in shelter areas has similar advantages: the community can be a source of strength and support and often maintains an internal policing system that can offer additional security. Furthermore, women are often in charge of collecting firewood and water, and are therefore particularly affected by the security of access routes to these resources. The spacing and design of shelters is important in ensuring adequate privacy for female members of households from neighbours or passers-by. Secure doors and adequate lighting can be important factors in safety. Cooking, bathing, and toilet arrangements also need to be adequate, safe, and culturally appropriate. This requires participation by both male and female beneficiaries in designing such facilities. If it is not possible to provide individual household sanitation facilities, then bathing areas and toilets are best segregated by sex. Female and male bathing areas should be placed at some distance from each other and near areas with adequate lighting. Whenever culturally necessary, women's bathing and toilet areas should also include a separate area for washing and drying menstruation cloths. Furthermore, kitchens should be adapted to local food preparation custom.

Housing, human settlements, and water and sanitation

It is vital that women and men from all social and economic groupings in the flood-affected communities actively participate in the design and location of new housing and communal infrastructure, such as water and sanitation facilities and community halls, as well as the repair of existing structures. Local participation in physical reconstruction should be encouraged, including the hiring of women, and providing them with training in construction-related skills. While it is advisable to proceed with sensitivity to

the local culture, many cases have been recorded where women have successfully launched new careers in non-traditional areas such as electrical fitting, masonry, and carpentry.

Re-establishing livelihoods

The roles women play in contributing to a household's food security or income, whether as family members or heads of the household, need to be understood, and livelihood recovery activities should be designed that meet their needs, in addition to those of the men in the household. This is especially the case when households were already poor, were particularly affected by the floods, or had their coping mechanisms badly eroded. One of the most important areas of post-disaster recovery programming for both men and women is the restoration of economic opportunities or the development of new livelihood opportunities to replace those that were lost. This can include diversifying household income sources to strengthen resilience to future hazards. However, recovery agendas do not always adequately recognize or appreciate the dynamics of the survival strategies of impoverished and marginalized rural or urban households. Women often play bigger roles in generating the household's means of making a living than is recognized by that planning recovery. This is particularly true when the household is headed by a woman or when male family members have migrated to find work elsewhere. Women's means-producing activities can include cultivating home vegetable gardens, playing key roles in crop and fish production and marketing, raising livestock, running small businesses such as selling snacks or making cakes and day labour. Livelihoods strategies have sometimes neglected to replace the assets necessary for women to resume their economic activities or have provided inappropriate assets based on assumptions about women's roles and needs. This may be due to prevailing perceptions of men as the family breadwinners, or possibly because men tend to possess more visibly productive assets than women. Women's

participation in livelihood schemes should be actively encouraged in addition to men. When the mobility of women or other groups is restricted, home-based work alternatives should be considered. Pregnant women and older or disabled persons also can be given lighter roles in reconstruction schemes, such as providing snacks or water to the labourers. The use of cash as an alternative or complement to commodity assistance is increasing in emergency responses. This includes cash grants, cash for work, providing cash through microfinance institutions, and vouchers for goods. Research has found that, under appropriate circumstances, cash-based programs can better meet people's needs than the distribution of commodities. Beneficiaries have used cash transfers for a variety of purposes: the purchase of food, kitchen utensils and clothes, the payment of debts and loans, school costs and health care, the purchase of livestock and agricultural inputs, and the purchase of tools and materials for rebuilding homes and businesses. Female household members, like males, can benefit greatly from such cash-based support and the programmes must be designed to ensure that they are not summarily excluded. Cash transfer schemes based on home ownership often overlook vulnerable people without land title, such as squatters, un-registered migrants, and female heads of household. Schemes focused on male heads of household also often miss the needs of female household members or heads. Vouchers or in-kind materials may be more appropriate in situations where women or other groups have restricted mobility for physical or socio-cultural reasons, for example a female-headed household in a strict cultural situation. Monitoring the impact of cash distributions also requires social and gender sensitivity, as decisions about how cash is spent and who makes those decisions, may create conflict within households.

Recovery Budget

TABLE 16 - 4: Budget proposals: Relief Items

#	Sector	Activity	Job description	No. of HH / Enterprises targeted	No. of Beneficiary	Daily wage rate / cost per HH / Beneficiary	Inputs required	Cost by Expense Head	Total Cost for 06 months [in SDG]
1	Reproductive health	Provision of reproductive health kits	Reproductive health information and provision of health kits	30,000 women and girls (6,000 per State for 06 States)	30,000 women and girls	SDG 200 per Beneficiary	Reproductive Health Kits (sanitary pads, panties)	Inputs 200*30,000 =SDG 6,000,000	6,000,000
2	Sanitation	Construction of sanitation facilities	Construction of sanitation female facilities	500 each state for 06 worst flood affected states	3,000 female sanitation facilities	SDG 10,000 for each sanitation facility	Tools, raw materials etc.	Inputs: 3,000*10,000 = SDG 30,000,000	30,000,000
3	Agriculture	Cash for Work in irrigated areas	Restoring Irrigation System	6,000 (1,000 per State for 06 States)	6,000 (one per female headed HH)	SDG 150 per female headed HH / Beneficiary	Tools and implements / Bricks / Cement etc.@ SDG 1,000 per female headed HH (Lumpsum)	Wages: 150*6,000 =SDG 900,000	900,000
Total recovery assistance budget for the above proposals (in Sudanese Pounds)									SDG 39,900,000
Total recovery assistance budget for the above proposals (in US Dollars)									USD 725,544

17. GOVERNANCE

SUMMARY

Sudan had been governed by nine constitutions since the independence in 1956. The protracted political instability had made it difficult for the various political parties and ethnic groups to agree on a permanent constitution. With the revolution in 2019, the Interim Constitution of 2005 was abolished. The legislation governing the transitional government and regulating the relationship between the different levels of Government are the Constitutional document of the transition period.

Decentralized Governance Regulation Law of 2020, and State local government laws. The Decentralized Governance Law of 2020 defined three levels of Government in Sudan, namely at the federal, state, and local level.

The Decentralized Governance Regulation Law of 2020 defined exclusive powers for the federal government and exclusive powers at the state level, in addition to joint powers that are exercised in coordination between the federal government and the states, as well as financial resources for each level.

The floods led to significant damages to government buildings located in rural areas and to a much lesser extent to government buildings located in urban areas where buildings are located in safer areas and constructed with stronger materials. The floods also affected the continuity of Government Services due to disruption on roads and electricity and economic losses in terms of reduction of local revenue and increased expenditure incurred on relief and recovery activities. The estimated cost of damages and losses for the Governance sector is SDG 2,824,149,920.

This assessment has identified the following recovery priorities:

1. Paving roads and maintaining main dirt roads and bridges to ensure the movement of citizens to government service centres, as well as workers' access to their work sites;
2. Horizontal expansion of communication networks and strengthening them to cover all parts of the country;
3. Reconstructing administrative units constructed with local materials and making sure that all government headquarters are constructed with fixed materials and far from torrential streams and river basins;
4. Local authorities have sufficient powers and resources to deal quickly with disasters;
5. Encouraging the private sector to engage in risk reduction projects;
6. Sponsoring civil society organizations and engaging them in disaster response work;
7. Provide the necessary government support by providing rebuilding materials (BBB) at reasonable prices;
8. Enacting legislations and laws to prevent housing in areas threatened by floods and torrents.

The assessment recognises the importance of the role of local governments in recovery and reconstruction and the need to augment capacity and technical expertise to support their role in the recovery process.

PRE-DISASTER AND SECTOR CONTEXT

The issuance of the constitutional document of the transition period after the 2019 revolution has disabled the Interim Constitution of 2005 and the constitutions state. However, the ruling laws of the local state remained in force and are now preparing for a new law for local government after it was passed a law to regulate governance relations decentralized during the transitional period as being. It is also preparing to hold a national conference on issues of governance and administration. Therefore, the legislation governing the transitional period and regulating the relationship between the levels of government defines the powers of each level of government resources:

- the constitutional document of the transition period
- Decentralized Governance Regulation Law of 2020
- State local government laws

The Decentralized Governance Law has defined three levels of government in Sudan, namely at the federal, state, and local level.

Finance & Funding

National governments focused on funding sources tended to rule since Sudan to self-governance report (1953) and increased attention to this in the post-independence stage to address the disparity in development between regions according to different formulas accompanied by developments in the legislation governing the relations of governance its different levels. The first of these formulas are brought about by the 1951 Law, which won the local level of financial resources ceded by the central government under the Tax Act of 1954 (herds tax and arable land and tithes tax).

This pattern in the distribution of resources and powers continued to prevail

until the year 1989 with the addition of some revenues from local commercial and agricultural activities to the localities, and with the adoption of Sudan to the federal government formula in the year 1991, the powers and resources were divided between the centre and the states that were established according to constitutional decrees, provided that the states later give up some of its resources for the localities (Constitutional Decree 12), then a subsequent constitutional decree (Qom 14) was issued regarding the division of resources into a triple division that includes local government.

After the signing of the peace agreement and the approval of the transitional constitution for the year 2005, which explicitly stated that no level may extend to other levels of government. However, it restricted the division in the areas of wealth, powers, and specializations between the central and state levels, and the constitution did not mention the level of local government despite reference to it. A level of government where the authority of its powers and resources was left to be determined by the state constitution, and it was considered that local government was a state affair, and under this transitional constitution the states issued state constitutions in which some resources and authorities were assigned to the local level without accompanying defining mechanisms to monitor and allocate these resources and ensuring their access to localities with the required transparency, especially state and central resources, in which state local government laws have defined the share of localities in percentages, which opened the door wide for the state level to invade local government resources and weaken its ability to fulfil its obligations in providing services and exercising the powers vested in it without resources. Sufficient and many states kept some of these local resources in return for bearing the cost of workers compensation (salaries) and implementing some for local projects and provide support to localities in emergency and disaster situations.

Division of Powers

The Decentralized Governance Regulation Law of 2020 defines exclusive powers for the federal government and exclusive powers at the state level, in addition to joint powers that are exercised in coordination between the federal government and the states, as well as financial resources for each level. Paragraph (14) of Table No. (B) preparedness for disaster response and its management, relief, and epidemic control, is a common competence between the federal and state levels. As for local government, in March, the powers and competencies defined by the Local Government Law within the scope of the powers granted to the state. Accordingly, the administrative structure through which specializations are exercised in the field of disaster response are as follows:

1. A national committee comprising the competent authorities of the Federal Government;
2. Commission jurisdictional and be formed by the governor under his chairmanship in addition to the operations room headed by the Ministry of Infrastructure;
3. Committee on the level of localities formed by the governor, headed by Executive Director of the local

Powers and terms of reference and membership of these committees is often determined by a federal decree. The localities allocate funds for coping with disasters, but they are insufficient and often depend on support from the state or the federal government.

TABLE 17 - 1: Administrative Baseline Data

	State	Capital	Area in km ²	Population	No of Localities	No of management units
1	Red Sea	Port Sudan	222,466	1,447,787	10	18
2	EL Gagera	Madani	24,098	4,926,555	8	43
3	South Darfur	Nyala	86,309	3,811,914	21	65
4	South Kordofan	Kadugli	79,088	1,055,503	17	70
5	Central Darfur	Zalingi	33,483	737,423	9	29
6	Kassala	Kassala City	54,066	2,438,806	11	25
7	River Nile	ELdamar	127,372	1,472,257	7	33
8	White Nile	Rabak	40,544	2,410,260	9	32
9	Blue Nile	Ad Damazin	42,278	1,080,742	7	18
10	Sennar	Singa	35,358	1,847,458	7	26
11	Gadaref	Al Gadaref	55,091	2,108,468	12	41
12	Eastern State	Dongola	365,602	913,533	7	21
13	North Darfur	El Fashir	297,593	2,296,068	18	61
14	North Kordofan	EL Obid	188,362	2,451,218	8	44
15	East Darfur	Ad Dean	45,071	1,408,276	9	32
16	Khartoum	Khartoum	21,198	7,687,584	7	116
17	West Darfur	El Junana	23,630	987,686	8	31
18	West Kordofan	El Fula	142,281	1,701,240	14	64
	TOTAL		1,883,890	40,782,742	189	769

TABLE 17 - 2: Self-revenue for States (2017-2018)

	State	2017			2018		
		Scheme	Executor	%	Scheme	Executor	%
1	Red Sea	499.35	619.36	124	724.1	952.86	76
2	EL Gagera	1,092.40	878.56	80	1,318.68	1,253.35	105
3	South Darfur	577.55	333.04	58	857	730.25	117
4	South Kordofan	320.88	190.25	59	405.06	292.93	138
5	Central Darfur	138.5	64.07	46	243.86	95.43	256
6	Kassala	623.62	544.24	87	773.83	654.99	118
7	River Nile	1,013.46	632.13	62	1,979.40	1,261.58	157
8	White Nile	536	415.64	78	675.35	661.58	102
9	Blue Nile	279.72	149.1	53	336.19	216.39	155
10	Sennar	561.72	416.22	74	933.27	739.46	126
11	Gadaref	970.42	702.95	72	1,257.42	947.84	133
12	Eastern State	360.55	436.08	121	830.92	479.23	173
13	North Darfur	382.57	234.54	61	454.49	428.97	106
14	North Kordofan	1,248.57	879.25	70	1,418.54	1,028.11	138
15	East Darfur	267	196	73	371.51	331.17	112
16	Khartoum	7,833.28	6,729.57	86	9,380.65	9,981.96	94
17	West Darfur	301.79	122.81	41	401.12	251.48	160
18	West Kordofan	446.1	367.66	82	508.31	582.73	87
	TOTAL	17,453.48	13,292.11	76	22,869.70	20,890.31	109

Labour Force

Workers in the country to Guanyin jurisdictional is subject to regulate their work, but they are paid salaries and in accordance with provisions of the decrees of federal and unified structure for salaries ranging from the seventeenth class to first class for a monthly salary of workers ranging from 4,400 pounds minimum grade (seventeenth grade) to 28,759 pounds degree higher (initial special

According to the wage structure for the year 2020.

Government workers are spread over the geographical spread of state power, especially with regard to basic health care services and basic education services, and these are mainly concentrated at the level of administrative units (773 units), some of which are in areas that lack paved roads and modern means of communication.

TABLE 17 - 3: Labour force by state

	State	2017	2018	Change (absolute)
1	Red Sea	17,893	19,521	1,628
2	EL Gagera	65,271	65,271	0
3	South Darfur	27,393	27,687	294
4	South Kordofan	17,797	19,195	1,398
5	Central Darfur	14,234	14,577	343
6	Kassala	26,463	25,928	-535
7	River Nile	28,823	28,887	64
8	White Nile	32,944	23,216	-9,728
9	Blue Nile	20,975	32,944	11,969
10	Sennar	22,393	25,677	3,284
11	Gadaref	25,970	26,906	936
12	Eastern State	25,740	25,531	-209
13	North Darfur	30,118	29,966	-152
14	North Kordofan	27,541	27,541	0
15	East Darfur	10,291	10,932	641
16	Khartoum	107,761	110,537	2,776
17	West Darfur	21,018	20,934	-84
18	West Kordofan	13,951	14,887	936
	TOTAL	536,576	550,137	13,561

POST-DISASTER EFFECTS FOR THE SECTOR

The impact of a flood disaster on the governance sector can be assessed in two main axes:

- **Urban areas:** These are the urban areas that are located on the banks of the Nile, its branches, and seasonal rivers, and in which the government offices are usually concentrated. In these areas, housing, electricity supply, and roads are affected by the flood, which affects the movement of the population on the one hand and the continuity of government services that depend on electricity on the other hand (Khartoum, Nile River and Northern states).
- **Rural areas:** It is the areas of agricultural and livestock production where the income of the population and the means of their livelihood are affected by the loss of crops and

where the FAO estimated in a rapid report to assess the effects of the floods in September 2020 that 2.2 million hectares of agricultural areas were damaged in 15 states of Sudan in particular. Mechanized cultivation areas in Gedaref, Blue Nile, and Sennar Kassala, and production losses were estimated at 1,044,942 tons of agricultural crops, and that affected a large number of farmers and their ability to provide for their needs, which forced them to borrow and sell production tools to prepare for the next season, as well as weaken seasonal agricultural employment opportunities. This had an impact on the gross domestic product of the states and the loss of estimated amounts of financial resources that were collected from these crops in the form of fees and taxes. Government services in these areas are mainly affected by the interruption of roads and the collapse of bridges that limit the movement of

citizens and government employees, and the state's ability to deliver humanitarian aid.

- In general, government buildings and assets were not directly affected, especially in urban areas, where buildings are located in locations far from the risk of flooding and constructed with cement materials. Some damage occurred in rural areas, especially government buildings constructed from local materials.

RECOVERY NEEDS AND STRATEGY

Recovery priorities

- Paving roads and maintaining main dirt roads and bridges to ensure the movement of citizens to government service centres, as well as workers' access to their work sites
- Horizontal expansion of communication networks and strengthening them to cover all parts of the country
- Reconstructing administrative units constructed with local materials and making sure that all government headquarters are constructed with fixed materials and far from torrential streams and river basins.
- Local authorities have sufficient powers and resources to deal quickly with

disasters

- Encouraging the private sector to engage in risk reduction projects
- Sponsoring civil society organizations and engaging them in disaster response work
- Provide the necessary government support by providing rebuilding materials (BBB) at reasonable prices
- Enacting legislations and laws to prevent housing in areas threatened by floods and torrents

Recommendations

1. Exemption of materials for rebuilding what was destroyed by the flood from customs and other government fees
2. Building an integrated system for the flow of information across the various levels of government
3. Unify government channels to deal with disasters
4. Adopting a development strategy to convert flood water into a useful natural and economic resource
5. Using modern technology in government dealings and enacting binding laws that are priorities

18. ENVIRONMENT

SUMMARY

The 2020 floods in Sudan were the worst recorded in the last 100 years. Continued rainfall and flooding caused an historical overflow of the River Nile and its tributaries, affecting all the States in Sudan, and causing devastating damage along riverbanks in the northern, central, and eastern parts of the country. The assessment for the environment sector is a joint exercise of the Government of Sudan which was led by the Federal Ministry of Environment and supported by UNDP with contributions from UNEP. This assessment looks at the impact of the 2020 flood on environmental assets and provides recovery measures to avoid further environmental degradation and re-establishment of ecosystem services.

Environmental issues are of particular importance in Sudan given that a large part of the population depend on natural resources for their livelihoods. Sudan is exposed to various environmental challenges such as desertification, land degradation, loss of biodiversity, and poor waste management which leads to water pollution. The recent devastating floods resulted in significant environmental damages, affecting riverine forests, agricultural land, biodiversity, thus impacting lives and livelihoods of local communities. The exceptional rainfall and prolonged flood period negatively impacted riverine forest through riverbank erosion along the main Nile and caused severe soil erosion in the watersheds of the Blue Nile and Atbara rivers and the main Nile. Soil erosion leads to fertility loss, deep gully formation and a large increase of sediment input to the river system, resulting in sedimentation problems downstream. Therefore, another important environmental damage caused by the 2020 floods is the exposed soil and silting of agricultural land, which affect natural water catchments. The floods have washed tremendous territory and

has brought gigantic amount of sand and sediment. This had a negative impact on water quality.

The recovery strategy must address the underlying problems of environmental degradation that exacerbated the impact of the floods. The Environment assessment team identified the following recovery measures:

- Conduct a 'comprehensive post-disaster environmental assessment' to determine site-specific solutions that are eco-friendly and based on a landscape and ecosystem approach;
- Riverbank rehabilitation through a mix of man-made and biological solutions, depending on risk levels. Where biological solutions are adopted, native vegetation should be used for riverine area protection and slope stabilization;
- Rehabilitation of degraded soils through ploughing of the soil surface to improve soil physical condition and break compacted layers and reclamation of soil salinity;
- Rehabilitation of rangelands through the distribution of seeds and creation of protected areas.

The recovery strategy for the environment sector for the next 3-5 years is estimated at USD 52 million.

PRE-DISASTER AND SECTOR CONTEXT

About 72 per cent of Sudan is desert and is sparsely populated. The land supports an agrarian economy and pockets of mining. The country's arable land extends to 90.7 million hectares (216 million feddan) of which only about 23.5 million hectares (56 million feddan) is under cultivation. Rain-fed agriculture is practiced on 12.4 million hectares (29.5 million feddan), while the area under

irrigation makes up only 3.9 per cent of the country's total area. Sorghum and millet are the major crops, while sugarcane, sesame, groundnut, and cotton are among the cash crops. About 25.6 per cent of Sudan's total land area is rangeland.

Forest in the Sudan contribute significantly to food security, economic growth, and poverty reduction as they provide many food and non-wood products, animal fodder and energy to local communities, representing an important source of revenue for the country.

Sudanese riverine forest landscapes are located along the banks of the Blue Nile, its tributaries and along the White Nile and other wetland bodies. They are characterized by multiple coexisting land uses, including a unique forest ecosystem covering a vast area with vital environmental and economic importance. They protect the Nile system and its watershed and soil against wind and water erosion, reduce water pollution, and provide habitats for wild animal species, migratory birds, and many aquatic organisms.

The riverine forests have an important biodiversity value since they host a wide range of fauna and animals, contributing to environmental conservation and livelihoods. The riverine forests are managed to conserve the Nile ecosystem and play a key role in stabilizing the Nile riverbanks from erosion and degradation, as well as having profound effects on water quality and the hydrology of the river, which sustains agricultural activities for local communities.

The most prominent environmental problems in Sudan are associated with desertification, land degradation and poor waste management including toxic chemicals. Biological damage includes tree removal, disturbance of species mix, disturbance of soil fauna and flora, destruction of soil seed bank, destruction of habitat for wildlife and reduction of rangeland area and usability. Sudan's

rich biodiversity continues to face many threats due to the harsh climate, deforestation and habitat fragmentation and weak conservation efforts. In addition, new emerging environmental challenges are created by gold mining which disrupts the soil, rendering it not suitable for any other land use. Chemical pollution by mercury, cyanide, and other heavy metals especially at the processing sites inside market complexes is widespread.

Severe soil erosion is going on in many parts of Sudan rendering a lot of land unproductive. Floods cause a different set of problems. Flooding accelerates land erosion, especially riverbank erosion particularly where the vegetation cover along the banks is removed. During a flood period, the Blue Nile and Atbara Rivers carry a lot of silt. Soil and debris are eroded from the Ethiopian highlands and carried into Sudan, causing siltation of reservoirs and irrigation canals. This reduces the storage capacity of reservoirs and the carrying capacity of irrigation canals and causes blockages in pumping systems. The erosion of riverbanks is another problem, especially along the main Nile north of Merowe where mature date palms and fruit trees are uprooted into the river. However, the partial regulation of flow downstream of Merowe dam has helped to limit riverbank erosion to some extent.

POST-DISASTER EFFECTS FOR THE SECTOR

The recent devastating floods inflicted significant environmental damages, affecting riverine forests, agricultural land, biodiversity, thus impacting lives and livelihoods of local communities. This is likely to continue if no sustainable and preventive measures are implemented. The exceptional rainfall and prolonged flood period negatively impacted riverine forests, causing severe riverbank erosion along the main Nile and severe soil erosion in the watersheds of the Blue Nile and Atbara rivers and the main Nile. Soil erosion leads to loss of arable land, deep gully formation and a large increase of sediment input to the river system,

TABLE 18 - 1: Labour force by state

Description of effect and location	Mild Effect	Moderate Effect	Severe effect
Riverbank erosion (along the main Nile)			x
Soil Erosion – (along the Blue Nile and Atbara rivers and the main Nile)			x
Biodiversity	x		
Silting of agricultural land		x	
Water Quality - Deposits of physical and chemical waste in the Nile.			x

leading to sedimentation problems more downstream. Another important environmental damage that flood caused is exposed soil and slitting up of agricultural land. The floods have washed tremendous territory and has brought gigantic amount of sand and sediment.

Table 18-1 presents a quick overview of the effects on the environment as a result of the flooding. Of most concern is the riverbank erosion which has occurred.

Riverbank Erosion

Bank erosion is a natural phenomenon of a river that could be complicated and aggravated by human practices and interventions. Bank erosion is the wearing away of the banks of a stream or a river. The rate of fluvial erosion is determined both by the force of the flowing water and the resistance of the bank material to erosion. In Sudan, the anthropogenic factors include brick making whereby the soil is excavated near the riverbank, cutting of trees and construction of buildings near the bank on the land used to be part of the river fold plain.

Riverbank erosion have serious impact on the livelihoods of communities living along the Nile and its tributaries. Coupled with bank erosion, there is also the phenomenon of riverbed degradation. The sediment deficit water released from dams such as Roseires Dam caused riverbed degradation downstream in Singa area.

The loss of arable land was 13.4 km²/year in the period 1985 to 1987, 9.8 km²/

year in the period 1987 to 1990 along the Atbara River as estimated by Hassan M. Fadul et al. (1999). According to Crosato et al. (2010), the irrigable land loss was estimated to range from 13 to 52 per cent. Besides the loss of this arable land, the Kerib land represents soil erosion is one of the main sediment sources of Atbara and Nile Rivers, where the eroded silt and clay materials end up in Sennar, Khashm ElGriba and Merowe and reducing their storage capacity. The Blue Nile is exhibiting active bank erosion at different locations. The most serious suffering areas are downstream of Roseires Dam, Singa to AlSuki,

Along the main Nile, a study by Salih and Mohammed (2008) indicated that about 15% of the bank length of the total studied area showed mild risk of bank erosion. The analysis revealed that about 30% of the total riverbank length surveyed exhibited moderate risk to erosion while 55% of the total riverbank length is classified as high risk. These rates increased during high floods. The annual rate of loss is more than 2 m/year of arable land. Riverbank erosion increased the internal and external emigration of the people because they lose the cultivable lands and their irrigation equipment. In a survey conducted in River Nile State, 481 feddan were lost to riverbank erosion, 2,660 date palm trees were lost with an estimated cost of US\$ 1,330,000 (Crosato et al 2010). There is also loss of aquatic and wildlife habitat and lowering of water quality. Studies on the problem of riverbank erosion should take on board the imminent impact of GERD.

Soil Erosion

Flooded soils create significant challenges for the environment. Most prominent is soil erosion. Severe soil erosion is experienced in the watersheds of the Blue and Atbara rivers and the main Nile caused by the flood. The resulted sediment causes sedimentation of dams' reservoirs, power houses, inlet channels of pumping stations and irrigation canals. Storage capacities of reservoirs are reduced due to sedimentation. During flooding soils are under water for days or weeks, causing oxygen depletion, or reducing conditions, which suffocate plant roots. Soil lost due to erosion can take with it valuable plant-available nutrients and organic matter. Flooding can also induce salinization of the soil. Soil erosion occurring in the upper catchment is mainly caused by deforestation practices. The results are local losses of arable land, deep gully formation and a large increase of sediment input to the river system, leading to sedimentation problems more downstream (Crosato et al 2010).

Biodiversity

Flooding is responsible for creating different site conditions and soil formations, preferred by different types of vegetation. Some crops like alfalfa, grown widely all over Sudan are very sensitive to flooding. Areas of alfalfa inundated by the recent flood in the state of Khartoum were completely destroyed. There is a correlation between the magnitude of flood and the quantity of biodiversity of the area. Flood causes animal as well as floral mortality. Some animals are sometime washed away by the current of the flood. Migration roots of animals are disrupted.

Also, rangelands which form an immense natural resource and the major source of feed for the national herd are affected by flooding. Species such *Sporobolus pungens* (Difra) and *Syperus spp* (Sedges) with high nutritive value disappear from the range while less value species such *Orobancha ramosa* (Broomrape) and *Tribulus terrestris* (Puncture vine) take over. Wildlife is highly linked to forests which provide

habitat, shelter, and food. Deforestation has several effects. Birds, animals, and creatures that depend on trees and plants for food or shelter lose their homes or starve to death. Survivors are forced to relocate and find a new dwelling.

Water quality

Water quality is of key importance to man and nature. Flooding tends to reduce water quality by introducing large amounts of eroded materials. Compounding the problem, large quantities of chemicals are flushed into the surface water by overland flows. Chemical loading and poor water quality can have long and short-term consequences. Point sources for pollution include lanterns collapsed by the flooding, inundated municipal and industrial sites, and disposal or holding areas. The largest non-point pollution source is runoff from agricultural land.

RECOVERY NEEDS AND STRATEGY

Environmental degradation is one of the fundamental causes of large-scale destruction, following the heavy rains of 2020. Therefore, the recovery strategy should address the underlying environmental issues, in addition to those environmental issues created by the disaster itself.

First, it will be essential to conduct a comprehensive post-disaster environmental impact assessment to study and document how environmental degradation has exacerbated the disaster, as well as the environmental damages caused by the disaster itself. This should include satellite image-based analysis of land use as well as field level studies on the impacts of the floods on biodiversity and assessment of water pollution and land contamination by chemicals. The studies should result in mitigation strategies. Approaches such as 'room for the river' should be the basis for addressing flood protection. Removal of sediments deposited as a result of floods should be based on site specific studies and suggestions by the experts.

Riverbank rehabilitation methods

Rigid protection measures should be limited to the most acute sections and in major cities along the rivers. Biological methods should be used in low and medium risk areas and a combination of physical structures (riprap) and bioengineering (the use of plants) methods in high risk areas. Biotechnical riverbank protection utilizes living plant materials

to reduce the erosive forces of water and increase soil's resistance to erosive forces and stabilize slopes. Plants can be used either as a primary structural component or in combination with inert materials such as rock and concrete. Recommended tree species include *Acacia nilotica*, *Acacia seyal*, *Tamarix aphylla*, *Sesbania sesban*, and *Mimosa pigra* besides the aquatic herbaceous *Salix safsaf*.

FIGURE 18 - 1: Trees recommended to be used for bank erosion control in Sudan: *Tamarix aphylla*, *Salix safsaf*, and *Mimosa pigra* (from left to right)



Erosion Rehabilitation strategy

Rehabilitation should start by classification of bank erosion according to severity as low, medium, or high risk. Low and medium erosion should be controlled by biological methods. High risk should be controlled by bioengineering methods. In major cities, the banks should be protected by engineering methods. Gabions are a low-cost method of flood protection. Building a flood control wall with gabions keeps the erosion protection systems cost down.

Rehabilitation of degraded soils

The area affected by the high flood erosion this year was estimated from satellite imageries. Damaged soils can recover naturally over a very long period of time. However, human intervention is needed in most cases. Suggested interventions for rehabilitation of soil include:

- Deep ploughing of the soil surface to improve soil physical condition and break compacted layers.
- Rehabilitation of soil fertility
- Reclamation of soil salinity.

Rehabilitation of rangelands

Rehabilitation strategy includes gathering and distribution of seeds, and creation of range enclosures.

Water quality reclamation strategy

Physical contamination of flood water is easier to reclaim than chemical and biological pollution. Flood water can be used to irrigate fields and for recharge of underground water.

Stagnant water is a great risk to health. Water-borne diseases usually outbreak after floods. Excess water needs to be

drained or directed towards low spots. Flood water can be directed to low spots which can be used to relief the river and this water can be used later. Water stored in the soil can be used in space irrigation agriculture.

Reclamation of chemically contaminated water is an expensive endeavour.

Wastewater treatment plants in Sudan are very few and not equipped to handle large volumes of water. The best strategy is to control the sources of water pollution by good management of physical and chemical waste away from the Nile.

TABLE 18 - 2: Short-, Medium and Long Term Recovery Needs for Environmental Restoration

N.	Measures	Short	Medium	Long	Cost (USD)
	Riverbank Rehabilitation				
1	Collection of tree seeds		x		500,000
2	Nursery			x	200,000
3	Planting		x		400,000
4	Rip Rap			x	300,000
5	Construction of engineering structures			x	5,000,000
	Rehabilitation of degraded soils				
6	Ploughing of the soil surface to improve soil physical condition		x	x	2,000,000
7	Rehabilitation of soil fertility	x	x		10,000,000
8	Salinity			x	3,000,000
	Rehabilitation of Rangelands				
9	Gathering of seeds		x	x	1,000,000
10	Distribution of seeds		x	x	2,000
11	Creation of protected areas			x	20,000,000
	Water Treatment				
12	Central/Reference Laboratory		x	x	3,000,000
13	Rehabilitation of existing wastewater treatment plants		x	x	2,000,000
14	Capacity building			x	500,000
15	Network of drainage system			x	5,000,000
	Total Recovery Needs				52,902,000

19. HUMAN IMPACT ASSESSMENT

OBJECTIVE AND KEY FINDINGS

Any disaster is first and foremost a human crisis. In the case of Sudan, many compounding stresses and shocks, including the macro-economic conditions causing unprecedented price inflation, protracted and new displacement from within and around the country, COVID-19 related containing measures, and on top of it, a nation-wide flood causing damages and epidemic outbreaks, have all contributed to severe human development setbacks. Although, it is difficult to attribute these impacts to any specific event, the experiences at the household and individual level are conditioned by their pre-existing vulnerabilities.

This chapter attempts to achieve three insights across the five key dimensions of human development - (1) multi-dimensional poverty (based on conditions of drinking water, sanitation, housing, energy access, asset ownership, health, and education), (2) income poverty (based on employment, livelihoods, savings and debt), (3) food insecurity, (4) gender inequality, and (5) social exclusion. It aims to:

1. understand the pre-existing vulnerabilities and the spatial inequalities across the 18 states to inform the recovery actions such that they are comprehensive, long-term, and address the entrenched vulnerabilities while also responding to the immediate needs;
2. estimate the impact on the people (mainly due to the floods) across the 18 states, using a primary household survey¹³⁰ documenting the before and after flood conditions, alongside the pre-existing baseline conditions and

estimates of flood-affected people in the areas (FAO & Transitional GoS, 2020);

3. comment on the overall impact this may have on the trajectory of achieving the Sustainable Development Goals pertaining to human development (SDG 1-10).

To achieve the first objective, this chapter develops a series of sub-indices for the five areas of human development vulnerabilities and inequalities across all states. This also offers a cumulative human development vulnerability index for the country as well as each of the states, to give a view of how the states are performing as compared to the others (see Figure 18 2). Comparing these indices suggests that:

- There exists a vast variation in human conditions across geography and the 18 states. Darfur and Kordofan states are amongst the most vulnerable in almost all dimensions, followed by Gedarif, Blue Nile and Kassala.
- In particular, East, Central, West, North and South Darfur are amongst the states with poorest living conditions and multi-dimensional poverty, which is also somewhat in line with the highest incidence of income poverty in these states as well as in West Kordofan.
- Food insecurity owing to economic vulnerability is proportionally the highest in West Darfur and the Red Sea, followed closely by Kassala, North Kordofan, White Nile, Blue Nile and South and West Kordofan (WFP, 2020a).
- Gender inequality is experienced at about similar levels across all states irrespective of the income and living

¹³⁰ A primary household survey was conducted between Nov – Dec 2020 (n=2,665 households) in 6 states. For the remaining states, estimates are drawn from previously conducted rapid field assessments by other partners, including FAO, HAC, UNOCHA, and the Inter-Agency Rapid Flood Assessments (August 2020), or national averages derived from the survey are used.

conditions, highlighting the need to address the deep-rooted socio-cultural challenges across the country.

- Social disparities are highest in the states of East Darfur, West Kordofan, South Darfur, South Kordofan, Khartoum, Blue Nile and Sinnar.

Besides, rural areas are more vulnerable across all the five metrics of human development as compared to their urban counterparts.

For the second objective, the following overall impacts are estimated across the five human development dimensions in the flood affected areas:

1. **Multidimensional poverty:** Living conditions of nearly 1.6 – 1.9 million households have been severely affected mainly because of widespread diseases triggered by damaged sanitation, contaminated drinking water, but also because of broken homes, loss of assets, and loss of education days. Some of the coping mechanisms employed by them are further worsening their safety, dignity, and privacy outcomes, especially for women. Being pushed to use shared facilities for toilets or shelter is also increasing their COVID-19 related exposure. Nearly 1.1 million households are experiencing homelessness or displacement, of which 790 thousand are temporarily relocated, and over 123.9 thousand have either already relocated or planning to relocate permanently in the near future.
2. **Income Poverty:** Incomes and savings of nearly 1.7 million households have been affected, of which the most impacted are the agriculturalists (634.9 thousand households), daily wage earners (607.3 thousand households), and people earning from micro-, small- or medium enterprises (374.6 thousand households). Considering most families have only a single earning family member, the effect of reduction in income, savings and increase in debt will be felt by the entire household of

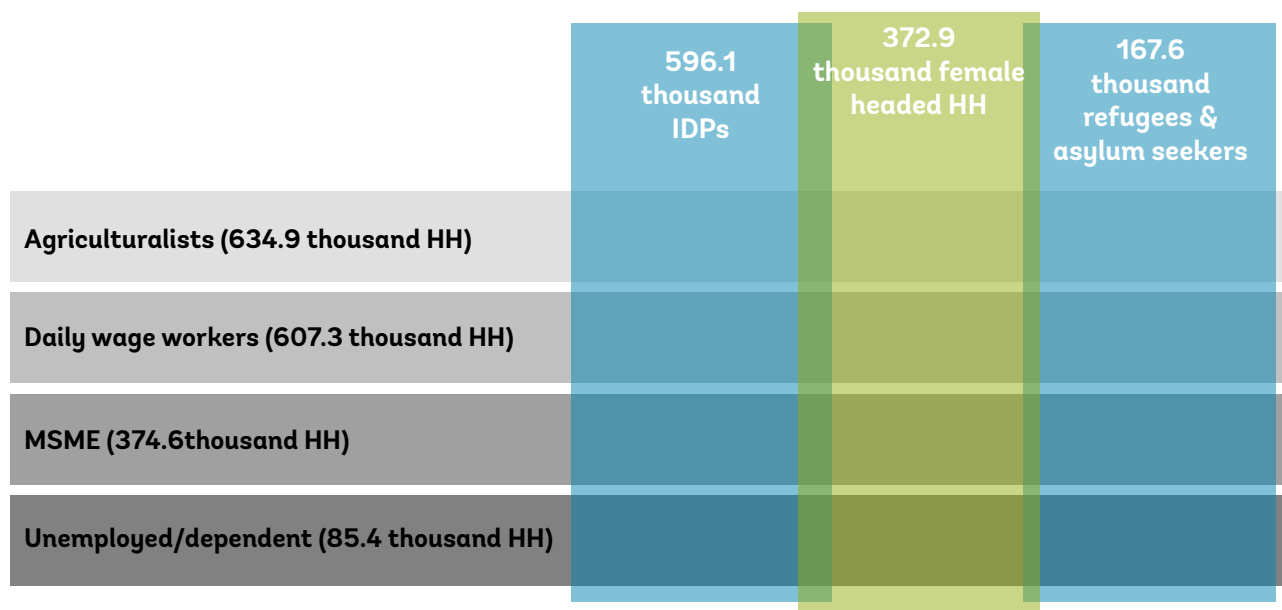
average size 5.4 people. In addition, people dependent on remittances or humanitarian aid (i.e., those who are unemployed or have only a seasonal income), although fewer in number (85.4 thousand households), but are the most severely affected for not having any savings or assets to rely on.

Of the ones affected, 596.1 thousand are IDPs, 167.6 thousand are refugees and asylum seekers, and 372.9 thousand are female headed households. See Figure 18 1 to understand the intersectionality of vulnerability across the different types of people facing income poverty challenges. There are 324.1 thousand households from the poorest quintile and 458.9 thousand households from the second to poorest quintile (both below the poverty line) living in the flood affected areas who will need immediate and long-term support through immediate humanitarian help and food/cash for work programmes. There are another 559.9 thousand households from the middle quintile who are although just above the poverty line, but with these cumulative stresses and shocks may be in the danger of falling below it (See Figure 3). They will also need to be supported through Employment Support Schemes and Skill Training workshops ¹³¹.

3. **Food insecurity:** Nearly 2.2 million households are food insecure in the flood affected areas owing to their economic vulnerability. Nearly 1.5 million of them are estimated to have borrowed money to get food for their families, worsening their debt and poverty outcomes further. Many are coping by skipping meals, rationing food portions, or changing dietary composition, all of which may affect the mid- to long-term malnutrition outcomes. These people need immediate assistance as food supply and/or cash vouchers (e.g., through the Sudan Family Support Program (SFSP)).

¹³¹ See Employment and Livelihoods Chapter for more details

FIGURE 19 - 1: Intersectionality of people affected by income poverty



4. Gender Inequality: About 2.9 million women are disproportionately affected among the population, who are facing loss of dignity and privacy after being forced to defecate in the open, safety issues while accessing toilets during the dark, increased burden of care-giving needs, and unhygienic menstrual conditions. Besides, it is expected that over 1 million women might face gender-based violence after these recent events, an increase of over 70% from before. 312.8 thousand female children might also end up dropping out of school because of conditions at home. Although, in that male children are even more likely to drop out than female children – about 450.6 thousand male children – with more burden on them for contributing economically to the family’s income. 626.9 thousand men might also shift to hazardous working conditions.

5. Social exclusion: IDPs, refugees and asylum seekers are among the most affected and excluded groups due to lack of integration within the society. They are more likely to be poor, than community members, have fewer assets (including land), live in camps with poor basic services

or shelter conditions, and many are mainly dependent on humanitarian assistance. Nearly 1.1 million of them have been severely affected, primarily due to damages faced in basic services (sanitation), and price inflations.

Children are another group affected disproportionately. About 770.1 thousand children may face severe physical or psychological aggression at home. Nearly 122.7 thousand children between the ages 1 to 3 risk the chance of missing vaccinations, and being exposed to otherwise preventable diseases in the long-term.

About 150.3 thousand people with special health needs (pregnant women, people with disabilities, or HIV) have also faced issues accessing health-care during and after floods, and need immediate support.

Overall, many of the development gains made over the past two decades may be in the danger of getting lost due to these compounded and cascading shocks and stresses. SDG4 on Education, SDG6 on water and sanitation, SDG8 on work and SDG9 on Infrastructure, had all made some progress over the past decades, but have been affected severely in 2020.

SDG2 on hunger, SDG3 on health, SDG5 on gender equality, SDG7 on energy and SDG10 on inequality were barely staying afloat, but with these shocks and stresses are likely to get a strong hit. But most critically, SDG1 on poverty was already showing worsening trends, and are likely to see many more people pushed into severe poverty and food insecurity. These areas need immediate attention through cash transfers, and cash and food for work programs to protect those already poor but also to prevent those just above from falling into poverty.

The following priority areas of action are recommended:

- Priority 1: Strengthen poverty alleviation & food security through cash grants and cash-for-work
- Priority 2: Improve living conditions by rebuilding sanitation and drinking water facilities
- Priority 3: Invest in building capacities of community members, organisations, and local governments to better understand and respond to future emergencies

CONTEXT OF HUMAN DEVELOPMENT IN SUDAN

While the political context in Sudan witnessed a historic shift in 2019, the human development context has been subject to a continuous and significant decline. Sudan's global ranking based on the Human Development Index has been steadily slipping down, from 147 in 2005 to 170 in 2020¹³². Years of conflict and natural hazard-driven displacements and inflation due to economic pressures have substantially increased the number of people living in destitution and those needing humanitarian assistance. This number has increased by 75% in the last 5 years - from 5.2 million people in 2015 to 9.3 million (23% of the population) in 2020

(FAO & Transitional GoS, 2020).

Sudan suffers regular epidemic outbreaks of three broad types, all of which are otherwise avoidable: water and sanitation-related diseases (e.g., cholera), vector-borne diseases (e.g., malaria and viral haemorrhagic fevers) and vaccine-preventable diseases (e.g., measles, polio, and diphtheria)¹³³. Many lives are lost to these epidemics, people face setbacks economically, physically, and psychologically, and these outbreaks leave the already strained health systems further stressed.

There have been marginal improvements in the incidence of stunting, wasting and underweight in children under five between 2014 and 2018, but the overall immunization coverage has suffered, when less than 26% children under one-year of age received full EPI coverage. The impacts of this are visible in the re-emergence of polio in recent months, which had otherwise been eradicated in the country by 2009.

Protracted and new displacement continues due to decades of conflict and environmental hazards, with approximately 1.86 million IDPs in addition to the over 1 million refugees hosted by the country. Also, limited institutional and financial capacities have constrained policy protections to alleviate poverty, provide diverse employment opportunities, reduce food insecurity, illiteracy, disease outbreaks, gender inequality, and social integration of the IDPs and refugees. All these conditions have had profound consequences on people's immediate physical and mental wellbeing; their living standards including access to services; their ability to live with dignity; and their long-term resilience (UNOCHA, 2020).

This chapter provides a baseline of the key human development vulnerabilities across the 18 states using 33 development indicators across 5 areas¹³⁴. The indices

¹³² (UNDP, 2020) <http://hdr.undp.org/en/countries/profiles/SDN>

¹³³ See the Health Sector Chapter for more details

¹³⁴ (1) Multi-dimensional poverty (based on conditions of drinking water, sanitation, housing, energy access, asset ownership, health, and education), (2) income poverty (based on employment and livelihoods), (3) food insecurity, (4) gender inequality, and (5) social exclusion. See the methodology at the end of this chapter for more details on the indicators, data sources and index computation.

developed are presented in Figure 18 2. Pre-existing conditions have been exacerbated by the impacts of the COVID-19 pandemic and the lockdown measures taken to prevent its spread, which have significantly decreased commodity movement, market functions, cross-border trade, and compromised livelihoods, daily labour opportunities, reducing household purchasing power and food access of the vulnerable population (Government of Sudan, 2020). In such a context, the nation-wide floods have had a compounding effect, which is having a disproportionate effect on the already vulnerable people and states more than others.

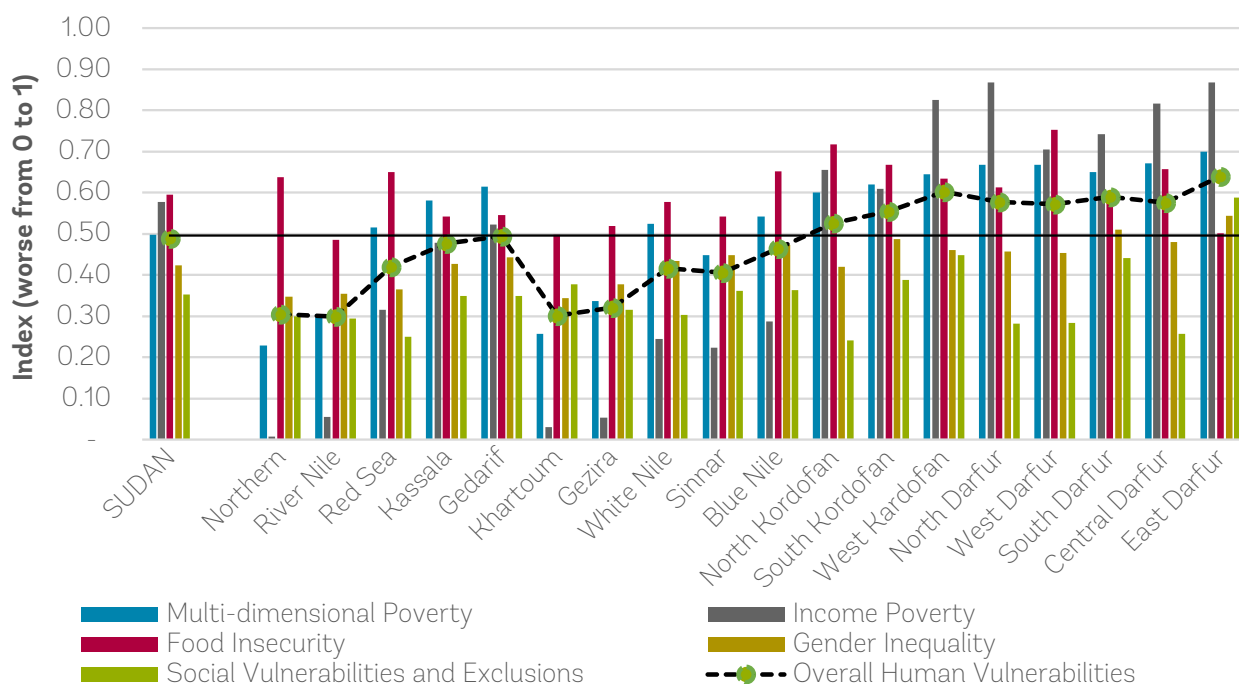
Living conditions and Multi-dimensional Poverty¹³⁵

Impacts due to affected drinking water
As per Sudan S3M II survey 2019, 17% of households (HH) used unimproved sources

of drinking water (unprotected well, *hafirs*, unfiltered surface water, etc.). This is a significant improvement from 31% of households (HH) as per MICS5 2014, of which 96% did not use any form of water treatment method. About 58% of all HH got their water away from the premises (32% of all HH had to walk over 30 mins), with the primary onus of fetching falling on women (38%) and children under 15 (23%) (UNICEF & CBS, 2014).

As per the inter-agency rapid flood assessments conducted in August 2020, many people faced challenges in accessing drinking water¹³⁶. People in Khartoum (Norwegian Refugee Council, 2020), mentioned the presence of a high ratio of salinity making the available borehole water non-potable, forcing HHs to pay for drinking water with the cost of 150 SDG/barrel. Besides, many households also faced challenges in accessing water temporarily owing to loss of jerry cans,

FIGURE 19 - 2: Human Development Vulnerabilities assessed using multiple indicators (see the methodology section at the end of this chapter for more details). The Y-axis denotes the relative index on the scale 0-1 in increasing order of vulnerabilities.



¹³⁵ This is complimentary to the sub-themes covered under the Human Development Index framework, but the assessment does not use the same indicators or methodology to arrive at a similar index, and therefore not comparable. This exercise only identifies the key vulnerabilities and potential impacts on various attributes of living conditions.

¹³⁶ HAC & UNOCHA Rapid Flood Assessment Reports August 2020

TABLE 19 - 1: Impacts due to affected drinking water

Key risks for most vulnerable social groups	Estimate number of impacted social groups in most affected geographies ¹³⁷
1.1. Drinking Water	
1.1.1. HH affected by worsened water quality (in terms of colour, taste, or other contamination) (this can have second-order implications on health and water-borne diseases discussed in the health section of this chapter)	1.31 million HH (Sinnar = 207.6 thousand, Khartoum = 202.8 thousand, River Nile = 186.5 thousand)
1.1.2. HH affected due to increased prices of drinking water (those who relied on tanker and bottled water earlier) (temporary impact but may result in coping mechanisms such as borrowing money and increasing debts that may have long-term implications)	485.5 thousand HH (Blue Nile = 141.7 thousand, Red Sea = 102.6 thousand, Khartoum = 75.1 thousand)
1.1.3. HH affected due to lack of physical access to drinking water (it may have been a temporary impact but has led to coping mechanisms such as reducing consumption of water, borrowed money, etc. which may have long-term implications)	1.699 million HH (Khartoum = 525.8 thousand, River Nile = 276.9 thousand, Sinnar = 263 thousand)

washing basins, and buckets. Those who were displaced from their homes and were staying with relatives, neighbours or at nearby schools, were able to access some drinking water during those days. Others complained about increased turbidity, caused by contamination, and may lead to water-borne diseases. As per the primary survey conducted¹³⁸, 54% of HH indicated facing water quality issues (taste, colour, or contamination), 20% faced price increase, and 70% faced issues accessing water.

Impacts due to affected sanitation and solid waste management

Even before the floods, less than 1% of households had access to a piped sewer system, while 40.1% used some form of decentralised sanitation (septic tank, ventilated improved pit latrine, etc.) (UNICEF & CBS, 2014). About 33% households practiced open defecation, 62% had access to unimproved sanitation facilities (pit latrine without a slab, bucket, etc.), and nearly 69% of households used shared sanitation facilities (public, community toilets) (Federal Ministry of Health, 2012).

As per the primary survey (qualitatively corroborated by the inter-agency rapid flood assessments in Aug 2020), 64% respondents raised the issue of damaged sanitation facilities, including those who previously had access to improved sanitation. This can have immediate and mid-term implications on water contamination related to disease outbreaks. Owing to poor solid waste management, 60% households experienced an increase in mosquitoes and bad smells, 46% experienced blocked drains, 41% experienced health and safety issues, and 33% faced blocked roads and access issues. 33% respondents indicated being forced to shift to open defecation, while another 48% respondents indicated shifting to shared sanitation facilities (mostly women while men shifted to open defecation), thereby potentially increasing their risks of contracting COVID-19. 10% of respondents also indicated rationing toilet times to either too early in the morning or late at night, with women, in particular, facing safety issues. 7% faced issues of access, 4% indicated having female family members who faced safety issues, and 3% indicated safety issues against animals (snakes, scorpions, etc.).

¹³⁷ Northern state is not included in this assessment due to lack of information available on the flood impact. West Kordofan, Central and East Darfur also have significant data gaps, and therefore are not as well represented here.

¹³⁸ A detailed primary survey was conducted between November and December 2020, in 6 states (Blue Nile, Gedarf, Khartoum, River Nile, Sinnar, and White Nile) covering 2665 households. See Annex of the Human Impact Assessment sector report for a the detailed sample description and overview of the methodology used for arriving at estimates.

TABLE 19 - 2: Impacts due to affected sanitation and solid waste management

Key risks for most vulnerable social groups	Estimate number of impacted social groups in most affected geographies ¹³⁹
1.2. Sanitation	
1.2.1. HH with toilets rendered dysfunctional (this may be a medium-term impact, with some repairs already made by people over time, but the second-order health and safety impacts maybe longer-term)	1.55 million HH (Khartoum = 548.3 thousand, River Nile = 242.994 thousand, Sinnar = 235.326 thousand)
1.2.2. Women who faced safety issues while accessing toilets	269.3 thousand women (Sinnar = 48.3 thousand, Khartoum = 43.5 thousand, West Darfur = 24.6 thousand)
1.2.3. No. of people faced safety issues due to animals (snakes, scorpions, etc.)	418.1 thousand people (Khartoum = 134.9 thousand, Blue Nile = 114.1 thousand, Sinnar = 39.9 thousand)
1.2.4. No. of people with increased danger from vector-borne diseases due to poor solid waste and sanitation issues	8.3 million people (Khartoum = 3.5 million, Sinnar = 1.2 million, West Darfur = 763 thousand, River Nile = 591.6 thousand)
1.2.5. No. of people forced to use open defecation	4.6 million people of which 2.2 million are women (Khartoum = 1.2 million, Blue Nile = 615.8 thousand, Sinnar = 559.1 thousand, Gezira = 442 thousand)
1.2.6. HH exposed to greater COVID-19 related exposure being forced to use neighbours / shared facilities	1.17 million HH (Khartoum = 450.7 thousand, River Nile = 237.4 thousand, Sinnar = 176.5 thousand, West Darfur = 127.2 thousand, Gezira = 107.2 thousand)
1.2.7. HH with potential water contamination and water-borne diseases (affected households using open defecation or decentralised sanitation systems more prone to damages during floods)	2.48 million HH (Khartoum = 745.447 thousand, Sinnar = 348.5 thousand, West Darfur = 271.8 thousand, River Nile = 267.4 thousand, Gezira = 201.7 thousand)
	
Image 1: Damaged Ventilated Improved Pit latrines (VIP) in one the houses in Um dawn ban, Khartoum as on 12 Aug 2020. Source: Norwegian Refugee Council	Image 2: Some parts of El Ferdous settlement in East Darfur after the floods as on 20 August 2020. Source: HAC & UNHCR Rapid Flood Assessment

¹³⁹ Note that although the % share of population using open defecation or decentralized systems of sanitation is higher in Gedarif, Red Sea, North and South Kordofan and Kassala, and the largest share HH availing piped sewer system who were not as badly affected is in Khartoum, but simply owing to an extremely large population is in Khartoum, the total number of households affected is much larger.



Impacts due to damaged housing, assets, and loss of energy access

As per Sudan MICS5 2014, over 28.8% of households did not own the housing they lived in (rented, provided by jobs, etc.); about 62.4% lived in a housing made of mud and sticks (e.g. Gottiya) [77% HH with rudimentary roofs or those made of natural material, and 66% HH with rudimentary/natural material walls], and 29.4% households had only one room for

the entire household (of average size 5.4 people). Nearly 59% of people used solid fuels for cooking. These households in the flood-affected regions are at the highest risk of facing household damages, or evictions due to inability to pay rent at a time of crisis.

Table 19-3 lays out the damages experienced by households across different states:

TABLE 19 - 3: Impacts due to damaged housing, assets, and loss of energy access

Key risks for most vulnerable social groups	Estimate number of impacted social groups in most affected geographies ¹⁴⁰
1.3. Housing, Assets and Energy	
1.3.1. HH with severe damages to their houses	1.38 million HH (Khartoum = 505.7 thousand, River Nile = 199.6 thousand, Sinnar = 191.5 thousand, West Darfur = 150.1 thousand)
1.3.2. HH that experienced permanent or temporary homelessness or displacement	1.01 million HH (Khartoum = 285.439 thousand, River Nile = 214.739 thousand, Sinnar = 162.6 thousand, West Darfur = 111.3 thousand)
1.3.3. HH with asset losses (potentially creating long-term implications for poverty)	970.9 thousand HH (Khartoum = 368.1 thousand, River Nile = 248.7 thousand, Sinnar = 134.7 thousand)
1.3.4. HH with affected access to cooking fuel (temporary impact but leading to coping strategies such as increased debts, food insecurity, etc. that may have long-term implications)	436.9 thousand HH (Khartoum = 210.3 thousand, River Nile = 124.3 thousand, Sinnar and West Darfur = 48 thousand each, Gezira = 40.2 thousand)
1.3.5. HH having rebuilt similarly vulnerable structures as before	1.5 million HH (Khartoum = 298.5 thousand, Sinnar = 228.5 thousand, West Darfur = 162.5 thousand)
1.3.6. HH at risk of losing housing due to lack of ability to pay rents	169.9 thousand HH (mostly in Khartoum)
1.3.7. HH at risk of losing housing due to losing jobs	35.4 thousand HH (West Darfur = 18.8 thousand, Sinnar = 12.1 thousand, Red Sea = 11.6 thousand)
1.3.8. HH living in overcrowded conditions (with implications for COVID-19)	724.4 thousand HH (Khartoum = 169 thousand, Sinnar = 118 thousand, West Darfur = 93.3 thousand)
	
Image 3: A completely destroyed IDP camp (Kass) in South Darfur. Photo Credit: OCHA & HAC field staff	Image 4: A severely damaged IDP house (Kass) in South Darfur. Photo Credit: OCHA & HAC field staff

¹⁴⁰ Northern state is not included in this assessment due to lack of information available on the flood impact. Kordofan and Darfur regions also have significant data gaps, and therefore are not as well represented here.

Impacts on health

Sudan has witnessed many disease outbreaks in the recent past, including malaria and haemorrhagic fevers after the floods last year. These outbreaks do not just stress the healthcare infrastructure but increase health care spending per capita: in 2017 it was nearly US\$ 100-199; where the out-of-pocket expenditure could be as high as 76%.¹⁴¹

43% of the total deaths of children below 5 were due to otherwise avoidable (infectious, water or vector-borne,¹⁴² communicable) diseases. 29% of children experience regular incidences of diarrhoea, with nearly 10% not being given ORS or any other recommended fluids. Further, there is a 3.7 times gap of equity in child survival between Northern state (the lowest U5MR of 30 deaths per 1,000 live births) and East Darfur (the highest under-five mortality rate of 111.7 deaths for 1,000 live births). Children living in poorest families are at double the risk of dying before their fifth birthday (U5MR of 84.2) in comparison to children from the richest household (U5MR of 39.4) (UNICEF & CBS, 2014).

With children missing vaccinations, there is an increased risk of spreading polio, measles and other diseases that are otherwise vaccine-preventable¹⁴³. There was an estimated 15% drop in the use of measles-containing-vaccines (MCVs) during the first quarter of 2020. Most activities planned in the Integrated Management of Childhood Illnesses (IMCI) plan were cancelled and there was a 65% decrease in measles vaccination coverage among children under five years of age. There was a new Polio outbreak reported in August after it was eradicated in 2009, and although WHO had plans to widespread polio vaccination, challenges were met due to areas becoming inaccessible during floods and lockdowns.

Also, 7% of the population was already at risk of malaria, with the highest malaria parasite prevalence found in Blue Nile, North and South Kordofan, and West Darfur (Federal Ministry of Health, 2012). With increased damages to sanitation facilities, increased open defecation, and other waste disposal issues, there is a high risk for people (even those not affected by floods directly) to be infected by vector-borne diseases, apart from water-borne diseases such as diarrhoea and cholera, and snakes and scorpion bites due to stagnant water.

The Inter-agency Rapid Flood Assessment in Aug 2020 also found that hospitals, such as Jabal Awliya in Khartoum, were found to be overcrowded with 250-300 visits per day. With few Primary Health Care facilities in rural areas, already with limited capacities, there was a lack of ambulance services for emergency cases and mother and childcare. They found there were significant gaps in Outpatient Therapeutic Programs (OTP) and Targeted Supplementary Feeding programs (TSFP) that provide malnutrition services for children (6-59 months). Additionally, they also found a need for breastfeeding spaces for lactating mothers and IYCF counselling.¹⁴⁴

With high fertility rates of 5.4, about 5% of the female population (between the ages 15-49)¹⁴⁵ are likely to be pregnant in any given month¹⁴⁶. With over 72% of child deliveries not happening at any health facility, and worsened living conditions at homes after the floods could pose an additional risk for those who have delivered or those expecting to deliver in the coming months. With neonatal mortality rates as high as 32%, there is a very real risk of that worsening in these conditions.

As per the primary survey, 52% households indicated experiencing water-borne

¹⁴¹ See Health chapter for more details

¹⁴² Open Data for Africa: <https://sudan.opendataforafrica.org/cxnktu/sudan-health-profile>

¹⁴³ <https://www.who.int/health-cluster/news-and-events/news/Multiple-emergencies-Sudan/en/>

¹⁴⁴ Inter-agency Assessment jointly led by Govt. of Sudan and OCHA in Aug 2020

¹⁴⁵ On average, women are found to be pregnant for nearly 5 out of 35 years (between ages 15-49).

¹⁴⁶ The primary sample survey reflects this estimation where 5% households surveyed indicated having pregnant family members.

TABLE 19 - 4: Impacts on health

Key risks for most vulnerable social groups	Estimate number of impacted social groups in most affected geographies
1.4. Health	
1.4.1. Households infected by malaria and other vector-borne diseases	1.9 million households (Khartoum = 616.9 thousand, Sinnar = 258.5 thousand, North Kordofan = 233.6 thousand, River Nile = 220.4 thousand, South Kordofan = 155.1 thousand)
1.4.2. Households affected by water-borne diseases (cholera, dysentery, skin infections, etc.)	1.3 million households (Khartoum = 421.4 thousand, Sinnar = 181.1 thousand, West Darfur = 137.6 thousand)
1.4.3. Households having family members with pre-existing health conditions facing (temporary) challenges in accessing health facilities	325.2 thousand households (Khartoum = 154.3 thousand, Sinnar, Blue Nile, and West Darfur = 35 thousand each, Gezira, and River Nile = 30 thousand each)
1.4.4. Households with family members with an increased incidence of mental trauma	422.6 thousand (Khartoum and River Nile = 160 thousand each, Sinnar = 56 thousand, West Darfur = 46 thousand, Gezira = 38.9 thousand)
1.4.5. Households where people with special conditions impacted (pregnant women, newborn children elderly, disabled, etc.)	150.3 thousand households (Blue Nile = 36 thousand, Khartoum = 33.8 thousand, Sinnar = 19 thousand)
1.4.6. In particular, people with HIV facing challenges in accessing regular medication	28.1 thousand people (Khartoum = 18.9 thousand, Blue Nile = 3900 people, Gezira = 2450 people)
1.4.7. Number of children (aged 2-3 years) at risk of missing their vaccination on time	122.8 thousand children (Sinnar = 21.4 thousand, Khartoum = 16.5 thousand, Red Sea & West Kordofan = 13.5 thousand each)
1.4.8. Households with women having faced gynaecological or female health issues	105.7 thousand households (Blue Nile = 32 thousand, Sinnar and River Nile = 17 thousand each)
1.4.9. Households with increased debt due to health expenditure faced following the floods	1.22 million households (Khartoum = 168.4 thousand, Sinnar = 188.1 thousand, West Darfur = 133.5 thousand)
1.4.10. Households with increased dependence on humanitarian assistance for health needs following the floods	580.2 thousand households (Khartoum = 312.3 thousand, River Nile = 135.625 thousand, Sinnar = 77 thousand)

diseases (cholera, digestive issues, skin issues, etc.) after the event, 78% indicated experiencing vector-borne diseases (malaria, etc.), 13% faced challenges accessing primary healthcare for pre-existing conditions, 17% reported experiencing mental trauma and stress, 6% households reported challenges faced by family members with special health conditions (pregnant women, newborn children, elderly, people with disabilities, etc.), and 4% households indicated having female family members who faced gynaecological or female health issues.

Impacts on education

Primary and secondary education enrolment has improved over the MDG period, yet it remains low. While 77.4 % of males of primary school age are enrolled, 75.5% female children of similar ages are enrolled for primary education. But as the

ages increase, overall education enrolment seems to drop, with male children marginally more excluded. Where 27.4% of male children of secondary education age level are enrolled, 29.4% of females are enrolled in education programmes. On average, nearly 13% of all children below 18 are not enrolled in education, with nearly 48% of children unenrolled in the state of Gedarif, and 29% in Blue Nile.

As per the primary survey conducted, 40% of households indicated having lost books and certificates, 15% indicated having lost other education-related assets (e.g., computers, etc.). 23% said they lost school days because of domestic reasons (such as help needed at home or health issues), whereas nearly 50% indicated a loss of education because of infrastructure issues (damaged school, roads, transport access, etc.).

TABLE 19 - 5: Impacts on education

Key risks for most vulnerable social groups	Estimate number of impacted social groups in most affected geographies
1.5. Education	
1.5.1. HH with children having lost education-related assets (books, certificates, or computers, etc.)	968.2 thousand HH (Khartoum = 353.7 thousand, River Nile = 248.7 thousand, Sinnar = 139.3 thousand)
1.5.2. HH with children having lost school days for needs at home and health issues (domestic issues)	560.2 thousand HH (Khartoum = 161.8 thousand, River Nile = 124.3 thousand, Sinnar = 97.8 thousand)
1.5.3. HH with children having lost school days due to affected access or school shutting down (infrastructure issues)	912.7 thousand HH (Khartoum = 393.7 thousand, Sinnar = 128 thousand, West Darfur = 99 thousand, Gezira = 83 thousand, River Nile = 73 thousand, Red Sea = 59 thousand)
1.5.4. Households with increased debt from borrowing for school fees	1.43 million HH (~ 59% HH)
1.5.5. Households with male child dropping out of school	265.1 thousand (~11% HH)
1.5.6. Households with a female child dropping out of school	183.9 thousand (~8% HH)

Impact on Income, Poverty and Livelihoods

46.5% of the population lived in poverty, and 7.76% lived in severe poverty. 1.27 million households belonged to the poorest wealth quintile, while 2.7 million households belonged to the second and middle quintiles (potentially at an increased risk of falling into poverty) (UNICEF & CBS, 2014). The proportion of poor people increases going further away from city centres (UN Sudan, UKAid, Government of Sudan, & World Bank, 2019). Of those unemployed, 50% had remained unemployed for over 12 months, indicating severe work shortages and/or unemployability levels (MHRDL, 2011).

Over 2.4 million people were employed in the informal sector, with no workplace protections, insurance, or social safety nets. Of these, 30% were employed in agriculture and allied activities, 23% in transport and storage – both activities severely hampered following the floods. Even those employed in the formal sector, only 12% had access to social security, 18% had access to health insurance,

15% had access to occupational safety measures (MHRDL, 2011).

As per the primary survey¹⁴⁸, the highest proportion of households affected were those involved in agriculture. 73% of the agriculturalist families lost working days during and post the event, nearly all of them reported a loss of transportation modes (bicycles, etc.), 25% reported a loss of work-related assets (equipment, machinery, etc.), 43% indicated a reduction in wages, 25% indicated decreased savings and 24% indicated increased debts. 36% of households indicated a loss of stored crops and seeds, while 31% indicated a loss of livestock.

Of those involved in daily wage work, 70% reported a loss of workdays, 39% saw reduction in wages, 18% reduction in savings, and 19% increased debts. Of those earning their income from micro, small or medium enterprises, 78% saw a loss in working days, 23% loss in work-related assets, 39% reduction in income, 21% indicated a reduction in savings, and 20% indicated increased debts.

¹⁴⁷ Northern state is not included in this assessment due to lack of information available on the flood impact. Kordofan and Darfur regions also have significant data gaps, and therefore are not as well represented here.

¹⁴⁸ The survey found an average of 1.3 earning members per family and an average family size of 5.4.

TABLE 19 - 6: Impacts experienced in livelihoods, income, and savings

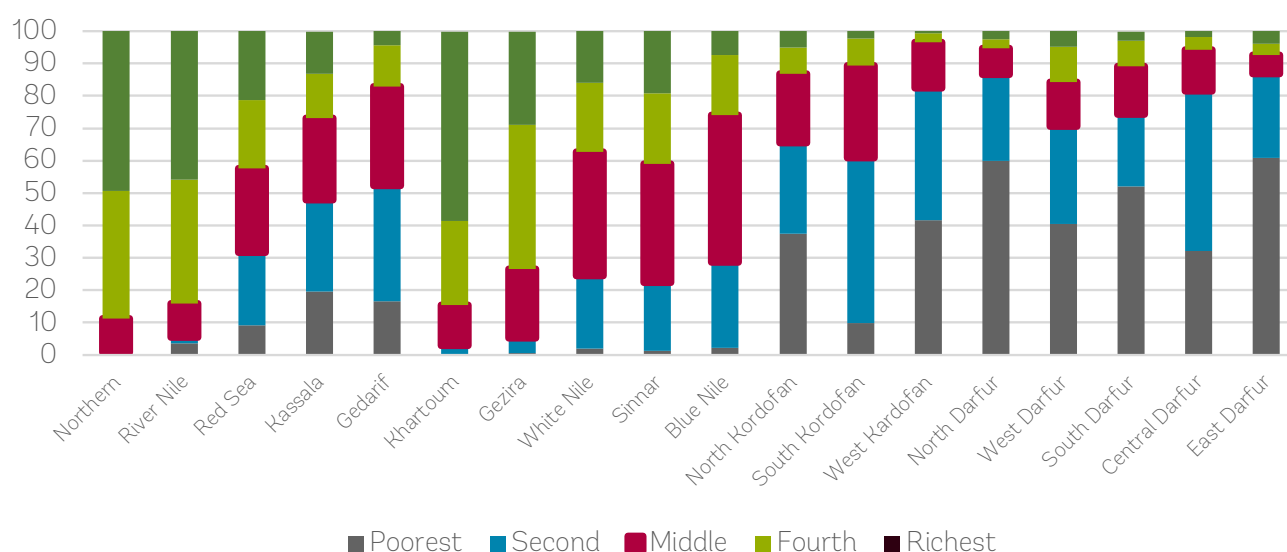
Key risks for most vulnerable social groups	Impacted numbers of social groups in most affected geographies ¹⁴⁹
2.0. Livelihoods and income poverty	
2.1. HH in the poorest quintile in the affected area having suffered the greatest shock (with direct implications on their food security, mental trauma, increased exposure to violence/crime, etc.)	324.1 thousand HH (West Darfur = 107.3 thousand, West Kordofan = 57.7 thousand, East Darfur = 25 thousand)
2.2. HH in the affected area just above the poorest quintile (although also below the poverty line) but likely to fall into severe poverty due to the shock	458.8 thousand HH (West Darfur = 79.5 thousand, Sinnar = 73.4 thousand, West Kordofan = 56.8 thousand)
2.3. HH in the affected area just above the poverty line but likely to fall into poverty after the series of shocks and inflation	558.9 thousand HH (Sinnar = 127.1 thousand, Khartoum and Blue Nile ~ 93 thousand each, West Darfur = 36.3 thousand)
2.4. Agriculture households affected (loss of working days, productive assets, reduction in income, decreased savings, increased debts)	634.9 thousand HH (West Darfur = 114.9 thousand, Sinnar = 58.3 thousand, Blue Nile = 57.4 thousand)
2.5. Cattle rearing households affected (loss of working days, productive assets, reduction in income, decreased savings, increased debts)	42.54 thousand HH (West Darfur = 8.3 thousand, Khartoum = 4.4 thousand, Sinnar = 4.1 thousand, Gezira = 3.7 thousand)
2.6. Households dependent on daily wage work affected (loss of working days, decrease in wages, decrease in savings, and increase in debts)	607.3 thousand HH (Khartoum = 401.8 thousand, River Nile = 117.5 thousand, Gezira = 71.9 thousand)
2.7. Households dependent on income generated from MSMEs affected (loss of working days, loss of assets, decrease in sales and earnings, decrease in savings, and increase in debts)	374.6 thousand HH (Khartoum = 75.9 thousand, Gezira = 41.4 thousand, Red Sea = 38.48 thousand, West Darfur = 28.1 thousand)
2.8. Households with no income source or those dependent on pensions, remittances, humanitarian assistance, or seasonal income affected (reduction in savings, increase in debts)	85.4 thousand HH (Khartoum = 19.3 thousand, West Darfur = 11.4 thousand, Gezira = 8.1 thousand)
2.9. Households with loss of crops and seeds	873.9 thousand HH (Khartoum = 232.9 thousand, River Nile = 152.6 thousand, Blue Nile = 131.659 HH)
2.10 Households with loss of livestock	752.5 thousand HH (Khartoum = 210.3 thousand, River Nile and Sinnar = 101 thousand each, West Darfur, and Blue Nile = 82 thousand each)

Another near-future impact that is expected due to lack of job opportunities such as casual agricultural labour, which are one of the most important sources of income for rural households. According to the FAO assessment, such jobs have already diminished, and are likely to reduce even further during the upcoming

harvest season. Consequently, a lack of job opportunities in areas such as farm labour and agri-food processing and marketing will have a significant impact on the livelihoods of many vulnerable women (FAO & Transitional GoS, 2020).

¹⁴⁹ The Northern state is not included in this assessment due to little information available on the flood impact in that region. West Kordofan, Central and East Darfur also have significant data gaps, and therefore are not as well represented here.

FIGURE 19 - 3: Proportion of households by wealth quintiles in 18 states. While the bottom two quintiles are already below the poverty line, those in the middle quintile are at a high risk of falling into poverty due to the recent shocks and stresses.



Impact on Food Insecurity

As per IPC (Oct-Dec 2020), over 7.1 million people were living with food insecurity (1.3 million in Phase 4 or emergency level, 5.8 million in Phase 3 or crisis level). Also, another 17.4 million were in Phase 2 or stress level (FSTS, WFP, FAO, FEWS, NET, & USAID, 2020). Besides, 90% of households were economically vulnerable, as they spent over 65% of their income on food (WFP, 2020a).

Malnutrition in mothers during pregnancy and early childhood is very high in Sudan hampering long-term development. Nearly 32.3% of children born have low birth weights; 33% of children under 5 remain underweight, 38.3% are stunted, and 16.3% of them are wasted.

As per Sudan MICS5 2014, 15.1% households relied on less preferred and less expensive food, 16.1% borrowed money to buy food, 6.4% relied on relatives, but most critically, 9.5% limited portion size, reduced number of meals in a day or had adults consume less for small children to eat, having long-term implications on food security.

To understand the urgency of the context, we also need to highlight the ongoing food price inflation and commodity movement restriction-based food availability issues, at the time of the floods. Although the primary survey focused on identifying implications due to the floods, it would be difficult to attribute the experiences at the household level purely to the floods. The effects reported here are likely the overall conditions of the people, and not merely because of the floods.

Access: The current economic situation in Sudan has resulted in steep price rises (Ministry of Agriculture and Natural Resources, WFP, FAO, FEWS NET, & USAID, 2020), with inflation nearly 270% in December 2020 as compared to same month last year. Much of it can be attributed to the devaluation of the Sudanese Pound over the same period (WFP, 2020d). This has had a considerable impact on households' food security. According to the WFP report, despite an increase in the casual labour daily-wage rate by 199% in December 2020 compared the same month of 2019, the high food commodity prices were still

stressing the purchasing power of the population, as the local food basket cost increased by 261% for the same period.¹⁵⁰ The report identified those dependent on informal transfers such as remittances, informal labour, agricultural wage labour as the main source of income among the most vulnerable group. The report also suggests that 54% of the resident households cannot afford to buy healthy meal daily without depleting their assets. For IDP and refugee households, the figure is around 75% (WFP, 2020a).

Main challenges for accessibility of food were lack of money and the high prices due to inflation. As per the primary survey, 84% of households indicated facing food price inflation and 36% indicated facing issues in accessing the markets. Physical access to markets was not affected to a great extent in Khartoum (as per HAC & OCHA Rapid Flood Assessment in August), although for the disabled and elderly, impassable roads posed challenges.

Availability: Availability of food commodities was also hampered following the COVID-19 related lockdowns and border closures. Although, these restrictions were lifted in October, which eased the conditions. Fuel shortages and the high cost of transportation continued reducing market supplies to affected remote areas and roads cut-off by flooding (FSTS et al., 2020). Although, the overall sorghum harvest is expected to be above average (nearly 4-5 million tonnes) in this harvest period¹⁵¹, high loss of food stocks in areas affected by floods will continue to contribute to reduced

supplies and high demand (FSTS et al., 2020). Expected delays in replanting caused by waterlogging in some areas could reduce the availability in some affected areas during November and December 2020 (FSTS et al., 2020).

As per the primary survey, 36% households indicated loss of stored crop and 31% indicated loss of livestock which may further exacerbate food availability. In addition, 27% had their stored food damaged, 36% indicated the unavailability of certain required food items, and 16% of households said special food needs of some family members (such as milk for children, etc.) were not available.

Utilisation: As per the primary survey, 69% of households said they changed dietary composition (e.g., increased carbs, reduced protein or vegetables) and 9% of households said that breastfed children were also affected since the mothers either did not have time, or sufficient food themselves to be able to feed.

The recent floods have exacerbated and intensified the food insecurity and malnutrition of already vulnerable populations and further put them at risk of falling into more severe phases of food insecurity – IPC Phase 4 (Emergency) and Phase 5 (Famine) – if no robust external support from resource partners is provided (FAO & Transitional GoS, 2020). Apart from increasing inflation, upcoming lean season and trade restrictions, WFP expects that around 2 million additional people are at risk of food insecurity due to COVID-19 across Sudan (WFP, 2020a).

¹⁵⁰ The highest cost of local food basket was recorded in North Kordofan (SDG 144.4) followed by Blue Nile (SDG 141.4), while the lowest cost recorded in West Darfur (SDG 95.9). (WFP, 2020c)

¹⁵¹ As per expert inputs received from WFP

TABLE 19 - 7: Impact on Food Insecurity

Key risks for most vulnerable social groups	Impacted numbers of social groups in most affected geographies ¹⁵²
3.0. Food Insecurity	
3.1. HH in flood affected areas at risk of falling into acute food insecurity owing to their economic vulnerabilities and increased food inflation	2.1 million HH ¹⁵³ (Khartoum = 647.5 thousand, Sinnar = 295 thousand, River Nile = 240 thousand, West Darfur = 219 thousand)
3.2. Households in affected areas facing food price inflation	2.01 million HH (Khartoum = 724.8 thousand, Sinnar = 253.7 thousand, River Nile = 226 thousand) [84% of the households surveyed in flood-affected areas indicated facing food price inflation]
3.3. Households affected by access to markets (temporary effect but the coping mechanisms employed may have long-term implications)	870.8 thousand (Khartoum = 300.9 thousand, River Nile and Sinnar = 111 thousand each, West Darfur = 95 thousand)
3.4. Households with stored food damaged (putting additional pressure on spending and savings)	644.9 thousand HH (Khartoum = 160.5 thousand, Sinnar = 114.9 thousand, River Nile = 107.4 thousand)
3.5. Households affected by the unavailability of certain needed food items	1.26 million HH (Khartoum = 400 thousand, Sinnar = 171.9 thousand, River Nile = 152 thousand)
3.6. No. of infants affected due to issues in breastfeeding	174.7 thousand infants (Khartoum = 34 thousand, Sinnar = 28 thousand, Blue Nile = 23.5 thousand)
3.7. Households employing dietary changes, having implications for nutrition intake	1.66 million HH (Khartoum, Sinnar, River Nile, West Darfur)
3.8. Households with adults practising food rationing, having implications for long-term malnutrition	1.65 million HH (Khartoum, River Nile, Sinnar, West Darfur)
3.9. Households with family members skipping meals, having implications on immediate health, immunity, and long-term malnutrition	1.7 million HH (Khartoum, River Nile, Sinnar, West Darfur)
3.10. Households with increased debt due to borrowing money for food supplies	1.5 million HH (Khartoum, River Nile, Sinnar, West Darfur)

Impact on Gender Equality

Women consist of only 27.7% of the labour force, with 69.2% females economically inactive in rural areas, and 73.9% in urban areas. 60.7% of the employed women are engaged in agriculture, forestry, fishing, and allied activities, some of the most affected sectors due to the floods. 12.1% are employed in education-related activities, also affected by COVID-19 restrictions (although may still be employed, but the stress and exposure may both be disproportionately higher). 33.1% of the youth are Not in Employment nor in Education or Training (NEET), where this rate is worse for female youth (46.7%) (UNICEF & CBS, 2014). Meanwhile, there was already a large gap in an average monthly income of females (295.93 SDG)

as against that of males (561.37 SDG), all indicating a prevalence of significant gender inequality in employment and income.

Women also face the brunt of many cultural phenomena. 21.2% of females between 15-19 years are married, 21.7% of married women between 15-49 years are in polygynous marriages, 21.5% of women (between ages 20-24) had adolescent childbirths, and most starkly, 87% of women in ages 15-49 had experienced some form of female genital mutilation. There was also a prevalence of domestic gender-based violence, with over 34% women between ages 15-49 have experienced some form of it at the hands of their husbands (UNICEF & CBS, 2014).

¹⁵² The Northern state is not included in this assessment due to little information available on the flood impact in that region. West Kordofan, Central and East Darfur also have significant data gaps, and therefore are not as well represented here.

¹⁵³ This estimate is only for people living in flood affected areas and not entire Sudan. As per the IPC by the FSTS, estimate for the entire country stands at 7.1 million people.

As per the primary survey, women were disproportionately affected than men on many fronts. 62% respondents said women in their families had to leave work to take care of the situation at home, and only 10% females were anticipating learning new skills to diversify their income in the future (as compared to 17% men). 38% said there was an increased pressure of care-giving on women than before. Most critically, 15% of respondents indicated facing gender-based violence at home after the floods, which was a 70% increase as compared to before.

Also, females faced special health and hygiene-related issues. 43% respondents indicated that women in their households had issues accessing safe hygienic-sanitary supplies during menstruation during the floods, 22% faced issues during the disposal of sanitary waste, and 18% said they faced issues accessing toilets multiple times a day. There were also some distinguishing impacts faced by female-headed households:

- Female-headed households were more likely (8%) to migrate than male-headed households (2%) in search of alternate livelihoods, although of those already displaced at the time of the survey, both male- and female-headed households constituted similar proportions.
- Female-headed households were significantly more likely to skip, reduce, or change their dietary intake (93%) as against the male-headed households (59%) after the shock. This could have disproportionate long-term implications for female-headed

households. As per previous estimates, households headed by females have a much higher prevalence of food insecurity with 44% of the female-headed households being food insecure, as opposed to 33% of the male-headed households (WFP, 2020a). As per a WFP report, female-headed households in North Darfur had the highest rate of food insecurity at 70% while the male-headed households in White Nile had the lowest rate at 21% (WFP, 2020b).

- 24% of female-headed households indicated the inability to participate in community-level decision-making than the overall sample proportion of 20%.
- As per previous studies, 16% of the female-headed households relied on informal transfers such as remittances, which is more than twice the prevalence observed in male-headed households (7.5%)(WFP, 2020b).

Meanwhile, this trend is reversed in education and migration. Although the ratio of male to female children attending primary school is comparable, fewer males attend secondary school as compared to females, with the increased responsibility of economic and domestic labour falling on male children. According to the survey, male children were more likely (11%) to drop out of school than female children (8%) post-floods, owing to an increased burden of earning on the male child even more. Of the respondents, 14% men anticipated migrating as compared to 5% women, and 9% of men changed work to more hazardous conditions, as compared to 3% of women who did so.

TABLE 19 - 8: Impact on Gender Equality

Key risks	Impacted numbers of social groups across Sudan
4.0. Gender equality	
4.1. Women leaving work due to increased needs at home	1.16 million women
4.2. Women with an increased burden of care-giving	2.6 million women
4.3. Women facing gender-based violence	1.1 million women (an increase of over 70% from before the events)
4.4. Women forced to defecate in the open after damaged toilets affecting their dignity, privacy, and safety	2.2 million women
4.4. Women facing menstrual hygiene-related issues (affecting their privacy, dignity, and health)	2.9 million women
4.5. Women facing safety issues	269.3 thousand women
4.5. HH with male children dropping out of school	265.1 thousand households
4.6. HH with female children dropping out of school	183.9 thousand households
4.8. Males shifting to hazardous working conditions	626.9 thousand men
4.9. Females shifting to hazardous working conditions	234.9 thousand women

Impacts on Social Inclusion

Nearly 2% of Sudan's population is that of refugees and asylum seekers (UNOCHA, 2020), and another 6.9% of internally displaced persons (Federal Ministry of Health, 2012). 44% of the refugee households and 54% of the IDP households in Sudan are food insecure (WFP, 2020b). These populations and other persons in need are increasingly unable to meet basic needs, thus remaining reliant on humanitarian assistance.

As per the primary household survey, 65% of the IDPs, refugees and asylum seekers,

faced drinking water quality issues, and 74% faced issues of accessing water; 88% faced issues with sanitation; 54% had faced damages to their housing; 32% lost household assets; 65% faced food price inflation, and 22% faced issues related to access to markets for food.

24.9% of children between ages 5-17 years, experience child labour, of which 17.8% were working in hazardous conditions (UNICEF & CBS, 2014). 63.9% of children between ages 1-14 experienced the use of physical or psychological punishment as a form of discipline (UNICEF & CBS, 2014).

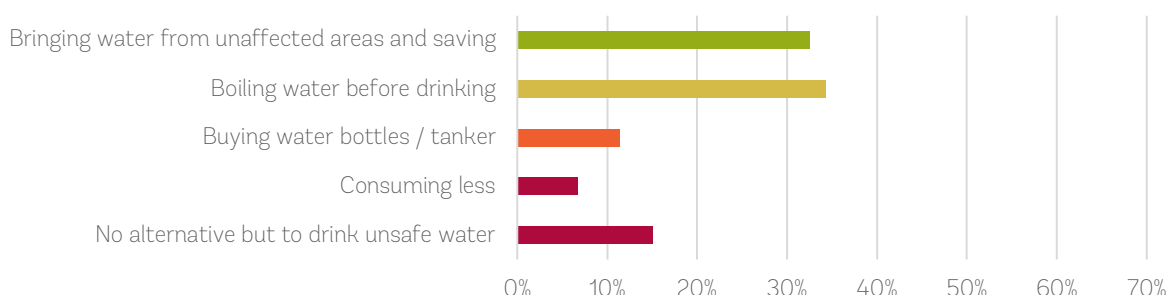
TABLE 19 - 9: Impacts on Social Inclusion

Key risks for the most vulnerable social groups	Impacted numbers of social groups
5.0. Social Exclusion	
5.1. IDPs/refugees/Asylum Seekers	
5.1.1. People affected by drinking water quality	800.6 thousand people
5.1.2. People affected by drinking water access	911.5 thousand people
5.1.3. People with affected sanitation facilities or access	1.1 million people
5.1.4. People with damaged housing	665.1 thousand people
5.1.5. People having lost household assets (implications for increased impoverishment in the long-term)	394.1 thousand people
5.1.6. People faced with food-price inflation	800.6 thousand people
5.1.7. People faced with market access	270.9 thousand people
5.2. Children below 3	
5.2.1. Children missing vaccinations	122.8 thousand children
5.3. Children below 18	
5.3.1. Children with an increased burden of household chores (fetching water etc.)	315.6 thousand children
5.3.2. Children facing severe physical or psychological punishment at home	770.1 thousand children below 14
5.4. Other special groups	
5.4.1. Households with people with special conditions (pregnant women, newborn children elderly, etc.) who faced difficulties due to the floods	150.3 thousand households
5.4.2. People with HIV facing challenges accessing regular medication during the floods	28.1 thousand people

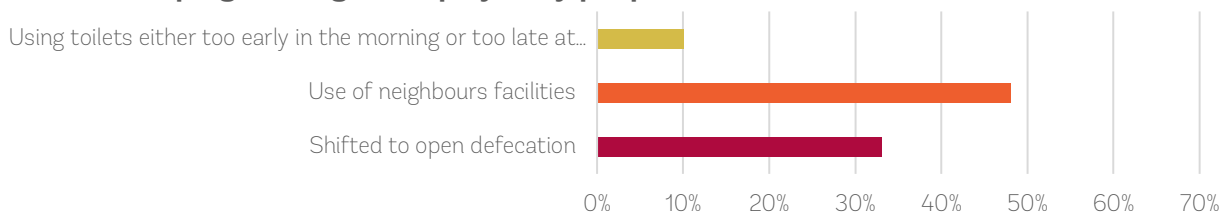
COPING STRATEGIES EMPLOYED BY PEOPLE, ASSISTANCE RECEIVED AND EXPRESSED NEEDS

People have employed various resources and strategies over the past few months to prevent further losses, adapt to the new conditions, and cope with the social and economic shocks and stresses. As per the various surveys, some are adaptive responses that could be strengthened further, there are others more maladaptive that may pose additional second-order impacts on people and are symptomatic of deep challenges being faced that must be addressed.

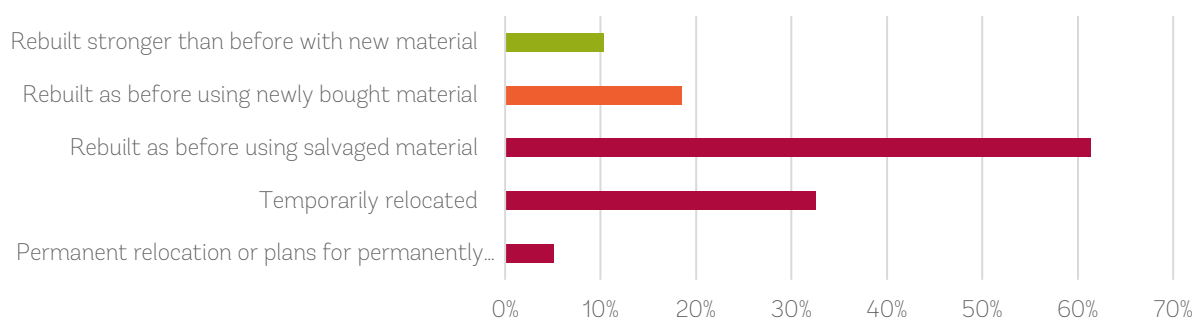
Coping Strategies employed by people with affected drinking water



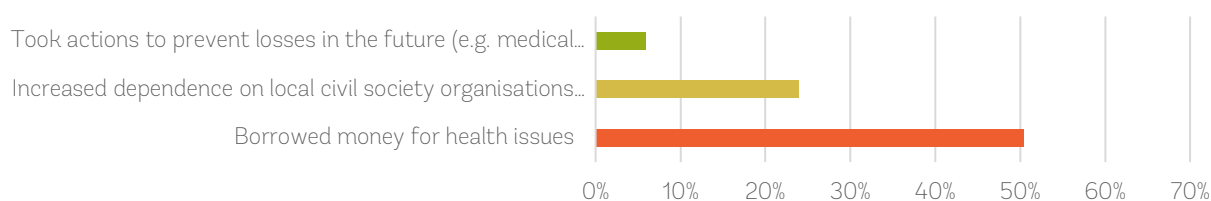
Coping strategies employed by people with affected sanitation



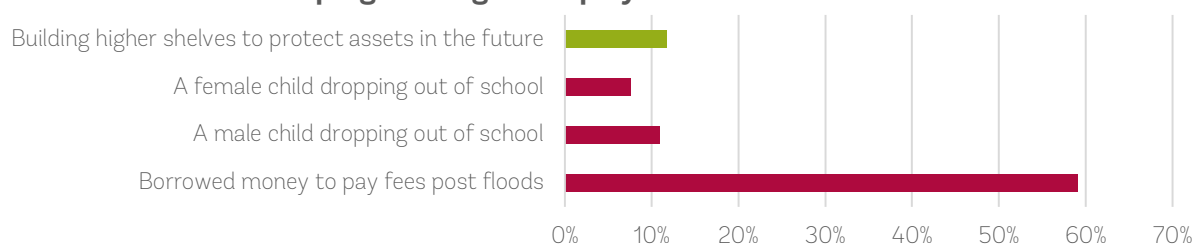
Coping strategies employed by people with damaged housing



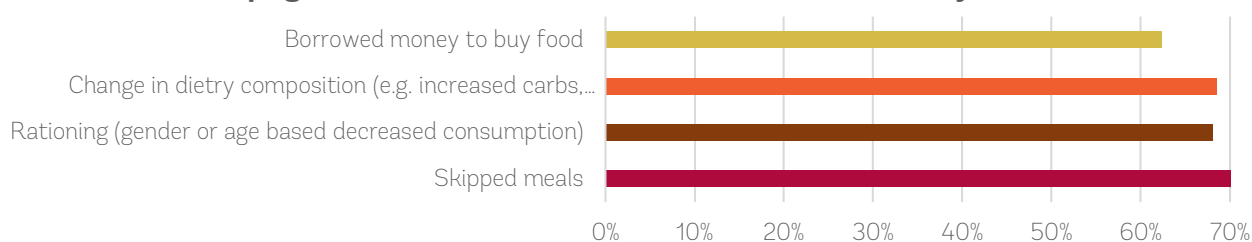
Coping strategies employed by people affected by health



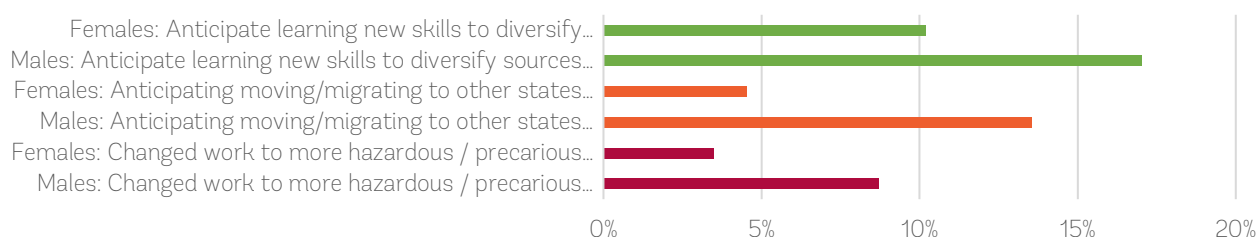
Coping strategies employed for education



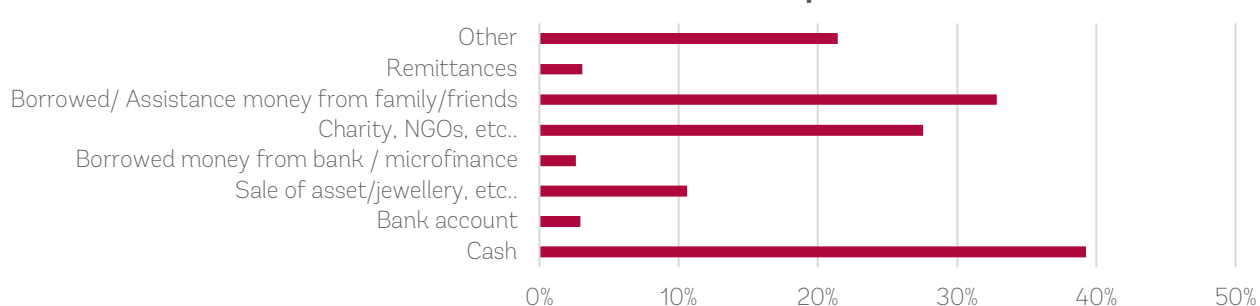
Coping mechanisms used to deal with food insecurity



Coping strategies employed (by gender) to deal with income and livelihoods

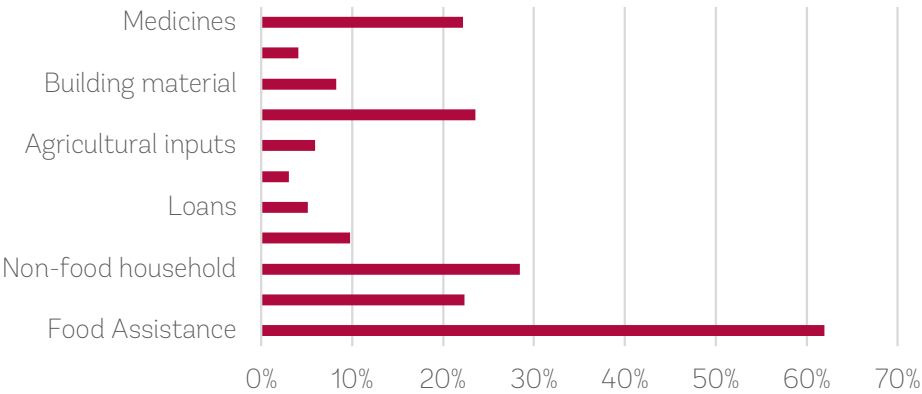


Sources of funds used to cope

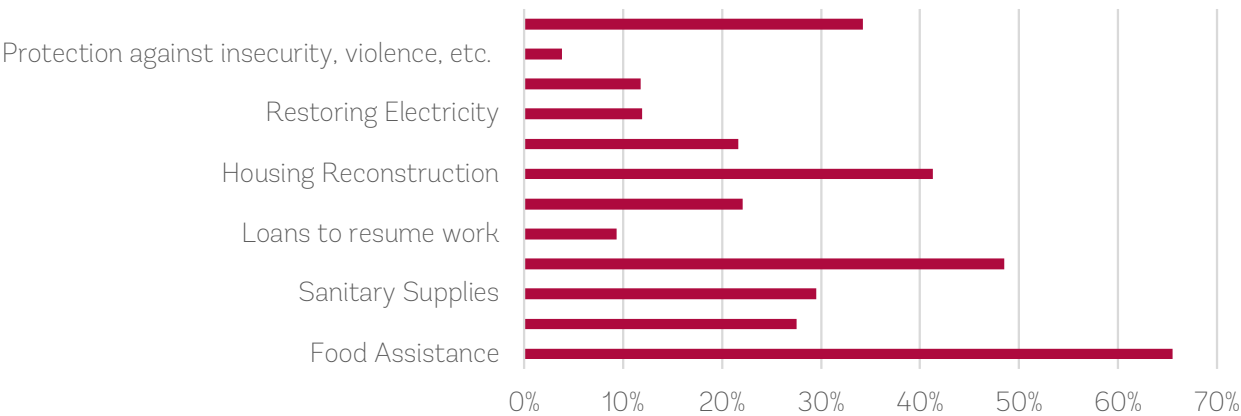


The following graphs indicate the assistance people had received until the survey, and the additional support requested by them (based on top 3 stated priorities):








Assistance received so far



Assistance requested (based on top 3 stated priorities)















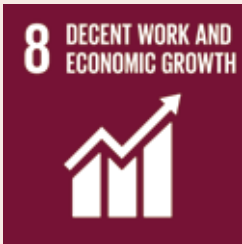








IMPLICATIONS FOR SUSTAINABLE DEVELOPMENT GOALS

SDG	Trend ¹⁵⁴ between 2008 - 2014 - 2018	Potential impact on the SDG achievement
	 <p>Limited data is available on the change in severe poverty since 2009 NBHS, but both international poverty rate and the lower-middle-income poverty rate has been increasing steadily in the past decade (World Bank, 2020), with more concentration of poverty away from urban centres and among IDPs and refugees (UN Sudan et al., 2019).</p>	 <p>With the multiple stresses and shocks, 458,825 poor households are in huge danger of falling into deep income poverty; 558,984 borderline-poor households at risk of falling into poverty, worsening the already grim conditions. Also, multi-dimensional poverty is going to worsen. Increased health burden has been affecting people's savings and debts, furthering impoverishment.</p>
	 <p>Although there has been a marginal improvement in food security over the years, the number of food-insecure people (in Phases 3 and 4) is still extremely high (Government of Sudan, 2020).</p>	 <p>Due to the food price inflation, there are 2.1 million economically vulnerable HH at the risk of falling into food insecurity. Overall, nearly 7.1 million people are living in Phase 3+ food insecurity (FSTS et al., 2020).</p>
	 <p>The MDG targets for child and maternal health were not achieved and it is still not on track for SDG targets¹⁵⁵. While there have been marginal improvements in stunting, wasting and underweight indicators for children under 5 and period prevalence of diarrhoea, but other indicators such as immunization coverage, re-emergence of polio, and prevalence of malaria and Acute Respiratory</p>	 <p>With severe damages to sanitation facilities during the floods, water clogging, and water contamination, the spread of both vector- and water-borne diseases is going to worsen. It has added additional stress on the health systems, causing vaccination delays leading to a recurrence of polio. People with preconditions, such as HIV, have also been severely affected both during the floods. Changes in food intake are also likely to increase malnutrition-related health issues.</p>

¹⁵⁴ 2008 based on Census Bureau of Statistics, Sudan; 2014 based on Sudan MICS5 Survey; and 2018 based on S3M Survey by the Federal Ministry of Health Sudan

¹⁵⁵ See Health Sector Chapter for more details

SDG	Trend ¹⁵⁴ between 2008 - 2014 - 2018	Potential impact on the SDG achievement
	 <p>Improvements have been made in education coverage at the pre-primary and primary level, although there are vast inequities between urban and rural areas, as well as by gender where male children are at a greater disadvantage than females potentially owing to early engagement with economic activities.</p>	 <p>While 23% of households have faced a loss of education days because of domestic issues, nearly 50% of households have faced education losses due to affected infrastructure (school closure, transport interruptions, etc.) These may be temporary challenges, but due to other financial stresses, nearly 20% of households may resort to children dropping out of school entirely, with particular impacts on male children</p>
	 <p>Although there have been steady improvements made in education and health indicators for women, their labour force participation continues to remain low, and prevalence of other cultural inequities such as female genital mutilation, early and polygamous marriages, adolescent childbirth, and gender-based domestic violence is still very high.</p>	 <p>Labour force participation, albeit already low, is likely to worsen with additional caregiving requirements imposed on the women. Gender-based violence has increased by nearly 70% from before the floods, for about 15% of women facing this challenge now. Due to fewer opportunities to migrate, women tend to migrate less and improve their income generation alternatives. Meanwhile, male children are under greater stress to contribute to household income and are dropping out of education earlier or during instances of shocks.</p>
	 <p>Although there were few, but some improvements had been achieved during the MDG period is improving access to water and sanitation. This access to clean drinking water and safe and hygienic sanitation was limited to mainly urban areas, and even there to those amongst the highest wealth quintiles.</p>	 <p>Widespread damage to the unimproved sanitation facilities has forced 4.6 million towards open defecation, and causing second-order issues of drinking water contamination and vector and water-borne diseases. This will have a long-lasting impact on the overall development of all the regions, and requires immediate attention on priority.</p>

SDG	Trend ¹⁵⁴ between 2008 - 2014 - 2018	Potential impact on the SDG achievement
	 <p>The majority of households rely on solid fuels for cooking and have no electricity connection. Only 5% use decentralised systems (solar, battery, etc.)</p>	 <p>436.9 thousand households were temporarily affected by lack of access to cooking fuels, but are likely to resort back to their older ways. There is an opportunity to improve the source and spread of energy access.</p>
	 <p>Due to many innovative programs, such as food for work, agricultural subsidies, income, and employment had made some improvements over the past decade. Although, most people being dependent on agriculture, the overall economy is much less diverse and more prone to environmental and macro-economic shocks.</p>	 <p>Nearly 70-80% of all people, working in agriculture, animal rearing, daily wage work, small and medium enterprises, or seasonal work, lost several days of work and faced a reduction in income, savings, and increased debts.</p>
	 <p>School, health and road infrastructure had made some improvements over the last two decades, including during the MDG period.</p>	 <p>Many of these infrastructure have suffered physical damages after the floods, and may push back the gains made over the past decades.</p>
	 <p>Although on a decline, deep inequality persists between urban & rural areas, between states, people of different gender, amongst IDPs and refugees, and people engaged in different forms of employment (formal/informal)</p>	 <p>Existing inequalities will have disproportionate implications on people and regions, especially for those living in underserved rural areas. This will require focused attention for a long period to reduce the existing inequalities.</p>

RECOMMENDATIONS

Government, humanitarian actors, and other civil society organisations have been working together to limit the impacts of concurrent emergencies, the limited resources have curtailed them from addressing the root causes of increasing displacement, worsening of health and physical and mental well-being for the most vulnerable populations. Resources need to be directed urgently to help the poorest of the poor, the most food-insecure people, and provide for the necessities like shelter, sanitation and

drinking water to ensure human dignity and rights. However, it is also pertinent to ensure that the flood impacts do not cascade into further disease outbreaks and displacements. While addressing these immediate and mid-term needs, it is also necessary to ensure that some focused actions are taken that help prevents such losses for the people soon by investing in sustainable and durable solutions that can help build resilience and capacities. The following three priority areas are, therefore, recommended to also remain in line with the Sudan HRP 2020 Strategic Objectives¹⁵⁶:

Priority 1: Strengthen poverty alleviation and food security through cash grants and cash-for-work

Target groups	<p>324,035 severely poor households (HHs); 458,825 poor HHs in the danger of falling into severe poverty; 558,984 borderline-poor HHs at risk of falling into poverty. Overall, there are 2.2 million HHs at risk of falling into food insecurity owing to their economic vulnerability (already paying over 65% of their incomes on food) that need to be protected immediately (FSTS et al., 2020; WFP, 2020a).</p> <p>Amongst these, 634.9 thousand households are dependent on agriculture, 607.3 thousand households are daily wage workers with no social protections, and 374.6 thousand households are dependent on their earnings from micro-, small- or medium enterprises. In addition, people dependent on remittances or humanitarian aid (i.e., those who are unemployed or have only a seasonal income), although fewer in number (85.4 thousand households), but are the most severely affected.</p> <p>Of these, 596.1 thousand are IDPs, 167.6 thousand are refugees and asylum seekers, and 372.9 thousand are female headed households.</p> <p>It is also recommended to refer to the upcoming WFP Comprehensive Food Security & Vulnerability Analysis (CFSVA) and Integrated Food Security Phase Classification (IPC) reports to more accurately capture the food insecurity situation as it unfolds over time.</p>
How	<p>In addition to the food and in-kind assistances being provided by different agencies, the following activities could be expanded:</p> <ul style="list-style-type: none"> • Provide immediate monthly cash transfers (for at least next 3 to 6 months) by expanding the current pilot under the Sudan Family Support Programme to other priority regions (and potentially increasing the disbursement amount from \$5 to \$10-12). It is also recommended to have a similar program aimed at the refugees in the group (at present SFSP only covers Sudanese citizens registered in the National Civil Registry). • Initiate cash-for-work minimum wage guarantee programmes, especially aimed at the unemployed youth, women, and IDPs without property ownership. • Expand food vouchers and food subsidies to support families to sustain themselves during food price inflation.
When	Immediately
Where	<p>Phase 1 - West Darfur, West Kordofan, East Darfur, Khartoum, Sinnar, River Nile</p> <p>Phase 2 - Central Darfur, Red Sea, Central Darfur, Gezira</p>

¹⁵⁶ (UNOCHA, 2020) (1) Provide timely multi-sectoral life-saving assistance to crisis affected people to reduce mortality and morbidity; (2) Contribute to building resilience to recurrent shocks and improving vulnerable people's access to basic services; (3) Enhance the prevention and mitigation of protection risks and respond to protection needs through quality and principled humanitarian action

Key partners for delivery	Led by the Ministry of Labour and Social Development in partnership with WFP, World Bank, FAO, UNHCR and key civil society organisations. Involvement of the local private sector agencies can also be promoted, esp. in the cash-for-work programs.
Expected costs	220 million USD (~100 USD per poor household via different schemes)
Expected outcomes	<ul style="list-style-type: none"> • Immediately provide safety support to the most food insecure and poor people and avoid the chances of increased displacement, crime, and violence. • Help with debt relief and support a variety of need-based non-food expenditures (health, education, livelihood investments such as buying seeds, livestock, etc.) (FAO & Transitional GoS, 2020)

Priority 2: Improve living conditions by rebuilding sanitation and drinking water facilities

Target people	Overall, 1.6 million households are facing challenges of broken toilets, and a wider population is at an increased risk of contaminated drinking water, water- and vector-borne diseases, apart from them facing issues of privacy, dignity, safety, and greater exposure to COVID-19.
How	<p>Apart from the shelter reconstruction, vector control activities, and strengthening of the health care facilities and capacities through mobile clinics, there is an urgent need to address the root causes of disease outbreaks by investing in WASH:</p> <ul style="list-style-type: none"> • Invest in a program for rebuilding toilets with safe disposal of waste (aligned with the cash-for-work program in Priority 1) • Rehabilitation and protection of water harvesting structures (aligned with the cash-for-work program in Priority 1) • Invest in awareness programs to improve uptake of water filtration methods and cultural/behavioural issues related to WASH.
When	Immediate to long-term phased approach
Where	<p>Phase 1 (smaller numbers but a higher proportion of people with poor sanitation): West Kordofan, Kassala, North Kordofan, Gedarif, South Darfur, North Darfur</p> <p>Phase 2 (higher numbers): East Darfur, West Darfur, Khartoum, Sinnar, River Nile, Gezira</p>
Key partners for delivery	Led by the Ministry of Infrastructure and/or Ministry of Water Resources, Irrigation and Electricity Drinking Water & Sanitation Unit in close partnership with Africa Development Bank, UNHCR, WHO, IOM, IFRC, REACH, and NRC. The involvement of the already established local resistance/protection committees ¹⁵⁷ and community leaders can also help improve the behavioural and uptake aspects of WASH.
Expected costs	445 million USD (assuming 278 USD per toilet) ¹⁵⁸
Expected Outcomes	<p>While there are sound health policies in place, the social sectors have remained dramatically underfunded. Resulting in poor WASH conditions expose people to repeated outbreaks of cholera, malaria, and haemorrhagic fevers, all of which contribute to avoidable deaths and increased financial, physical, and mental stress on already poor families. This also pushes the deeply stressed health system near a breaking point.</p> <ul style="list-style-type: none"> • Investments in WASH can lead to significant savings per households (who at the moment spend over US\$100-199 per capita annually, with over 76% out of pocket expenditure)¹⁵⁹ • Alleviate the chances of future disease outbreaks and save lives lost. • Improve safety, privacy, and dignity outcomes, especially for the women. • Reduce the burden on the health system, which can then focus on other health aspects (such as expanding immunisation, etc.)

¹⁵⁷ HAC & OCHA Rapid Flood Assessments Aug 2020

¹⁵⁸ <https://www.rescue.org/sites/default/files/document/956/latrinesdesignedbrieffinal.pdf>

¹⁵⁹ See Health Sector Chapter for more details

Priority 3: Invest in building capacities of community members, organisations, and local governments to better understand and respond to future emergencies

Target people	Ensuring the interests of the most vulnerable and excluded groups including the refugees, IDPs, females, children, youth, people with disabilities, and the elderly.
How	<ul style="list-style-type: none"> • Strengthening “durable solutions” that can help integrate the IDPs and refugee groups within the host communities better • Provide technical support for improved cropping and breeding practices, improvement of the value chain, marketing and added value of agricultural produce • Establishment of seed banks at village level and diversify access to markets and affordable rural financial services • Strengthen data and information governance and capacities for early warning and early action at the local level • Help establish a Scientific research and consultation committee at the national level
When	Mid- to long-term
Where	All-State and Local-level governments
Key partners for delivery	Led by the Ministry of Local Governance in close partnership with the National Council of Civil Defence (NCCD), UNDP, and bringing together a wide network of civil society organisations, citizen groups, resistance/protection committees and community leaders.
Expected costs	22 million USD (~10% of direct spending on the poor households)
Expected outcomes	<ul style="list-style-type: none"> • Build systems, assets, and local capacities for regular information gathering and evidence-based responses • Enhance early warning systems and early actions in case of future emergencies • Reduce chronic malnutrition through community support and quick response mechanisms <p>More sustainable and durable outcomes (UN Sudan et al., 2019) of other investments made through Priority 1 and 2.</p>

20. SUDAN NATIONAL RESILIENCE AND RECOVERY FRAMEWORK

Disaster events result in consequences that affect individuals, communities, regions, and nations depending on the scale and seriousness of the event. The most vulnerable are those that suffer the most as they lack the resources to rebound following an event. This document provides the general guiding principles and concepts of recovery management, which will be applied to Sudan disaster caused by the flooding event of September 2020. It sets out the prioritization for action and the arrangements for implementation.

Recovery is described by the Emergency Operation Centre (EOC) as: 'The coordinated efforts and processes to affect the immediate, medium- and long-term holistic regeneration of a community following a disaster'. Recovery is a developmental and a remedial process encompassing the following activities:

- Minimising the escalation of the consequences of the disaster;
- Regeneration of the social, emotional, economic, and physical wellbeing of individuals & communities;
- Instilling resilience to meet the social, economic, natural, and built environments future needs;
- Reducing future exposure to hazards and their associated risks.

The leadership of the country is keen to instil the concept of resilience into the fabric of the Sudanese society. For so many years the country has suffered from ineffective approaches to disaster recovery and this resulted in even more suffering

and struggle for the vulnerable members of the society. The proposed recovery approach will aim to reduce the level of vulnerability; and hence improve the ability of the various society components to deal with future disasters.

As part of the undertaking of the Rapid Post Disaster Needs And Recovery Assessment, commissioned and led by the Transitional Government of Sudan (TGoS), following Sudan's worst flooding in decades, a resilience and recovery strategy has been prepared, which will work to meet the needs of the people and support the vision and work towards the fulfilment of the Sudan Transition Government Programme. The strategy recognizes the broader challenges facing the country as it grapples with a complex political transition, treats with measures to achieve macro-economic stability, addresses the health crisis due to the prevailing COVID-19 pandemic while all at the same time increasing population displacement. The strategy therefore will seek to adopt an integrated approach – or whole of government approach – to recovery and resilience building.

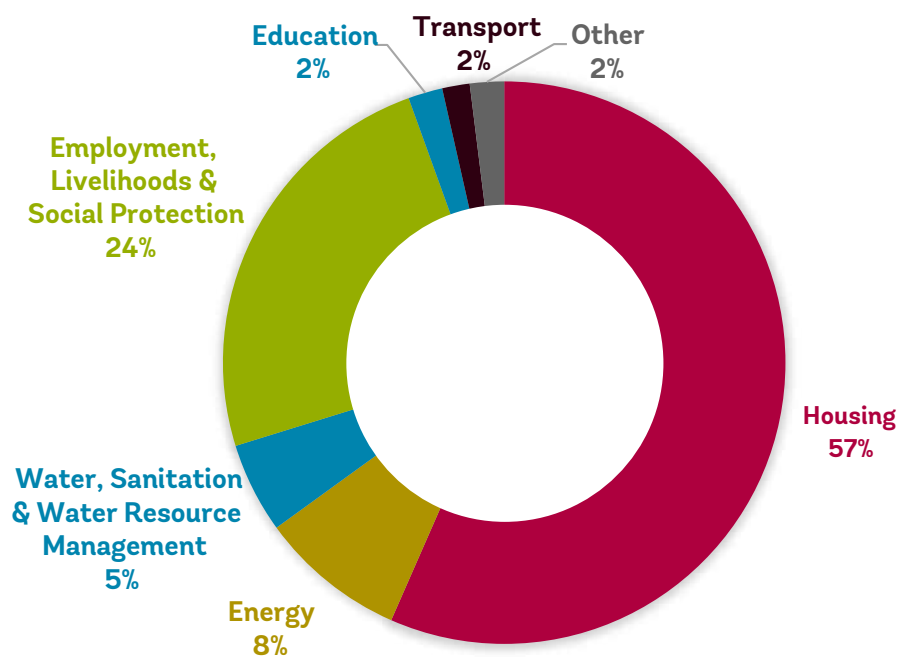
The country experienced extraordinary rainfall in the summer of 2020 which caused deaths, displacement, and massive destructions to key infrastructure and livelihoods across seventeen of the eighteen states of the country, with Blue Nile, Khartoum, North Darfur, Sennar, and West Darfur states amongst the hardest hit. The result was unprecedented floods affecting the entire length of the country. The worst effects of the floods were experienced by those already vulnerable

populations such as internally displaced persons (IDPs), refugees and women headed households and their children. One third of cultivated land and about 3 million people from agricultural households were directly affected. According to the Humanitarian Aid Commission (HAC) the rains/floods have affected thousands of people in many states in the country. The impact of the floods was felt in many sectors of the economy and in villages and cities across Sudan. Many cultural sites of great significance, not only to the Sudanese community but to the world archaeological community, have been impacted by the disastrous floods. This due to the fact that ancient Sudanese civilizations were mostly near the Nile.

Additionally, many people lost their living heritage as a result of the floods that have taken their homes, forcing them to live in shelters.

The total estimated damage across all sectors amounted to SDG 183.77 billion or USD 3.34 billion. The indicative¹⁶⁰ cost of recovery will be SDG 379.87 billion or USD 6.91 billion, to be disbursed over a five year period (see Table 19 1). As summarized in Figure 19 1, the housing sector accounts for over half (57%) of the total estimated recovery costs, followed by Employments, Livelihoods and Social Protection (24%), Energy (8%) and Water, Sanitation & Water Resource Management (5%).

FIGURE 20 - 1: Overview of estimated recovery costs by sub-sector



Vision

The vision of “Building a democratic, development-based State for everyone, where citizens will all enjoy peace, freedom, justice and welfare,” is the driving force of the Recovery Strategy.

(General Framework for the Programme of the Transitional Government)

¹⁶⁰ The figures are a preliminary estimate, as final total recovery cost have yet to be determined at the time of the assessment.

Guiding principles

The following are the five guiding principles discussed and agreed with the leadership of the Higher Committee for Flood Mitigation which will guide Sudan's recovery efforts.

Each principle is meant to describe an action that realises a certain outcome:

1. Restore Livelihood to preserve lives.
2. Improve Resilience to minimise risks.
3. Involve Community to ensure sustainability.
4. Align with Governance to maximise coordination; and
5. Leverage on Humanitarian Effort to avoid redundancy.

Implementation Strategy

Disaster events result in consequences that affect individuals, households, communities, regions, and nations depending on the scale, intensity, and type of the event. The general principles and concepts of recovery management should be applied to all scales of disaster. The recovery strategy adopts a holistic – all of government approach – which highlights the importance of coordination across sectors/policy domains as well as between the different levels of government. Such an approach to recovery measures ensures that measures not only meet the needs

required for mitigation against future flooding, but where possible addresses the challenges presented by the COVID-19 pandemic and supports the governance needs of the TGoS.

In that regard the Strategy seeks to support the most relevant priorities for recovery as set out in the General Framework for the *Programme of the Transitional Government*:

- Addressing the economic crisis and establishing the bases of sustainable development.
- Promoting public and private freedoms and safeguarding human rights.
- Ensuring the promotion of the rights of women in all areas and their equitable representation in the structures of governance.
- Supporting social welfare and development and preserving the environment.
- Enhancing the role of youth of both sexes and expanding their opportunities in all areas.

It will be the guiding principles, however, that provide the implementation strategy for the recovery processes. Figure 19 2 illustrates how the principles should guide the recovery efforts in the short, medium, and long term.

FIGURE 20 - 2: Guiding principles by period of recovery

	Livelihood Restoration	Resilience Improvement	Community Involment	Governance Alignment	Humanitarian Leverage
Short-term					
Medium-term					
Long-term					

Source: EOC

Recovery measures are presented according to the sectors which have been assessed, the cross-cutting issues and the human impact of the event. It is evident that the event has had a very high impact on the people, particularly the already poor and the internally displaced. The human impact analysis undertaken suggests that there will be need to provide support for personal debt relief, for seeds and agricultural inputs, veterinary and livestock support, animal feed due to damaged pastures and lack of income to purchase feed, the replacement of lost poultry, goats and donkeys used for draught, and vaccines to prevent spread of animal diseases. For households; construction of latrines has been identified as a priority.

The following measures for resilience building and recovery identified in the report are highlighted to meet the recovery needs of the people:

- **Livelihood Restoration** - the restoration of livelihoods disrupted, will be undertaken through the establishment of cash for work programmes: to meet the needs of the agricultural sector and to support farmers; works on rebuilding and retrofitting irrigation projects; and skills training to support house building and resettlement with new methodologies to withstand future flooding. Cash grants to supplement income loss due to destruction of produce ready for harvest and as support to SMEs involved in the agro-processing area. As part of the restoration of livelihoods the distribution of seeds and seedlings and food aid will be undertaken where necessary.
- **Resilience Improvement** – will be most evident in the physical infrastructure sectors that requires reconstruction or repair. Based on the building back better principle, infrastructure teams will repair, reconstruct, relocate and retrofit infrastructure to withstand future floods. Rehabilitating the transportation network of roads and

bridges. With regard to housing, the aim is to repair, reconstruct, and where necessary relocate damaged and destroyed housing and provide training in improved techniques for families involved in home construction. In addition, zoning and avoiding urban development in hazard-prone areas will be undertaken. In the energy sector the team will seek to reconstruct, repair and rehabilitate damaged facilities; provide renewable energy systems to provide power to communities that are cut off; establish standard operation procedures (SOPs) for emergency preparedness and disaster response; develop and implement improved safety standards and building codes; carry out long-term development planning for power generation, transmission, distribution, improvement program, increase power supply coverage, and explore alternate sources of energy; strengthening the uses of solar energy. With regard to educational facilities the teams intend to explore modelling through the use of local materials in different regions, taking into account the educational standards and the particular culture and customs, such as those of nomadic peoples. Where it is deemed that schools require relocation the appropriate risk and vulnerability surveys will be undertaken. Cultural sites that have been damaged are earmarked to be restored, repaired, or retrofitted as needed. The damaged sporting facilities are to be reconstructed and repaired with consideration of lessons learnt and ensuring future flooding risks are addressed during restoration work.

- **Community Involvement** - The recovery strategy seeks to enhance communities' involvement in terms of improving risk awareness and strengthening disaster preparedness at the community/local level. For that, the Transitional Government of Sudan will invest in building capacities of community members, organizations, and local governments to better understand and respond to future emergencies. Introduce on-line

services (e-governance) thus reducing face to face and paper-based services and increase efficiency in the delivery of government services to the people and strengthen online capabilities and facilities for teachers and children. Develop School Flood Preparedness Plans and create School Disaster Risk Management Committees; incorporate Disaster Risk Reduction principles and approaches into schools' curricula; Strengthen psychological health programmes with focus on DRR (through psycho-social support and school counselling) for both students and teachers; provide training in primary health for students and children in view of the recent floods and COVID-19. Water Education courses for youth of both sexes is proposed to increase youth resilience in managing water disasters such as floods and droughts. In the area of culture there is a recommendation to mobilize communities in the management and protection of key cultural sites and develop and strengthen community-based tourism.

- **Governance Alignment** – Efforts will be undertaken to ensure accountability and transparency by strengthening inter-governmental alignment through the establishment and activation of systems to control State revenue and expenditure, by means of using networks and modern technologies.
- **Humanitarian leverage** – Through the strengthening of partnerships with the development community the Transitional Government of Sudan will seek to deliver the programme for resilience and recovery. With the support of the humanitarian actors and the development partners the Transitional Government of Sudan can jointly leverage resources for the recovery efforts. The Transitional Government of Sudan will guarantee that the necessary action are taken to ensure that the humanitarian needs of the population are met while human rights are safeguarded, by adopting and encouraging oversight

and supporting bodies, mechanisms and societies for human rights issues, adopting and enforcing international human rights conventions, starting with the International Bill of Human Rights, particularly the rights of women and children; and promoting and ensuring religious freedoms in a way that preserves the peoples' absolute right to practice their religious rituals.

It is expected that measures will be carried out on a phased basis using the short, medium- and long-term timeframe as detailed in the sector reports. Action will be based on the Common Values and Principles of the TGoS. Among those that are immediately applicable to the recovery strategy are the following:

“Celebrating diversity and plurality; respecting and promoting human dignity and rights; Inclusive participation and joint social responsibility; Justice and equality; Financial and administrative transparency and accountability; Promoting peace and tolerance; Upholding the national interest; and encouraging Innovation and creativity”.

In the General Framework for the Transitional Government Programme, the TGoS states that “The institutions of both the State and society shall work in full harmony and effective partnership with the regional and international community to meet the aspirations of the Sudanese people in attaining the bases for realizing the desired common vision, the programmes and plans of the transitional period.” It is within this spirit that the Recovery strategy is presented with the details provided in the sector reports.

Institutional Arrangements for Recovery

With Sudan's Disaster & Emergency Risk Management Authority, a permanent strategic federal body was established to coordinate national, regional, and international efforts in the field of disaster risk management. Beyond leading implementation of the overall recovery

strategy, the establishment of this authority will support the current efforts to manage disasters and emergencies, and will benefit from the experiences of humanitarian aid and emergency committees to deal with the COVID-19 pandemic and the effects of torrents and floods.

This body will work to institutionalize the efforts made in the context of dealing with the recent flood disaster, which witnessed a measure of success in activating the mechanisms of damage assessment, estimating losses, defining needs and formulating recovery plans through the Post Disaster Needs Assessment (PDNA) project that was implemented with the participation of 15 Ministries and over 13 international organizations coordinated by the Emergency Operation Centre (EOC) operating under the Higher Committee for Floods Mitigation.

The Disaster & Emergency Risk Management Authority is a federal body with branches in the 18 States, supervised by a coordinating Supreme Council headed by the Prime Minister, assisted by the Minister of Social Development acting as the Council's Rapporteur. The executive arm of the Council is conducted by a General Secretary with the rank of a State Minister and who is appointed by the Prime Minister.

The Authority consists of a number of strategic units concerned with managing disaster related information and making strategic and emergency decisions, while supporting and following up on the implementation mechanisms in coordination with the relevant authorities.

The Authority also works to support the efforts of the emergency committees that are established according to need in the event of disasters, to carry out specific tasks.

The duties of the Authority are as follows:

- Developing policies, strategies and programs related to disaster and emergency risk reduction;
- Managing the Disaster Management Information Centre and coordinating research and studies while keeping an inventory of damages and emergency needs;
- Establishing guidelines and frameworks for early warning mechanism, as well as disaster precautions in coordination with the relevant government agencies;
- Coordination between national, regional, and international bodies concerned with disaster risk reduction;
- Activating partnerships and supporting the implementation of regional and international agreements to achieve the effectiveness of preparedness, response, and disaster recovery efforts;
- Supporting mobilization efforts, media and communication between the relevant authorities and affected parties and communities;
- Drafting regular professional reports on disasters forecasts, damages, needs and interventions;
- Support efforts and mechanisms for The Strategic Inventory mechanism and all related logistical needs.

TABLE 20 - 1: Summary of Damage, Loss, Total Effects and Needs for Recovery

Sector	Sub-Sector	Damage, billion			CEP/Losses, billion			Total Effects, billion		Recovery, billion ¹⁶¹	
		USD	SDG	Ownership (SDG)	USD	SDG	Ownership (SDG)	USD	SDG	USD	SDG
Social	Housing	2.920	160.644	160.644	0.067	3.707	3.707	2.987	164.351	3.908	214.932
	Health	0.005	0.289	0.289	0.009	0.478	0.478	0.014	0.767	0.047	2.560
	Education	0.040	2.207	2.207	0.006	0.331	0.331	0.046	2.538	0.137	7.513
	Sport	0.002	0.120	0.100	0.001	0.026	0.026	0.003	0.146	0.003	0.170
Productive	Agriculture	0.032	1.769	1.769	0.546	30.051	30.051	0.579	31.820	0.046	2.551
	Manufacturing	0.003	0.150	0.150	0.348	19.158	19.158	0.351	19.308	0.033	1.818
Infrastructure	Transport	0.091	4.999	4.999	0.001	0.045	0.045	0.092	5.044	0.109	5.999
	Energy	0.007	0.387	0.387	0.019	1.021	1.021	0.026	1.408	0.583	32.059
	Water, Sanitation & WRM	0.240	13.200	12.265	0.088	4.813	0.330	0.328	18.013	0.359	19.745
Total		3.340	183.765	20.247	1.085	59.630	2.205	4.425	243.395	5.225	287.347
Cross-Cutting issues	Culture									0.000	0.023
	Environment									0.005	0.275
	Governance									0.000	
	Gender									0.001	0.039
	Employment, Livelihoods and Social Protection									1.676	92.161
	Disaster Risk Reduction (DRR)	0.000	0.009	0.009						0.000	0.022
Grand Total		3.341	183.774	20.256	1.085	59.630	2.205	4.425	243.395	6.907	379.867

¹⁶¹ The figures are a preliminary estimate, as final total recovery cost have yet to be determined at the time of the assessment.

21. ANNEXES

ANNEX – HOUSING

Sector assessment methodology

Data provided and officially notified by HAC has been taken as a starting point for estimating effects. In the absence of detailed field surveys, the following assumptions were made in estimating housing effects: (i) weighted proportion of totally destroyed and partially damaged houses by housing typology with reference to the proportion of housing stocks in the 2011 Labour Force Survey and the likelihood of effects by housing typology; (ii) replacement/repair cost based on the average floor area and unit cost per square metre for each housing typology; and (iii) proportion of rental property in each state in 2011 Labour Force Survey and average rental per state surveyed through telephone calls. Secondary data on damage to housing stock has been collected for quantitative and qualitative assessment.

Detailed field survey was proposed for each state affected by the flooding as part of the recovery plan to measure and verify the effects, damages, and losses, and to refine the recovery strategy according to the verified effects.

Sources

- Centre for Affordable Housing Finance Africa (CAHF). 2019. Housing Finance in Sudan.
- Central Bureau of Statistics (CBS). 2011. Labour Force Survey.
- Central Bureau of Statistics (CBS). 2014. Sudan Multiple Indicator Cluster Survey.
- Elkhailifa, A. A. 2012. The Construction and Building Materials Industries for Sustainable Development in Developing Countries: Appropriate and Innovative Local Building Materials and Technologies for Housing in Sudan.
- Hafazalla, A. 2018. Rationalizing Urban Housing Land Allocation Policy in Khartoum for Sustainable and Effective Urban Planning.
- Humanitarian Aid Commission (HAC). 2020. Flood Damages.
- International Monetary Fund (IMF). 2019. World Economic Outlook Sudan.
- UN Office for the Coordination of Humanitarian Affairs (OCHA). 2020. Flood Situation Report.
- UN Department of Economic Social Affairs (UNDESA). 2019. World Urbanization Prospects.
- World Bank. 2011. Sudan: Issues in Urban Development
- List of people met: Fedaa El-Dosougi, National Council for Urban Development & Physical Planning; Omr Alsir, National Council for Urban Development & Physical Planning

ANNEX – HEALTH

Sector assessment methodology

The health sector deployed use of informal, non-structured, key informant interviews via telephone and in person with State Ministry of Health, Federal Ministry of Health, and relevant sector offices to explore more on the type and level of damage to health facilities following the floods. Besides, the sector team used secondary data from grey literatures and periodic reports from government offices such as HAC and FMOH and UN and other institutions.

Assumptions were made for estimating damages and losses as concrete information were missing. For the interest of time and resource, field visit was not possible to be made for verification.

The level of damage to health facilities was categorized into four and assigned percentage of damage. Accordingly, minor entails 15% damage, moderate entails 35% damage, major entails 50% damage while complete entails 100% damage. The impact of the damage in terms of access to health services was calculated based on the minimum number of catchment population per type of health facilities. The cost of damage on medical equipment, ICT and furniture was calculated based on the recent project expenditure for a PHCC. The cost for hospital is doubled while the cost for PHCU is halved.

ANNEX – EDUCATION

Sector assessment methodology

Assumptions and findings

Damage quantification has been made for estimating the financial costs for the flood damage and loss incurred, using the following assumptions and formulas:

a. Damages

- Average costs will be considered for all States;
- If a school is destroyed, it is assumed that its furniture and equipment will also be fully damaged;
- It is assumed that all the destroyed schools are made of brick clay/mud brick;
- If offices and residences damaged are not reported in the damage list, then, it is assumed that either there was no loss to office buildings, or the administration has managed to repair affected offices;
- Due to the nature of the disaster, damages to school infrastructures is concentrated on the foundation and walls. Therefore, it is assumed that all foundations and walls amount to around 60% of the building cost value of school;
- Average unit cost of school construction was calculated by multiplying the average size of schools (sqm) by the average cost by sqm, information provided by the Ministry of Education.
- The overall cost will vary according to location, type of material, the school area, and number/size of classes. However, according to the Housing Authority and other experiences (see references) the cost of building one sqm. with red brick and sandy

clayey mortar and aluminium roof is between US\$ 90 (market rate) and US\$404 (Bank rate). Respectively, the cost of building one sqm. with red brick, cement mortar and concrete roof is between US\$165 (market rate) and US\$703 (Bank rate).

- The damage to schools has been calculated by applying the following formula:

Fully Destroyed: Number of affected institutions x Average Unit Cost

Partially Damaged: Number of affected institutions x Average Unit Cost x 60%

b. Losses

The cost of debris removal, cleaning and sanitizing, temporary structures for school to continue, and replacing the textbooks and other learning materials were estimated as a ratio of 15% from total damage;

c. Recovery

- The estimates of recovery needs are calculated using the replacement value of assets and infrastructure accounted for the use of better materials and construction techniques and for inflation (15%).
- Applied exchange rate: 1 USD = 55 SDG

Data collection

In the days following the floods, the FMOE began to gather information from affected states, prepared by locality level authorities. Data collection for the report focused on secondary data available through various sources that primarily include the relevant local and state government departments, particularly, the Federal Ministry of Education and the Ministry of Higher Education and Scientific Research. Where States had not submitted data on damage, the information collected by the HAC and UNICEF was used. All secondary data received was closely scrutinized through various analyses. The data were validated through several measures including damage discussion meetings by sector team; desk reviews, satellite imagery and GIS map data checks and assessment for analytical works by sector team. Data for higher education was received from 6 universities exclusively. The information, while valuable, indicated that more detailed school-level assessments were required in order to have a better understanding of damage on a case-by-case basis and understand how the flooding had affected children at the school level. This can be led by the National Emergency Committee in collaboration with the relevant Ministries and development partners.

Sources

- [1] Flooding and Its Impact on Education, By Edson Munsaka and Sebia Mutasa ,November 6th 2020, <https://www.intechopen.com/online-first/flooding-and-its-impact-on-education>
- [2] Basic Education Project for Northern Sudan: Environmental and Social Management Framework (ESMF)
- [3] Pakistan Floods 2010
- [4] Sudan Education Sector: Impact of the Floods on Education (update as of Sept 2020); for further communication, please contact Julienne Vipond jvipond@unicef.org or Hisham Elawad (helawad@unicef.org) <https://www.intechopen.com/online-first/flooding-and-its-impact-on-education>
- [5] Heat map of Sudan's basic education schools. The World Bank Sudan Basic Education Emergency Support (P172812)
- [6] HAC
- [7] SUDAN EDUCATION SECTOR: IMPACT OF THE FLOODS ON EDUCATION (MAP Update as of Sept 2020; for further communication, please contact Julienne Vipond

jvipond@unicef.org or Hisham Elawad helawad@unicef.org

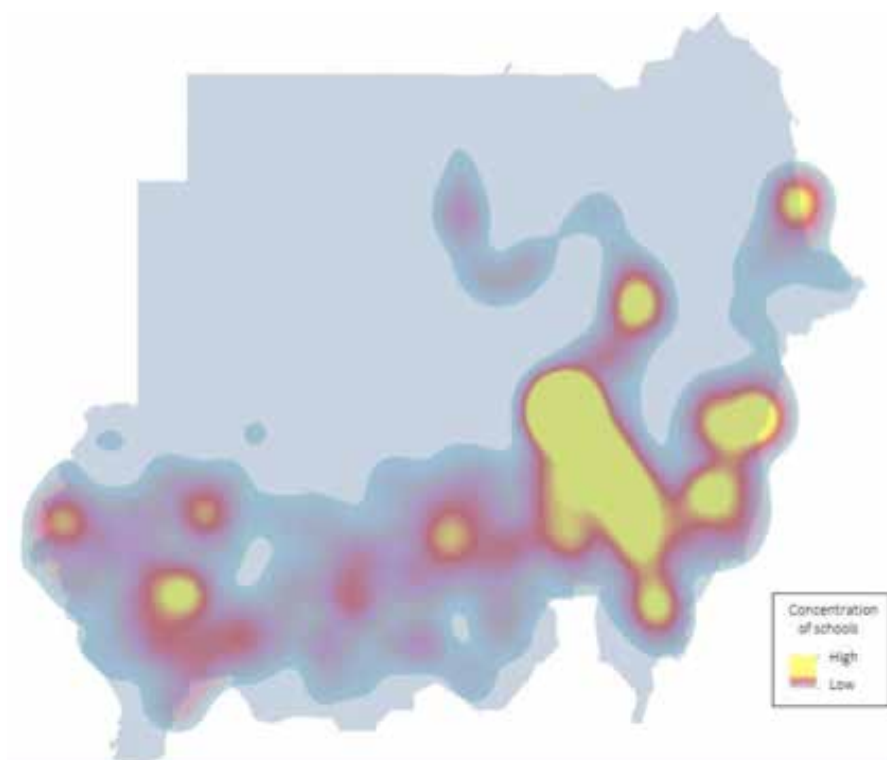
- [8] Making Schools Safe from Flooding
- [9] Damage Estimation of Urban Catchment Using Remote Sensing and GIS, Sirikantha Hirathm Senior Academic Programme Officer, Environment of Sustainable Development, United Nations University, Japan, International Training Program on Total Disaster Risk Management, 10-13 June 2003
- [10] Flooding and Its Impact on Education, By Edson Munsaka and Sebia Mutasa ,November 6th 2020, <https://www.intechopen.com/online-first/flooding-and-its-impact-on-education>
- [11] Education Sector Joint Assessment Overview on Flood-Affected Schools
- [12] Sudan_education_sector_awg_tor_oct20
- [13] Establishment of flood damage function models: A case study in the Bago River Basin, Myanmar
- Shelly Wina et al, International Journal of Disaster Risk Reduction, Volume 28, June 2018, Pages 688-700
- [14] 2020 يراوطلا ريقرت ناضي فدا لبق مي لعتلا
- [15] Evaluation of Global Partnership for Education Programme in South Sudan Final report 6 April 2018
- [16] Vietnam 2016: Rapid Flood Damage and Needs Assessment

Additional Tables and Figures

TABLE 21 - 1: Sudan Education Sector: Flood Reconstruction Needs Estimations by Higher Education Institution

No	University	State	Place of Damage	Type of Damage	Required Solutions	Cost of Damages SDG	Loss	Cost of Losses SDG
1	Khartoum	Khartoum	Houses and University Farm in Shambat area	Complete and Partial	Rebuilding, maintenance, and cleaning	20,000,000	Cultivable Clover, Burglary	13,834,300
2	Blue Nile	Blue Nile	Missing	Missing	Missing	Missing	Unspecified	Missing
3	Zalingei	Central Darfur	Administrative offices, Lecture Halls, Fences, Farm, canal, bridge, Central library in the Faculties of Agriculture and Community Development	Complete	Rebuilding	36,735,000	Unspecified	Unspecified
4	Shendi	River Nile	Northern Fence (150 m) of Administration, Academic Affairs and Faculty of Medicine's, Students Hostels and Univ. Farms,	Complete	Rebuilding	4,300,000	500 young Mango trees, Cowsheds and 18 Feddans (7.56 ha) of cultivable fodder	7,450,000
5	Holey Quran	Al Gajira	Fence of the Faculty of Arabic Language in Al Managil City	Complete	Rebuilding	11,095,000		
6	Abdulatif Alhamad University of Technology	Northern	Faculty of Engineering administration Buildings and Laboratories in Kariima City	Partial – inundation and structural	Const. of a flood protection terrace, waterproofs to Laboratories, Library, and office buildings	2,800,000		
Sub total						74,930,000		21,284,300
Total						96,214,300		

FIGURE 21 - 1: Heat map of Sudan's basic education schools



Source: The World Bank Sudan Basic Education Emergency Support, based on 2018/19 School Census using ArcGIS

FIGURE 21 - 2: Sudan education sector: Impact of the floods on education

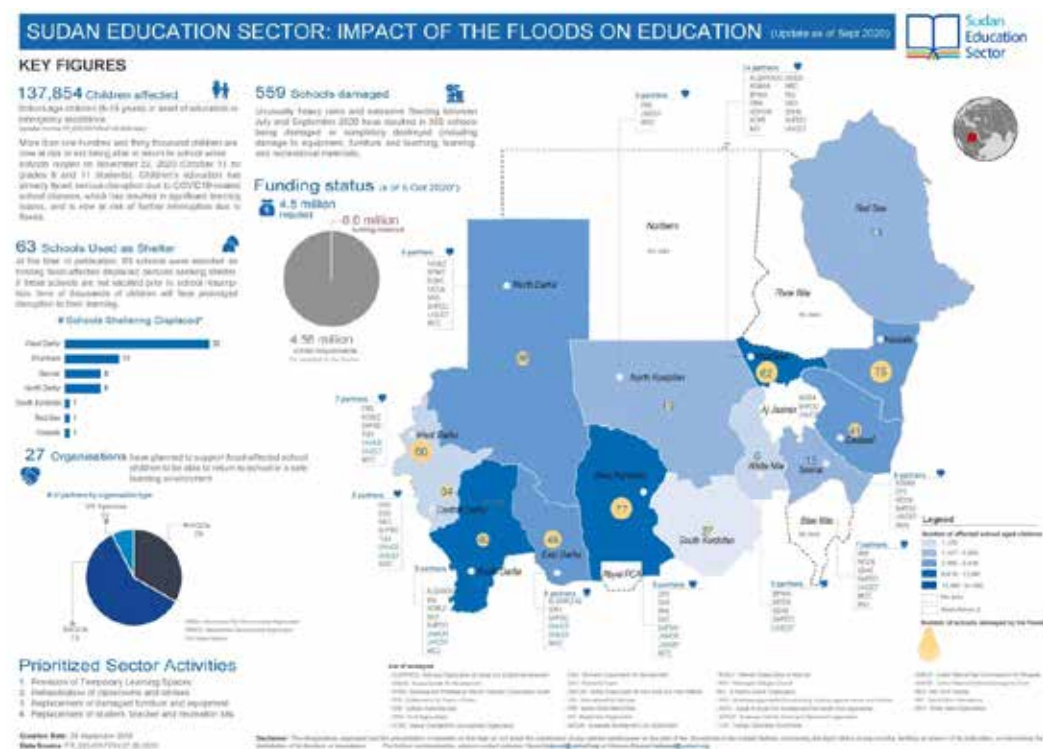
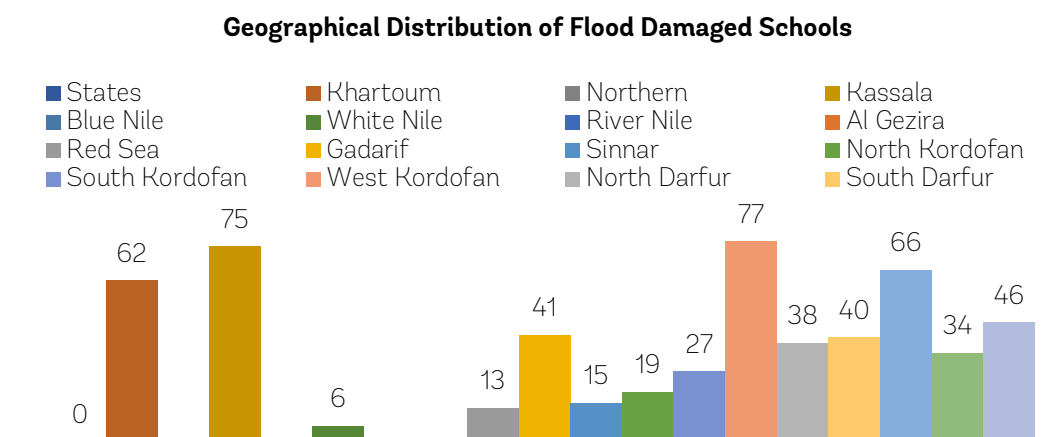
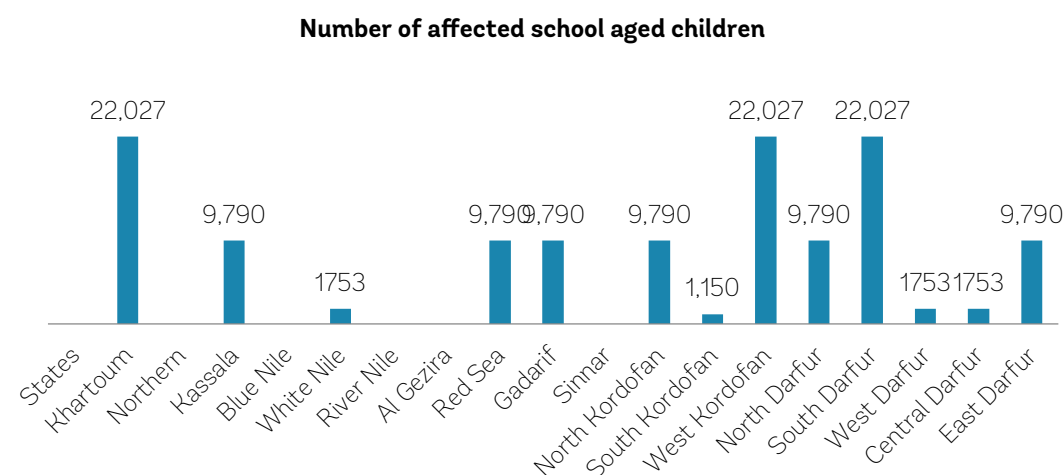


FIGURE 21 - 3: Number of flood damaged schools by State



Data Source: Sudan Education Sector: Impact of The Floods on Education

FIGURE 21 - 4: Number of affected school aged children by states



Data Source: Sudan Education Sector: Impact of The Floods on Education

ANNEX – SPORTS

Sector assessment methodology

The methodology involved collection and validation of data as follows:

- Data collection process and sources: Estimates made based on Data collected by HAC and the Ministry of Sport and Youth
- Assumptions made for estimating costs: a 15% increase in the cost of damage to build back better

Sources

- Youth Policy.org
- General Framework for the Programme of the Transitional Government of Sudan
- UN Chronicle. Sports as a means of advancing international development. <https://www.un.org/en/chronicle/article/sport-means-advancing-international-development>

ANNEX – MANUFACTURING

Sector assessment methodology

In order to ascertain the effects and impact of floods on the manufacturing MSMEs sector, the assessment took into account a special report by Small Industry Chamber Khartoum, which was commissioned by the Secretary General for the Post-disaster Needs Assessment. It should be noted that data on the estimated value of physical assets destroyed and of production or sale losses was not available for analysing the sector effects. However, the team estimated MSMEs losses in terms of income loss to the sector.

Sources

- Comprehensive Industrial Survey Project March 2005, Ministry of Industry in co-operation with the Central Bureau of Statistics and with technical assistance from UNIDO
- Small Industry Chamber Khartoum

Additional Tables and Figures

ISIC	Activity	Gross Output		No. of Establishments		No. of Labours	
		No.	%	No.	%	No.	%
	Total Manufacturing	765,429,858	100.0	24,114	100.0	131,506	100.0
15	Manufacture of food products and beverages	423,637,059	55.3	16,974	70.4	74,058	56.32
16	Manufacture of tobacco products	38,527,680	5.0	33	0.1	1,209	0.92
17	Manufacture of textiles	21,696,554	2.8	58	0.2	6,982	5.31
18	Manufacture of wearing apparel; dressing & dyeing of fur	1,140,509	0.1	180	1.0	613	0.47
19	Tanning & dress. of leather; man. of leather products. & footwear	12,576,772	1.6	461	1.9	2,870	2.18
20	Manufacture of wood, cork, plaiting & prods., exc. Furniture	4,103,398	0.5	820	3.4	2,300	1.75
21	Manufacture of paper & paper products	5,844,334	0.8	9	0.0	634	0.48
22	Publishing, printing, and reproduction of recorded media	7,210,556	0.9	88	0.4	1,927	1.47
23	Manufacture of coke, refined petroleum products & nuclear fuel	128,838,437	16.8	3	0.0	845	0.64
24	Manufacture of chemicals & chemical products	32,851,260	4.3	278	1.2	5,636	4.29
25	Manufacture of rubber & plastics products	11,196,142	1.5	62	0.3	2,661	2.02
26	Manufacture of other non-metallic mineral products	11,846,597	1.5	1,541	6.4	18,633	14.17
27	Manufacture of basic metals	11,822,060	1.5	139	0.6	973	0.74
28	Manufacture of fabricated metal products, exc. Mach. & equip.	14,482,531	1.9	2,812	11.7	7,530	5.73
29	Manufacture of machinery & equipment n.e.c	6,354,330	0.8	15	0.1	461	0.35
30	Manufacture of office, accounting & computing machinery	251,379	0.0	2	0.0	25	0.02
31	Manufacture of electrical machinery & apparatus n.e.c	2,898,019	0.4	12	0.0	945	0.72
32	Manufacture of radio, T.V. & communication equip. & apparatus	582,749	0.1	51	0.2	140	0.11
33	Manufacture of medical, prec. & optical instr., watches & clocks	21,264	0.0	2	0.0	102	0.08
34	Manufacture of motor vehicles, trailers & semi-trailers	27,881,525	3.6	28	0.1	1,744	1.33
35	Manufacture of other transport equipment	59,325	0.0	25	0.1	50	0.04
36	Manufacture of furniture; manufacturing n.e.c.	1,607,378	0.1	521	1.5	1,168	0.69

ANNEX – AGRICULTURE, FISHERIES & LIVESTOCK

Sector assessment methodology

Data collection process included secondary data collection mainly from the reports developed by FAO and the relevant ministries of the Government of Sudan.

Cost estimates for damage, loss and recovery include a limited set of crops and livestock and use pricing from 2018 GIEWS Update by the FAO.

Assumptions made for estimating costs

- production losses only refer to sorghum, millet, sesame, and groundnut in the rainfed sector
- Seeds costs are estimated based on the reported 111 tonnes of mixed seeds loss by the FAO. The estimate assumes the seeds to be of sorghum, millet, sesame, and groundnut and estimates the costs based on unit price of each crop accordingly. The total of seeds lost are broken down for each of the four crops based on their relative production percentage, as can be seen in the attached Table 20 4.
- Livestock damage and recovery are based on the unit price of livestock multiplied by the total number of heads lost due to the floods.

Sources

- Republic of the Sudan. Ministry of Finance and Economic Planning. (2019). *Implementation of Istanbul Plan of Action for Least Developed Countries (IPoA) 2011-2020*. Sudan National Report.
- FAO. (2020). *The Sudan 2020 Flood impact rapid assessment. A joint assessment with the Government of the Sudan*. Rome.
- FAO. (2020). Special Report - 2019 FAO Crop and Food Supply Assessment Mission to the Sudan. Rome. <https://doi.org/10.4060/ca7787en>
- FAO. (2018). GIEWS Update. The Sudan Fuel shortages and high prices of agricultural inputs affecting planting of 2018 crops. <http://www.fao.org/3/CA1361EN/ca1361en.pdf>

Additional Tables and Figures

TABLE 21 - 2: Baseline Data for Crop Production

States	Total Area cultivated (ha)	Baseline Production (2019/2020) - tonnes			
		Sorghum	Millet	Sesame	Groundnut
East Darfur	478,829	294,000	193,000	17,000	923,000
Red Sea	48,145	4,000	1,000	-	-
White Nile	446,463	60,000	4,000	45,000	9,000
Kassala	359,310	49,000	-	8,000	-
Gedarf	2,436,000	-	-	-	13,000
West Darfur	136,107	128,000	273,000	78,000	138,000
North Darfur	237,804	56,000	140,000	23,000	105,000
South Kordofan	650,000	141,000	73,000	104,000	19,000
Central Darfur	400,925	201,000	129,000	18,000	104,000
Blue Nile	1,850,529	-	17,000	-	-
Sennar	688,261	-	34,000	-	-

West Kordofan	315,000	28,000	45,000	65,000	730,000
River Nile	160,000	117,000	-	-	-
Khartoum	30,110	13,000	-	-	-
North Kordofan	63,000	128,000	10,000	166,000	34,000
South Darfur	-	489,000	132,000	29,000	-
Gegira	-	260,000	13,000	59,000	496,000
Total		1,968,000	1,064,000	612,000	2,571,000

TABLE 21 - 3: Baseline Data for Livestock

States	Sheep	Goats	Cattle
East Darfur	1,801,309	749,373	2,009,200
Red Sea	434,532	749,373	143,626
White Nile	2,661,508	2,665,951	3,699,926
Kassala	2,107,480	1,743,995	892,978
Gedarif	2,226,976	1,103,622	1,099,050
West Darfur	2,238,361	2,524,674	2,360,459
North Darfur	3,921,651	3,020,200	727,496
South Kordofan	2,205,684	2,152,812	4,567,925
Central Darfur	1,838,070	20,633,038	1,929,581
Blue Nile	4,073,737	472,332	2,132,531
Sennar	1,433,955	1,707,662	1,433,955
West Kordofan	4,350,099	2,419,612	3,496,976
River Nile	1,075,466	1,258,038	106,158
Khartoum	461,690	6,721,165	256,029
North Kordofan	4,207,138	2,706,145	780,575
South Darfur	2,205,684	1,723,018	2,455,689
Gegira	2,580,033	2,580,033	2,625,854
Total	39,823,373	54,931,043	30,718,008

TABLE 21 - 4: Recovery Cost Estimates

Livestock	Total Number of livestock to restock	Unit Cost (per head)	Total Cost (SDG)
Sheep	66,462	19,000	1,262,778,000
Goats	22,070	12,000	264,840,000
Cattle	4,828	50,000	241,400,000
Poultry	290	400	116,000
Total			1,769,134,000
Crop	Seed Requirement* (tonnes)	Unit Cost (per Kg)**	Total Cost (SDG)
Sorghum	35.15	19	667,822
Millet	19.00	23	437,070
Sesame	10.93	60	655,820
Groundnut	45.92	24	1,102,034
Total	111	-	2,862,746
Tools	No. of tools lost	Unit Cost (per item)	Total Cost (SDG)
Tractors	256	1,045,000	267,520,000
Disc ploughs	200	495,000	99,000,000
Sprayers	150	49,500	7,425,000
Hand tools	310	2,750	852,500
Donkey ploughs	1,000	71,500	71,500,000
Total		-	
Total Recovery Cost			2,218,294,246
Total Recovery Cost (inflation-adjusted @15%)			2,551,038,383

*FAO reports that 111 tonnes of different seed varieties were lost, and this value is considered underreported. The recovery estimate here is based on an assumption that the seed mix included sorghum, millet, sesame, and groundnut.

** FAO. (2018). GIEWS Update. The Sudan Fuel shortages and high prices of agricultural inputs affecting planting of 2018 crops. <http://www.fao.org/3/CA1361EN/ca1361en.pdf>

ANNEX – TRANSPORT

Sector assessment methodology

This report preparation has been a result of corroboration between the World Bank, UN agencies and the Government of Sudan. The government nominated and counterpart to liaise with the World Bank and UN agencies. The UN agencies and the World Bank provided the government counterpart with a template and structure for the report. The government counterpart, helped to collect vital information in form of reports, development plans, maps, photos for the before and after the flood disaster. The quality and accuracy of the data used in the report was enhanced by field visits by the government counterparts. The data collection process was facilitated by the corporation of the various agencies within the Federal Ministry of Infrastructure and Transport, i.e. National Roads, Railways, Aviation and River transport Authorities. The World Bank and the UN agencies reviewed the supplied information, carried out necessary analysis of the data provided and prepared the sector reports. In preparing the sector reports, some assumptions have been made including the following:

- The costs of the short, medium, and long-term initiatives have been derived from comparison with similar activities carried out in other countries, with adjustments for conditions in Sudan.
- A 20% has been added to the recovery needs to allow for best international practice and building back better, rather than returning to the exact pre-flood circumstances which in some cases were likely to fail under a similar disaster.
- The damages for the different subsectors have been derived from the unit costs supplied by the sub sectors. For instance, for the road sub sector, the cumulative length of the damaged infrastructure was multiplied by the unit cost of that infrastructure.
- The government of Sudan is already carrying out immediate measures to ensure some connectivity between places and the cost of this has not been established or considered.

Sources

- Sudan railway authority
- Sudan airways
- Land transportation unit
- National roads & bridges authority
- River navigation authority
- Sudan Regional Airports Co.ltd

ANNEX – ENERGY & ELECTRICITY

Sector assessment methodology

Field visit was conducted by a team representing the Sudanese Power Thermal Generating Company to Garri Stations in Khartoum North.

Sources

Data provided by the Sudanese Power Thermal Generating company; Sudanese Electricity Distribution Company; Sudanese Electricity Transmission Company; and Sudanese Electricity Holding Company

List of people met

- Eng. Hamza Atta Alfadeel Ali Ahmed, Director of Health Safety, and environment directorate
- Eng. Alaeldin Mergani Logman (Health and safety Department manager, STPG)
- Eng. Asma Mahgoub ALkair (Environment Department manager, STPG)
- Eng. Dr. Galal Abd Elfattah (Sudanese Electricity Distribution Company)
- Eng. Ali Habib Allah (Sudanese Electricity Transmission Company)
- Eng. Hatim Hassan Salman (Sudanese Electricity Holding Company)
- Eng. Alhadi Gomaa (Sudanese Electricity Holding Company)
- Eng. Amin Subri Ahmed (World Bank)
- Eng. Tarig Taj Alasfia (World Bank)
- Miss Kawther Ahmed Brema (World Bank)

ANNEX – WATER, SANITATION & WATER RESOURCES MANAGEMENT

Sector assessment methodology

- Data collection process and sources: Interagency assessment reports from field visits covered 11 states of the total 18 states. The rest of the information is obtained from HAC reports and interviews with decision-makers carried by EOC;
- Methodology to extrapolate data: Comparisons made depended on similarities found on nature of damages, state population size, and geographical location;
- Field visits: Based on Interagency assessment reports;
- Assumptions made for estimating costs: Agency guidelines, quantification of damages by concerned WASH personnel and officials.

Sources

- Interagency assessment and EOC report summary; the cost of effects
- Implementing IoT for Smart Water Management _ Water World
- Historical gauge stations
- Water and Sanitation _ Baseline
- WASH guideline
- FAO Food deprivation measurement
- FAO Sudan flood impact assessment
- Decision-maker interviewed included:
- Water Authority director
- Khartoum State; Sanitation director
- Federal Ministry of Health; Environmental Health Manager
- Khartoum Ministry of Health; Environmental Health Manager

Additional Tables and Figures

TABLE 21 - 5: Annex 1 (Water, Sanitation & Water Resources Management)

	Theme	Item	Sanitation			Water			Improved water & sanitation	Handwashing	
			Im-proved	OD	Unim-proved	Total un-improved	Im-proved	Unim-proved		Place for hand-washing w/ soap	Place for soap is available in the house
	States	Total	30.4	30.5	39.1	69.6	63.6	23.2	36.4	40.7	25.1
	Area	Urban	57.0	5.0	38.0	43.0	78.3	16.1	21.7	47.3	34.0
		Rural	22.1	40.0	37.9	77.9	63.5	27.1	36.5	38.2	21.8
	Education	Total	39.8	22.7	37.4	60.2	70.7	16.5	29.3	46.3	30.5
Baseline data: Source of drinking water 2019-20*											
States	% of households accessing drinking water using various sources per region										
	Rural					Urban					Time to source of drinking water
	A	B	C	D	E	A	B	C	D	E	
Total	36.1	26.8	14.7	15.3	7.1	48.0	16.4	1.2	31.4	4.7	
Sources	Key <Adjust as per context>										
1	A	Water Yards									
2	B	Mini Water Yards									
3	C	Hand pump/Protected dug well									
	D	Treatment plant/compact units									
	E	Hafir/dam with filtration/disinfection units									
*Figures for Sennar, River Nile and East Darfur needs revision											
Baseline data: Type of sanitation accessed 2019-20*											
% of households out of those having access to improved sanitation											
Rural											
States	A	B	C	A	B	C					
Total	27.6	32.1	40.3	72.4	61.9	13.8					
Sources	Key <Adjust as per context>										
1	A	Improved pit latrine									
2	B	Flush toilet to septic tank or pit									
3	C	Flush toilet to Sewerage System									

TABLE 21 - 6: Annex 2 (Water, Sanitation & Water Resources Management)

DARFUR	STATIONS	LAT	LONG	FROM	TO	RED-SEA PROVINCE					
	SHEBEIKA	13° 43'	22° 25'	1962	1976	STREAM	STATION	LAT	LONG	FROM	TO
	GUHUR MURFAEIN	11° 35'	23° 23'	1952	1978	Khor Arbaat	ARBAAT	19° 50'	36° 57'	1957	1992
	ZALAT GRASH*	14° 06'	28° 01'	1952	1978	Khor Salloum	SALLUM	19° 25'	37° 10'	1958	1969
	GAZALA GAWZ.*	14° 36'	28° 25'	1952	1962	W. Odrous	ODROUS (No A)	19° 06'	36° 32'	1960	1979
	SALATIYA	14° 29'	23° 44'	1952	1976	W. Odrous	ODROUS (No B)	19° 20'	36° 25'	1981	1992
	GOZ BANAT	14° 28'	23° 38'	1952	1976	W. Goub	GOUB - A	18° 00'	37° 10'	1958	1982
	DAWANI	14° 01'	23° 01'	1962	1976	W. Goub	GOUB - B	19° 20'	36° 25'	1981	1992
	TURTUR	14° 01'	23° 20'	1962	1976	Khor Arab	ARAB	18° 45'	37° 02'	1960	1992
	LAGI	13° 04'	23° 35'	1962	1976	Khor Arab	ENHA	18° 20'	36° 18'	1974	1979
EL GADAREIF	STATIONS	LAT	LONG	FROM	TO	Khor Arab	TOHAMIYAM	18° 20'	36° 32'	1974	1980
	WAD ELHASSEIN	14° 02'	35° 36'	1963	1977	Khor Ailterba	AITERBA	17° 57'	38° 21'	1977	1986
	EL SOFY	14° 03'	35° 22'	1963	1977	Khor Kass	KASS	18° 16'	36° 11'	1979	1986
	EL SARAF	14° 00'	35° 27'	1963	1977	BLUE NILE PROVINCE					
	WAD ELMALIK	14° 04'	35° 25'	1963	1977	STREAM	STATION	LAT	LONG	FROM	TO
	WAD EDDAMMAK	14° 02'	35° 26'	1963	1977	Khor Bau	BAU (dam)	10° 22'	34° 06'	1959	1958
	ABAYO	14° 01'	35° 25'	1963	1977	Khor Wadaka	WADAKA	10° 30'	33° 56'	1978	1984
STREAMS	DALASA	14° 01'	35° 26'	1963	1977	Khor Elsamaa	EL SAMAA	10° 41'	33° 39'	1982	1983
Khor Abu Fargha	ABU FARGHA	14° 02'	35° 22'	1961	2006	Khor Ghormain	GHORMAIN	10° 18'	34° 10'	1983	1984
Khor Agazat Elfeil	AZAZATEL FEIL	13° 19'	35° 18'	1966	1990	N. KHORDOFAN PROVINCE					
Khor Abugamida	ABU GHAMIDA	13° 33'	35° 22'	1965	1975	STREAM	STATION	LAT	LONG	FROM	TO
Khor Essageiaa	ESSAGEIAA	13° 31'	35° 31'	1967	1975	Khor Abuhabil	ABU HABIL	12° 39'	30° 42'	1978	1989
S. KORDOFAN	STATIONS	LAT	LONG	FROM	TO	Khor Abuhabil	ERRAHAD TURAA (Feeder canal)	12° 32'	30° 24'	1973	1984
	EL ABBASIA	12° 10'	31° 19'	1953	1978	Khor Elsikera	AL SIKERAN	13° 11'	29° 50'	1982	1989
	SUBUT	12° 03'	31° 14'	1964	1978	Khor Elsikera	NABALAT	N/A	N/A	1982	1997
	TASSI	12° 02'	31° 11'	1964	1978	Khor Abuhabil	GARADUD ELARAK	12° 30'	30° 35'	1983	1989
	UREIGA	12° 06'	31° 14'	1964	1978						
STREAMS	EL SUNUT	12° 10'	29° 53'	1965	1978						
Khor Elabbassia	ABAASIYA	12° 10'	33° 39'	1968	1982						
Khor Rashad	RASHAD (dam)	11° 50'	31° 04'	1974	1976						
Khor Abu Erouge	ABU GUBEIHA	12° 28'	31° 14'	1973	1975						
Khor Abuhabil	UMM BREMBITA	11° 01'	30° 41'	1974	1981						
Khor Abuhabil	EDDILLING	12° 02'	29° 38'	1974	2000						
Wadi El Ghella	ELSUNUT	11° 10'	29° 02'	1967	1981						

TABLE 21 - 7: Annex 3 (Water, Sanitation & Water Resources Management)

No.	State	Infrastructure	Q. CD	Q. PD	No.	State	Infrastructure	Q. CD	Q. PD
1	Khartoum				9				
Jebel Aulia, Dar Elsalam, South Omdurman, North Omdurman and, North Bahri localities; 29 administrative units		Rivers, lakes, ponds, or dams		1	All state	White Nile	Rivers, lakes, ponds, or dams	4	
		Boreholes, hand-dug wells					Latrines	338	
		Large and small filtration systems	1	1			Housing sector	5588	2073
		Piped distribution systems	Not known				Educational facilities	4	
		Latrines	3687	4400	10				
		Housing sector	3841	5805	All state	River Nile	Rivers, lakes, ponds, or dams	1	
		Waste management sites	1				Latrines	631	
2	Blue Nile						Housing sector	2700	1036
Tadamon and Bau localities; 7 administrative units		Rivers, lakes, ponds, or dams	1	5			Educational facilities	5	
		Latrines	349		11				
		Housing sector	>322	>456	All state	West Darfur	Waste management sites		
		Educational facilities		13			Housing sector	5659	8095
3	North Darfur				12	Algadarif			
Kebkabiya locality; 2 administrative units		Boreholes, hand-dug wells	500		All state		Housing sector	2311	4461
		Pumping stations - motor, wind, solar	1	21			Educational facilities	23	
		Latrines	7013		13	Kassala			
		Housing sector	2205	8513	All state		Housing sector	4291	3470
		Educational facilities	6	19			Educational facilities	11	
4	East Darfur				14	Red Sea			
Ellaiet locality; 3 administrative units		Rivers, lakes, ponds, or dams		3	All state		Boreholes, hand-dug wells	2	
		Pumping stations - motor, wind, solar		1			Housing sector	2082	8058
		Latrines	1589				Educational facilities	16	
		Housing sector	535		15	South Darfur			
5	Sinnar				All state		Latrines	55	
Elsuki locality; 4 administrative units		Rivers, lakes, ponds, or dams	1				Housing sector	24	3463
		Boreholes, hand-dug wells	2				Educational facilities	2	
		Latrines	243		16	Central Darfur			
		Housing sector	748		All state		Latrines	195	
6	Northern						Housing sector	1899	1216
Aldabbah and 4 other localities		Piped distribution systems		1			Educational facilities	10	
		Latrines	542		17	South Kordofan			
		Housing sector			All state		Latrines	62	
7	North Kordofan						Housing sector	425	215
Sheikan, Um Rawaba, Um Dam, Sodary and, West Bara localities; 30 communities		Storm and runoff collection systems	20,000 Km		18	West Kordofan			
		Housing sector	1969	6854	All state		Rivers, lakes, ponds, or dams	1	1
		Educational facilities	1	9			Latrines	1131	
8	Gezira						Housing sector	2958	6788
Total 6 localities; 20 administrative units		Rivers, lakes, ponds, or dams	5				Educational facilities	6	
		Boreholes, hand-dug wells	9						
		Piped distribution systems	7.2 Km						
		Latrines	1748						

ANNEX – DISASTER RISK REDUCTION

Sector assessment methodology

- Document and data review from the archive of the National Council for Civil Defence.
- An interview was conducted with His Excellency the General Director of Civil Defence, Secretary General of the National Council for Civil Defence.
- The estimation of total cost of losses is brought forward from knowledge of prices in the local market.

Sources

Additional Tables and Figures

TABLE 21 - 8: Draft Decree to Establishing Sudan's Disaster & Emergency Risk Management Authority

Draft Decree	مقتراح قرار إداري
Establishing Sudan's Disaster & Emergency Risk Management Authority	إنشاء الهيئة السودانية لإدارة مخاطر الكوارث والطوارئ
<p>Introduction</p> <p>By reviewing the institutional work of emergencies and disasters and in light of the experience of the COVID-19, floods and torrents, and the formation of emergency committees, the risk of disasters in Sudan continue to pose a huge challenge and especially that Sudan disaster prone country. These disasters are sometimes caused by human action, resulting in great pressure from asylum, displacement, and negative economic, health and social impacts, and sometimes violent conflicts.</p> <p>Therefore, it was necessary to establish a permanent strategic federal body to coordinate national, regional, and international efforts in the field of disaster risk management. The establishment of this authority will support the current efforts to manage disasters and emergencies, and will benefit from the experiences of humanitarian aid and emergency committees to deal with the COVID-19 pandemic and the effects of torrents and floods.</p> <p>This body will work to institutionalize the efforts made in the context of dealing with the recent flood disaster, which witnessed a measure of success in activating the mechanisms of damage assessment, estimating losses, defining needs and formulating recovery plans through the Post Disaster Needs Assessment (PDNA) project that was implemented with the participation of 15 Ministries and over 13 international organisations coordinated by the Emergency Operation Centre (EOC) operating under the Higher Committee for Floods Mitigation.</p>	<p>المقدمة</p> <p>بمراجعة العمل المؤسسي للطوارئ والكوارث وعلى ضوء تجربة الكورونا والأمطار والسيول وتكوين اللجان الطارئة فإن الطوارئ في السودان عملية موسمية مع العلم أن السودان بلد تكثر فيه الطوارئ والكوارث الطبيعية والتي تتم أحياناً بفعل الإنسان مما يترتب عليها ضغطاً كبيراً من لجوء ونزوح وأثار اقتصادية وصحية واجتماعية كبيرة بل وأحياناً نزاعات دموية.</p> <p>لذا كان ضرورياً إنشاء هيئة إستراتيجية دائمة لتنسيق الجهود الوطنية والإقليمية والدولية في هذا المجال. سيدعم انشاء هذه الهيئة الجهود الحالية لإدارة الكوارث والطوارئ وستستفيد من تجارب العون الإنساني والمجالس الطارئة للتعامل مع جائحة الكورونا وأثار السيول والفيضانات.</p> <p>وستعمل هذه الهيئة على مأسسة المجهودات التي تمت في سياق التعامل مع كارثة الفيضانات الأخيرة والتي شهدت تحقيق قدر من النجاح في تفعيل آليات حصر الأضرار وتقييم الاحتياجات وصياغة خطط التعافي من خلال مشروع الذي تم (PDNA) حصر الاحتياجات واستراتيجية التعافي تنفيذه بمشاركة خمس عشرة وزارة وثلاث عشرة منظمة التابعة (EOC) دولية تحت مظلة غرفة الطوارئ المركزي للجنة العليا لمعالجة آثار السيول والفيضانات.</p>

Draft Decree	مقترح قرار إداري
Establishing Sudan's Disaster & Emergency Risk Management Authority	إنشاء الهيئة السودانية لإدارة مخاطر الكوارث والطوارئ
Definition This is a federal body with branches in the 18 States, supervised by a coordinating Supreme Council headed by the Prime Minister, assisted by the Minister of Social Development acting as the Council's Rapporteur. The executive arm of the Council is conducted by a General Secretary with the rank of a State Minister and who is appointed by the Prime Minister.	التعريف هو هيئة اتحادية لها فروع في الولايات ويشرف عليها مجلس تنسيقي أعلى برئاسة رئيس الوزراء يساعده مقرر المجلس كمشرف عام وهو وزير وزارة التنمية الاجتماعية ويدر العمل التنفيذي بواسطة أمين عام بدرجة وزير دولة يتم تعيينه من قبل رئيس الوزراء.
Composition The Authority consists of a number of strategic units concerned with managing disaster related information and making strategic and emergency decisions, while supporting and following up on the implementation mechanisms in coordination with the relevant authorities. The Authority also works to support the efforts of the emergency committees that are established according to need in the event of disasters, to carry out specific tasks.	مكونات الهيئة تتكون الهيئة من وحدات استراتيجية تعنى بإدارة المعلومات واتخاذ القرارات الاستراتيجية والطوارئ مع دعم ومتابعة آليات التنفيذ بالتنسيق مع الجهات ذات الصلة. وتعمل الهيئة كذلك على دعم مجهودات اللجان الطارئة التي يتم انشاؤها حسب الحاجة في حالات الكوارث للقيام بمهام محددة.
Duties <ul style="list-style-type: none"> Developing policies, strategies and programs related to disaster and emergency risk reduction. Managing the Disaster Management Information Centre and coordinating research and studies while keeping an inventory of damages and emergency needs. Establishing guidelines and frameworks for early warning mechanism, as well as disaster precautions in coordination with the relevant government agencies. Coordination between national, regional, and international bodies concerned with disaster risk reduction. Activating partnerships and supporting the implementation of regional and international agreements to achieve the effectiveness of preparedness, response, and disaster recovery efforts Supporting mobilization efforts, media and communication between the relevant authorities and affected parties and communities Drafting regular professional reports on disasters forecasts, damages, needs and interventions Support efforts and mechanisms for The Strategic Inventory mechanism and all related logistical needs 	المهام <ul style="list-style-type: none"> وضع السياسات والاستراتيجيات والبرامج المتعلقة بإدارة مخاطر الكوارث والطوارئ إدارة مركز معلومات مخاطر الكوارث وتنسيق البحوث والدراسات مع حصر الأضرار والاحتياجات الطارئة وضع موجّهات وأطر واليات الإنذار المبكر والتحوطات للكوارث بالتنسيق مع الجهات الحكومية ذات الصلة التنسيق بين الجهات الوطنية والإقليمية والدولية تفعيل الشراكات ودعم تنفيذ الاتفاقيات لإنجاز فاعلية جهود الجاهزية والاستجابة والتعافي من الكوارث دعم مجهودات التعبئة والاعلام والتواصل بين الجهات ذات الصلة والجهات والمجتمعات المتضررة صياغة التقارير المهنية الراتبة حول التنبؤات والأضرار والاحتياجات والتدخلات دعم مجهودات وآليات المخزون الاستراتيجي والاحتياجات اللوجستية

Draft Decree	مقترح قرار إداري
Establishing Sudan's Disaster & Emergency Risk Management Authority	إنشاء الهيئة السودانية لإدارة مخاطر الكوارث والطوارئ
Membership The Authority is managed by the General Secretary of the Supreme Council of the Authority under the leadership of the Prime Minister. The Minister of Social Development shall be the rapporteur of the Council. The Council consists of the following members: <ol style="list-style-type: none"> 1. Minister of Defence 2. Minister of Finance and Economic Planning 3. Minister of Interior 4. Minister of Foreign Affairs 5. Minister of Federal Government 6. Minister of Information 7. Minister of Social Development 8. Governor of the Bank of Sudan 9. Secretary General of the Supreme Council for the Environment 10. Secretary General of the Population Council 11. Director General of the Central Bureau of Statistics. 12. Director General of The Meteorological General Authority 13. Director General of The Military Survey Authority 14. Director General of the National Information Centre 15. Secretary General of the National Council for Civil Defence 16. President of the Sudanese Businessmen and Employers Federation 17. 1Secretary General of the Sudanese Red Crescent 	عضوية المجلس تدار الهيئة بواسطة الأمين العام للمجلس الأعلى للهيئة تحت رئاسة رئيس مجلس الوزراء وأن يكون وزير التنمية الاجتماعية مقرراً للمجلس. ويكون المجلس بعضوية كل من: <ol style="list-style-type: none"> 1. وزير الدفاع 2. وزير المالية والتخطيط الاقتصادي 3. وزير الداخلية 4. وزير الخارجية 5. وزير الحكم الاتحادي 6. وزير الإعلام 7. وزير التنمية الاجتماعية 8. محافظ بنك السودان 9. أمين عام المجلس الأعلى للبيئة 10. أمين عام مجلس السكان 11. مدير عام المركز القومي للإحصاء 12. مدير عام الهيئة العامة للإرصاد الجوي 13. مدير عام هيئة المساحة العسكرية 14. مدير عام المركز القومي للمعلومات 15. أمين عام المجلس القومي للدفاع المدني 16. اتحاد أصحاب العمل 17. أمين عام الهلال الأحمر السوداني

ANNEX – EMPLOYMENT, LIVELIHOODS & SOCIAL PROTECTION

Sector assessment methodology

The employment profile was based on the last available data from the Sudan Labour Force Survey (2011) and, for income loss computation, the GDP of Sudan was considered at USD 18.9 billion which were the World Bank estimates for the year 2019. The income losses were estimated for high, middle, and low GDP contributing states of Sudan.

For agricultural livelihood impact assessment, the pre-disaster data considered number of population/households dependent on agriculture: both rainfed and irrigated. For fishers and pastoral households, it was based on secondary data available for each state. Information on estimated loss of cultivable area, amount of food crops destroyed, damage to riverine forest and water resources was accessed from the Sudan 2020 Flood Impact Rapid Assessment report released by the FAO in September 2020.

Data pertaining to household assets was taken from Sudan MICS5 (Multiple Indicator Cluster Survey), and the identification of the six severely affected states was based on the percentage damage of planted area. Accordingly, those states which suffered at least 25% damage in planted area were prioritized for immediate / short-term (3-6 months) intervention.

The income loss estimates for Micro and Small Enterprises in Khartoum state was based on information made available by the Union of Small Industries and Handicrafts in Sudan which, in turn, was based on their primary survey of affected enterprises in Khartoum state during November and December 2020.

Assessment of recovery needs, both immediate (3-6 months) and medium term (6-12 months), was based on discussions with government officials and other PDNA sector teams. These needs were then taken forward to form a set of budgeted recovery proposals targeting affected people / households. The number of beneficiaries were estimated in the discussions with officials and other PDNA sector teams; the estimates being deemed achievable to implement by them through the proposed interventions during this period.

Sources

- OCHA January 2020, Humanitarian Needs Overview, Sudan
- ILO January 2014, A Roadmap Toward A National Employment Policy for Sudan
- FAO, The Sudan 2020 Flood impact rapid assessment report
- Common Country Analysis for Sudan Desk Review - April 2016
- UNDP (April 2020). COVID-19 Socio-Economic Impact Assessment for Sudan
- UNDP (August 2010). Socio-Economic Study of Business Opportunities and Support Services for DDR Participants in Khartoum State
- UNDP (April 2020). COVID-19 Socio-Economic Impact Assessment for Sudan
- African Development Bank/OECD/United Nations Development Programme (2017), "Sudan", in African Economic Outlook 2017: Entrepreneurship and Industrialisation, OECD Publishing, Paris. DOI: <https://doi.org/10.1787/aeo-2017-59-en>

ANNEX – CULTURE

Sources

1. Assessment of Impact of 2020 floods on World Heritage and Archaeological Sites in Sudan (2nd to 17th November 2020) by George Abungo
2. National corporation for antiquities and museums –fieldwork department, Restoration department, museums department
3. library,
4. private references,
5. Tourism office in Khartoum.
6. Tourism office in al Damar- Nile Province.
7. Tourism office in Sennar.

SUMMARY OF RECOMMENDATIONS OF RECOVERY

Priority Number 1: Meroe Island

1a. The Pyramids

Recommendation:

1. Removal of newly accumulated sand dunes from the immediate surroundings of the pyramids as well as from inside the offering chapels with their unique reliefs.
2. Documentation of the site and its monuments to assess, the state of their preservation after the shutdown and after summer rains and storms (photographical documentation, comprehensive report, and assessment on necessary protection measures).
3. Control and monitoring of tourists and monuments.

Budget for sand removal from around the Pyramids at Meroe Royal Cemetery

1. 2 NCAM officers for supervision of sand dune removal, fence repair, damage assessment, report, administration (Salaries covered by NCAM)
2. Field allowances for 5 NCAM technicians for 30 days × USD 15 = USD 2,250 (Including food)
3. Payments for 12 local workmen (sand dune removal from the surrounding of the pyramids to area accessible for trucks) for 30 days × USD 10 = USD 3600
4. USD 35 for the one load of sand × 200 load = USD 7,000 (Truck and loader to be hired)
5. NCAM camp at Meroe will be the place for the accommodation for the team (NCAM)

Total = 12,850 USD

1b. The City of Meroe

Recommendation:

1. A Master Plan aimed at providing more protection to the site is urgently needed.
2. The plan will incorporate both research work (preparation of a catalogue or file for all features at the site by collection of all available documentations, and preparation of work plan), and fieldwork (survey and mapping, surface cleaning, fencing, and opening pathways) to presentation.

Budget for master plan:

1. Equipment: Laptop, camera, digging tools, etc. (Provided by NCAM)
2. Transportation (Provided by NCAM)
3. Fencing materials, signs making and installation, sum of 2000 USD
4. Archaeologists per diem: 2 × 40USD × 60 days = 4,800 USD (including food and accommodation)
5. Topographer × 40 USD × 60 days = 2,400 USD (including food and accommodation)
6. Local workmen: 20 × 10USD × 40 days = 8,000 USD
7. Skilled masons: 2 × 30 days × 20USD = 1,200 USD (including food and accommodation)

Total = 18,400 USD

1c. Naga Site

Recommendation:

1. A trench is to be dug on the three sides of the Hatur temple to create a semi-island feature to temporarily hold water during the rainy season.
2. The water flow towards the temple will be redirected elsewhere by constructing a wall about 70 cm high all along the eastern part of the archaeological area where the Lion and Hathor temples are located.
3. The wall would follow the same pattern constructed at el-Kurru, that is a cement structure covered by stone.
4. During rains, little movable wooden walkway could be put over the channel for people to walk into the temple compound or the temple could be reached through the direction of the Lion temple that will have no trench around.
5. The long-term recommendation involves the possibility of putting up a water trough but only after a proper study to determine what microenvironment may be created and what effects it may have generally on the heritage within the property.

Budget for building protection wall at Naga

1. NCAM Technicians 2 (skilled masons) x 20 Days x USD 20 = 800 USD (including food)
2. 5 Local workmen x 20 Days (Digging foundation trench, assisting the masons) x 10 USD = 1,000 USD
3. 5 Local workmen x 5days (Digging the shallow trench around the Hatur temple to hold water during the rainy season) x10 = 500 USD
4. Building Materials (Cement, sand, gravel, water, stone, rebars) = 6000 USD
5. Tools for construction (rent and purchase): concrete mixer, etc. = 1500 USD
6. Gasoline (for concrete mixer and generator and cars) = 1000 USD

Total = 10,800 USD

Priority number 2: Teseen Mosque

2a. The Mosque and its surrounding

Recommendation:

1. It is recommended that in order to solve this, an underground tank be constructed where the water will drain to as part of the solution as well as serving as a water catchment and management strategy for the locals.
2. Concurrently to be undertaken with the restoration and protection work should be an archaeological investigation that should establish the date of the mosque and gather other data that will contribute to its proper understanding and appreciation.

This work is considered of immediate urgency as the mosque could collapse if nothing is done and the budget is provided below

Budget

Flood protection, Drainage System and Archaeological Investigation

1. Earthen landfills with stone cladding at the eastern side (3,500 US\$, one week);
2. Landfill cladding at the eastern and southern sides (4,500 US\$, one week);
3. Strengthening the northern wall by adding landfills on it (2,000 US\$, one week);
4. Urgent removal of the roof that Khartoum State Tourism Department constructed, before the next year's rains and floods, due to danger of collapse and high load that is affecting the body of the mosque (1,000 US\$, one week);

5. Conducting a scientific archaeological study to determine the age of the mosque 3500 USD for 14 days, including analysis and write up;
6. Restoration of the broken wall and repair to the wall cracks (5000 USD for ten days). Local community will be involved in every stage and process of all the activities with a view to them taking full ownership at the end of the project.
7. Improve flood protection and drainage system including the Digging of a well/ underground water tank at the north-western side and connecting it to a piping network in order to transport the rainwater that collects inside the Mosque to protect it 17,000 USD

Total= 36,500 USD

Priority number 3 Tabo Temple

Priority number 4 Fossil Forest of El Kurru

Priority number 3: Ground Water Research in Nuri and Kerma

3a. Ground Water Research at Nuri

Recommendation:

1. It is recommended that before any action is put in place as a solution that a thorough study is carried out by a multi-disciplinary team of experts to determine the cause of the underground flooding in this area and recommend a lasting solution.
2. The team could be the same as that set up under the auspices of Ministry of Higher Education but should include professionals of relevant subjects from the local universities, local persons with traditional knowledge system of water behaviour over the years as well as representation from the regional government.
3. The study should also look at issues of microenvironment creation through new developments and their effects on heritage.
4. Part of the recommendation of such a study would be expected to cover the implementation of end-to-end Disaster Risk Management planning.
5. It would also ensure that both EIA and HIA studies are carried out before major developments are put in place including those of water extraction and use.

Budget

The budget for the exercise should include:

1. Procurement of research materials
2. Carrying out new research on the cause of underground flooding in the region
3. Per diem for the team,
4. Meetings costs,
5. Transport costs,
6. Accommodation and Food

Total USD 50,000

3b. Ground Water Research at Kerma

Recommendation:

1. It is recommended that this is one of the areas where the interdisciplinary team looking at among other things the problem of underground floods should research and provide a recommendation to address the challenge.

2. The Deffufa because of the materials used of earth and daub are in eminent danger if these challenges are not addressed soon enough and so this is an urgent a must exercise.

Budget

The Multi-disciplinary team to carry out research on the cause of underground flooding in the sites and to be catered for on:

1. Procurement of research materials
2. Per diem
3. Meetings costs,
4. Transport costs,
5. Accommodation and food.

Total: USD 10.000

Priority number 4: Backfilling of Town wall trenches at El Kurru site

4a. Trenches at El Kurru Site

Recommendation:

1. The trenches exposing the town wall that get inundated with water during flood times should be backfilled, possibly leaving only a small demonstration part that can also include the gatehouse.
2. The site should receive the same maintenance regime that the main site is getting if this part was to be left open so as to avoid decay and destruction.
3. The cost of backfilling should be met by the excavators/mission responsible if this cannot be sources within the present rescue programme.

Budget

Backfilling of Ancient Town Wall at El-Kurru

1. 8 lorries of sand at USD 43 per lorry = USD 344
2. Labour by 10 men x 7days x 10 USD = USD 700
3. Supervision =USD 350

Total = USD 1394

Priority number 5: Preservation of the Nile Steamers of the Nile Museum

Recommendation:

1. It is recommended to pull the out the ship from the water into the dry dock, carry out the necessary repairs with a view to turning it into a marine/maritime museum

Budget:

1. Make floating sandals to fix the Steamers Thurayah, Gamoosa and Asaad: Length: 26 meters, width 10 meters. Angle 2 inches, 5 mm at cost 51,818 USD
2. Maintenance of the tractor machine to move the two steamers Gamoosa and Asaad at cost 30,910 USD
3. Buy a strap wire to install the Thuryaha steamer from sinking in the Nile 16 mm wire at a cost: 5,820 USD

Total cost = 88,548 USD

Priority number 6: Restoration of the Tabiyeh (Mahdia Fortifications)

Recommendation:

1. The challenges facing the last remaining Omdurman gate and the Tabiyeh (Mahdia fortifications) should be considered under a major interdisciplinary/research study to be carried out by the group appointed under the Ministry of Higher Education that will look at the question of floods both river induced and underground and its effects on heritage and others.
2. It is further recommended that the team coordination be a joint one between the UNESCO Khartoum and the Ministry of Higher Education.
3. It is also recommended that for the time being and based on the damage already caused and the potential damage posed to the Tabiyeh from the factors discussed above, that repair/mitigation work be carried out on a numbers of them to minimize the damages with a budget provided below for the various tabiyeh

Budget for Restoration of the Tabiyeh (Mahdia Fortifications)

Al-Dibaga fortification

Total= USD 1146

Al-Gamayer fortification

Total = USD 1146

Al Hitana Fortification

Total = USD 1146

Al Sarrha Fortification

Total = USD 1446

Shambat Fortification

Total = USD 1266

Priority number 7: Project for Strengthening local communities' capacities near Boot Dam in Blue in safeguarding indigenous knowledge and inventorying local knowledge under threat

1. Mission
2. Safeguarding Plan
3. Inventorying of Living Heritage
4. Capacity Development

Budget 100,000 USD

ANNEX – GENDER

Sources

- FAO
- Humanitarian Needs Overview
- Humanitarian Response Plan
- Relief Web
- UNFPA
- UN OCHA
- Middle East Monitor
- International Federation of Red Cross and Red Crescent

ANNEX – ENVIRONMENT

Sources

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ANNEX – HUMAN IMPACT ASSESSMENT

Methodology and Limitations

The Human Development Vulnerability indices presented for the 18 states is the numerical average of the following sub-indices, where each indicator is weighted equally:

- A. Multi-dimensional Poverty sub-index (numerical average of the following)
1. Drinking water (% HH with unimproved drinking water)
 2. Sanitation (% HH with unimproved sanitation or open defecation)
 3. Housing (numerical average of % HH with unfinished roof, unfinished walls, not owner, 3+ people per room for overcrowding)
 4. Cooking fuels (% HH using solid fuels)
 5. Asset ownership (numerical average of % HH not owning mobile phone, land, vehicle of any kind, Bank account)
 6. Access to electricity (% HH without access to electricity)
 7. Health (numerical average of % HH without access to hospital within 5 km, under 5 mortality, % children not vaccinated, Malaria Parasite Incidence Rate)
 8. Education (numerical average of % of children in the appropriate age group not attending primary or secondary school)
- B. Income poverty sub-index
9. % of households in the lowest two quintiles

- C. Food Insecurity sub-index (numerical average of the following)
 - 10. % of HH that are food insecure
 - 11. Economically vulnerable households (spending more than 65% on food)
- D. Gender Inequality sub-index (numerical average of the following)
 - 12. % women married before 18
 - 13. % women with adolescent childbirth
 - 14. % women in polygamous marriages
 - 15. % women with any form of female genital mutilation
 - 16. Illiteracy among women
 - 17. % females economically inactive
 - 18. Prevalence of domestic violence
- E. Social vulnerabilities and exclusions (numerical average of the following)
 - 19. Number of refugees per 1000 people (normalised as a %)
 - 20. % of IDP population
 - 21. Prevalence of child labour
 - 22. Prevalence of physical or psychological aggression against children

Each of the sub-indices and the overall Human Development Vulnerability Index ranges from 0 to 1, 0 being the least and 1 being the most vulnerable.

Do note that this index is not comparable to the official UNDP Human Development Index, considering its different methodology, indicators used, and purpose. This vulnerability index is primarily developed to help aid the resource allocation during the recovery process across the states, to address the pre-existing systemic vulnerabilities during the recovery process.

The estimates for each of the impact areas are calculated as follows:

Step 1. Estimating the total number of people in flood affected areas (N_0). Estimate number of people in each of the states in the affected areas based on the FAO Rapid Assessment and Geographical analysis (FAO & Transitional GoS, 2020). Assumptions are made for South Darfur and Northern (5% of the population), and Gegira (25% of the population) based on the spread of impact and interviews with on-ground experts, since other estimates are not available. Population for 2020 is calculated using the 2018 Population data from Open Africa¹⁶², and growth rate of 2.5 (UNICEF & CBS, 2014) using the formula: $(x_t = x_0 * e^{(r * t)})$. Sub-groups of people are also estimated based on national and state-wise averages (e.g. number of women in affected areas, number of pregnant women in affected areas, number of children below 1, number of refugees and IDPs, etc.).

Step 2. Establishing the Baseline (C). Proportion of people with different baseline conditions are estimated using previously available data (e.g., proportion of people practicing agriculture). The most recent estimates available are used.

Step 3. Estimating the Effects (n). Proportion of people with certain characteristics affected are estimated based on the primary household survey

Step 4. Estimating the Impact (I). Impacted population and sub-groups are estimated as follows: $I = N_0 \times C \times n$

Recommendations are arrived at based on the estimates made, as well as several interviews with government officials, partnering organisations, and people's requests as gathered through the primary household surveys.

¹⁶² <http://sudan.opendataforafrica.org/cyltla/sudan-regional-atlas-fact-dataset-january-2019> last accessed on 24 Jan 2021

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