

# Paramaribo Strategic Flood Risk Assessment - innovative modelling approach

Climate and Disaster Resilience in Small Island Developing States (SIDS): Practical Solutions

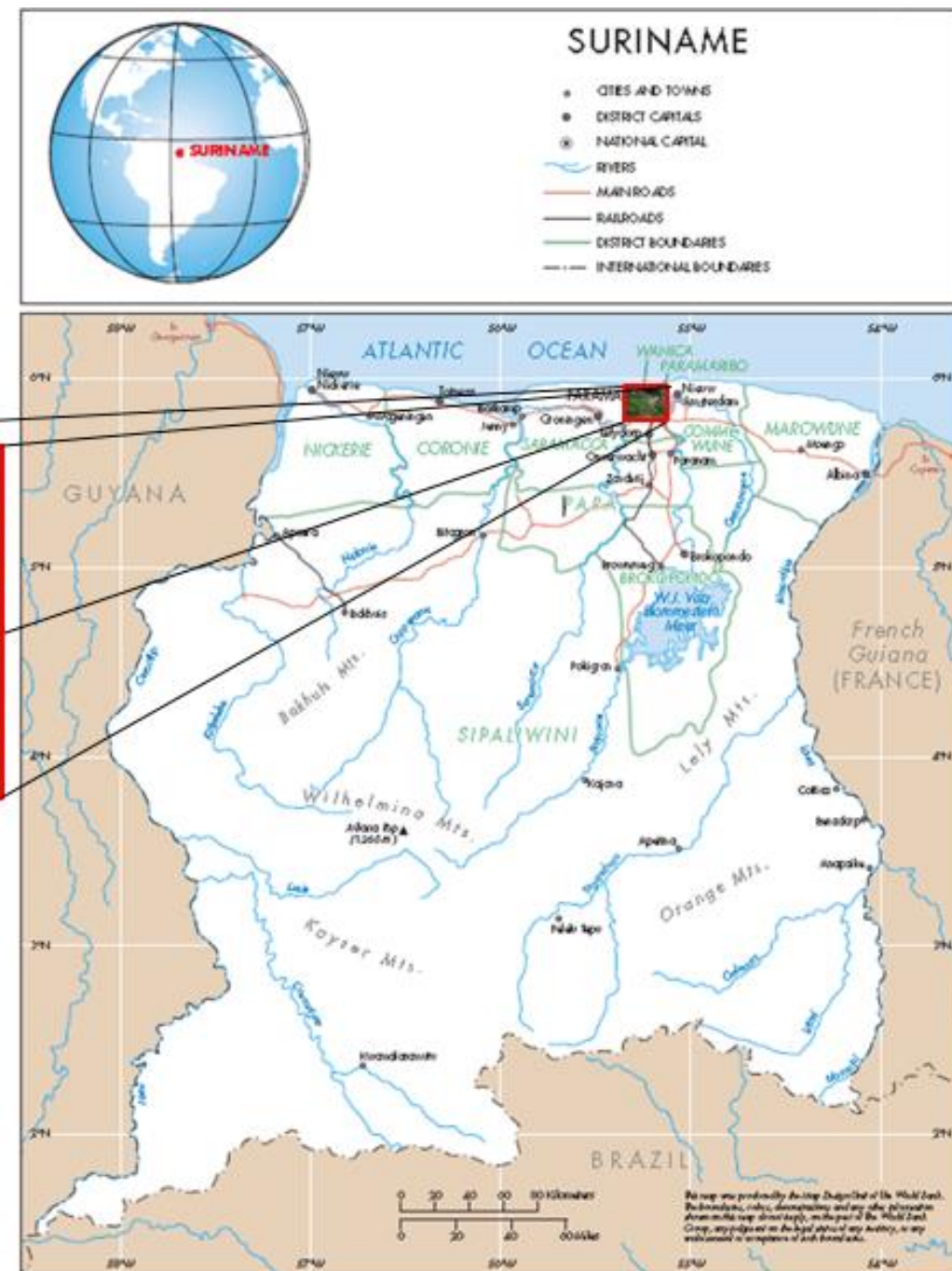
Cancún, México

May 21-23, 2017

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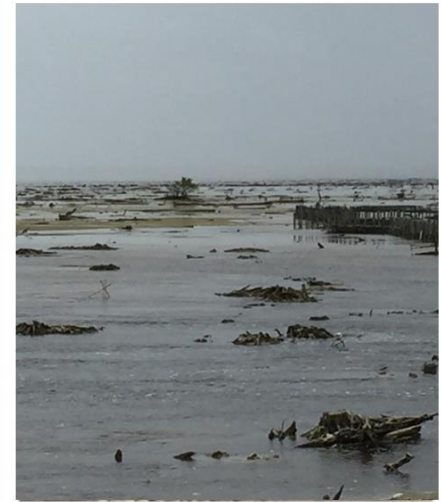
## Acknowledgements :

- Satish Mohan and MoPW Team (Government of Suriname)
- Armando Guzman (World Bank TL)
- Isabella Bovolo (Hydrologist)
- Juliana Castaño Isaza (Coastal)
- JBA Consultants



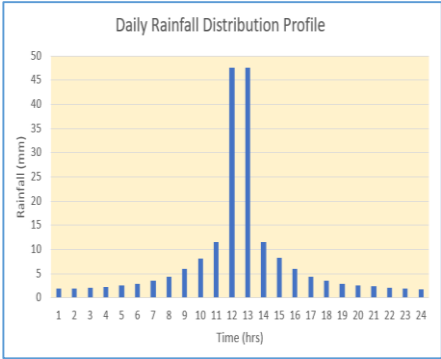
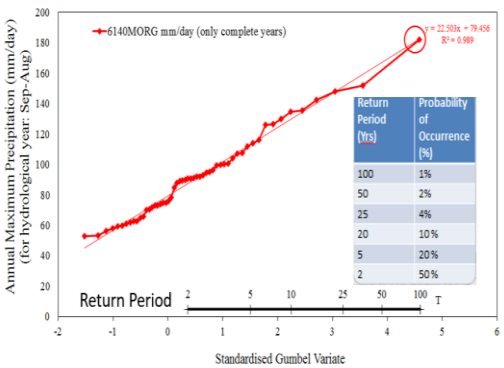
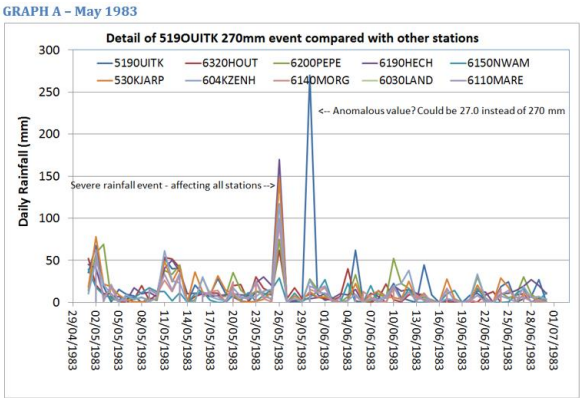
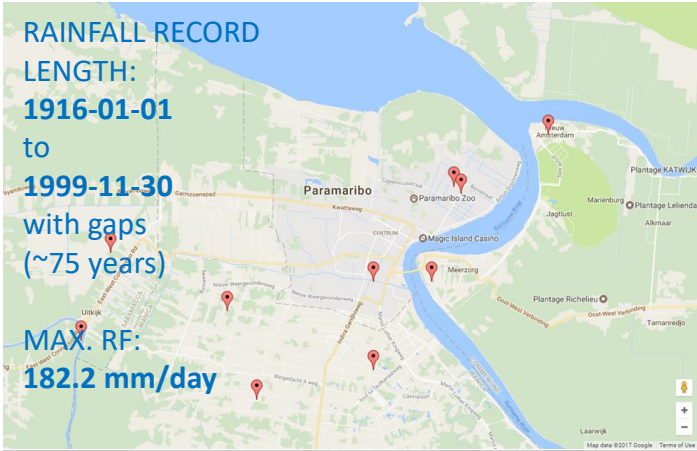


Flood risk - in and around the city of Paramaribo

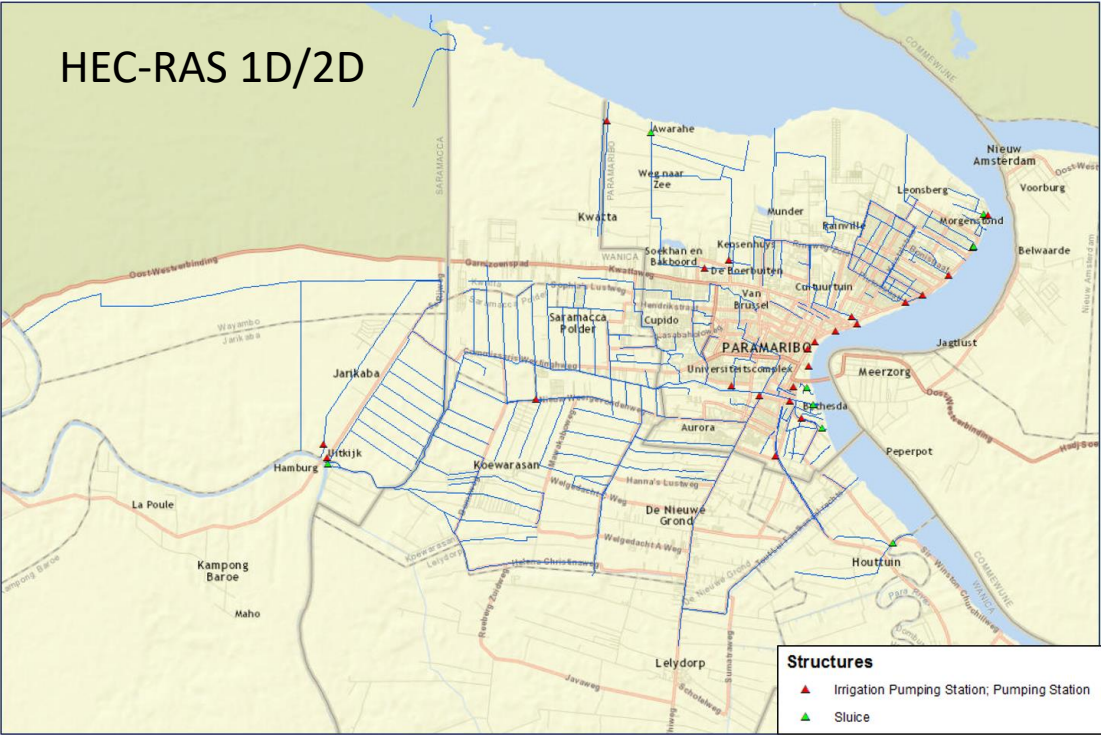
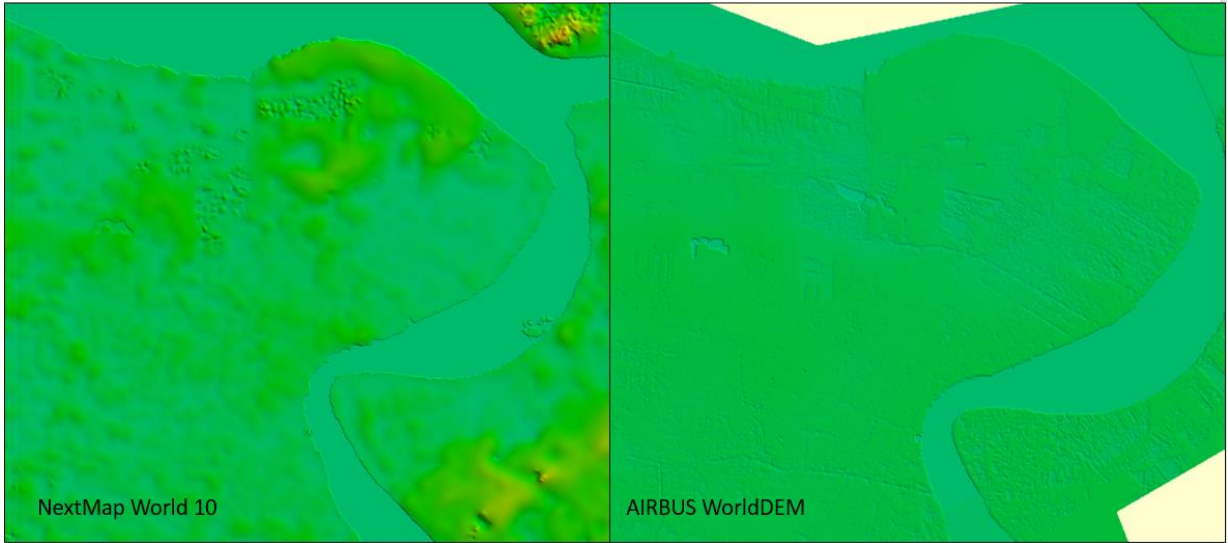




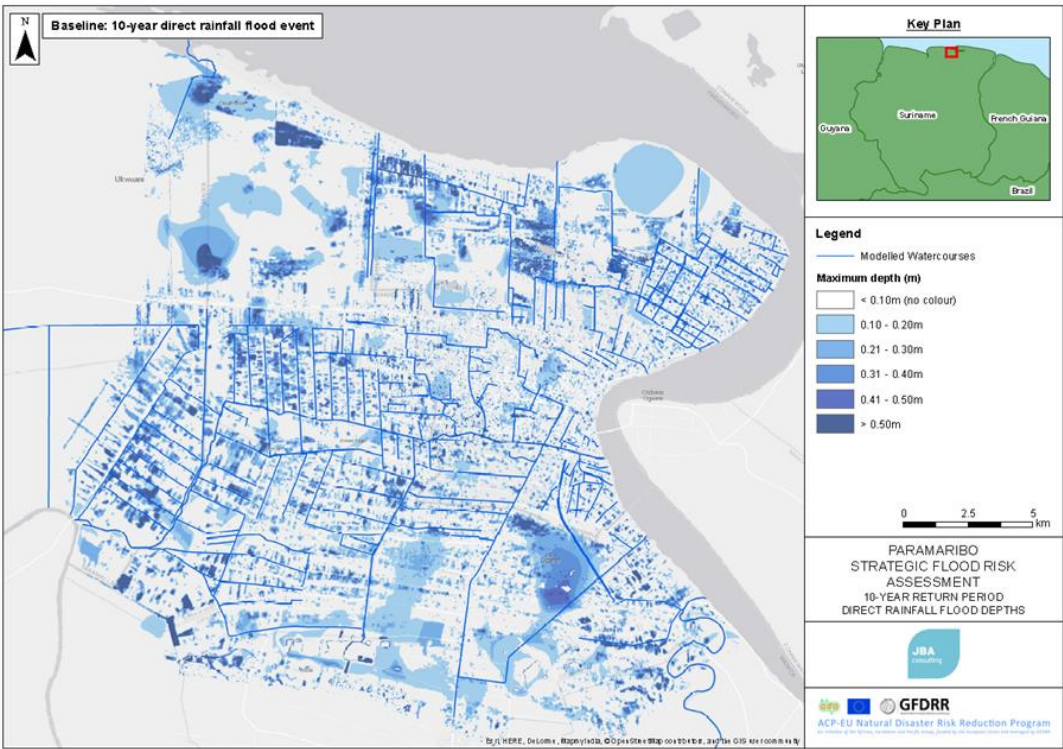
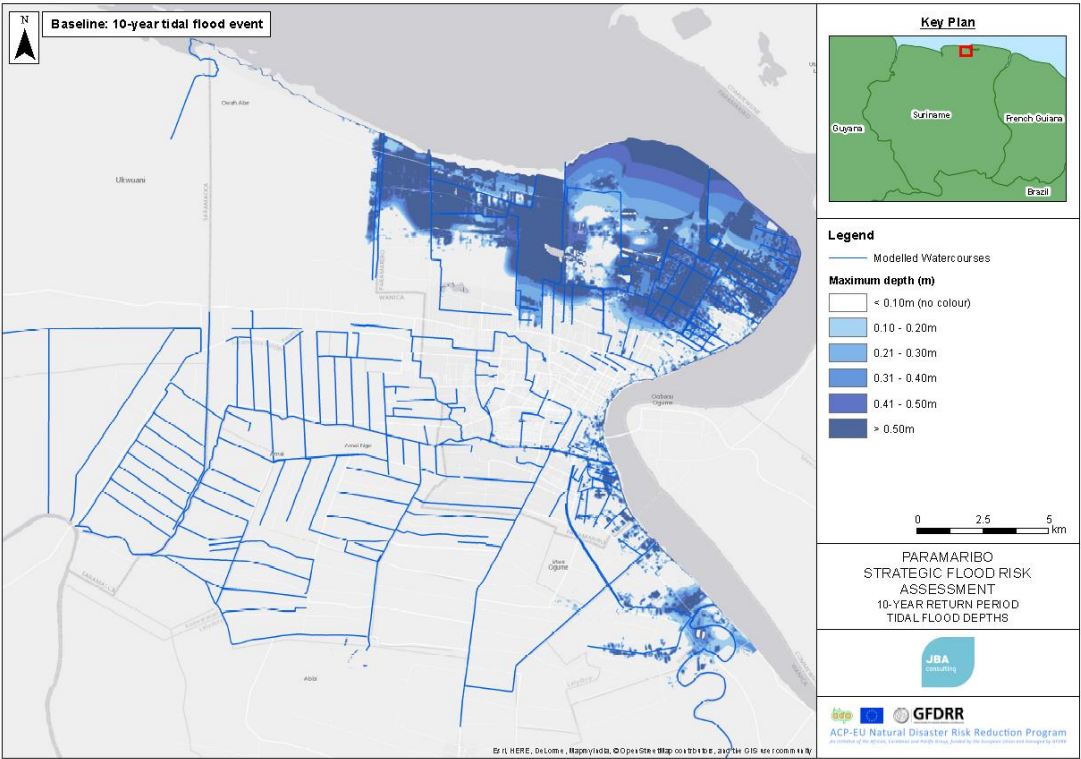
# Flood Hazard Analysis – data and approach (CHARIM)



DTM Options



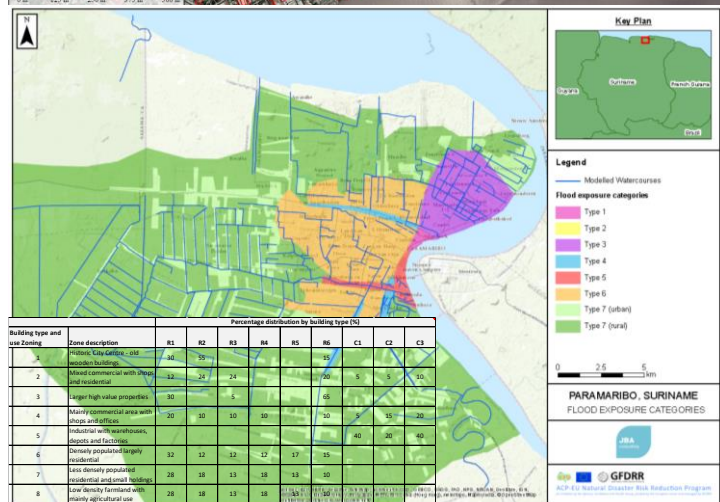
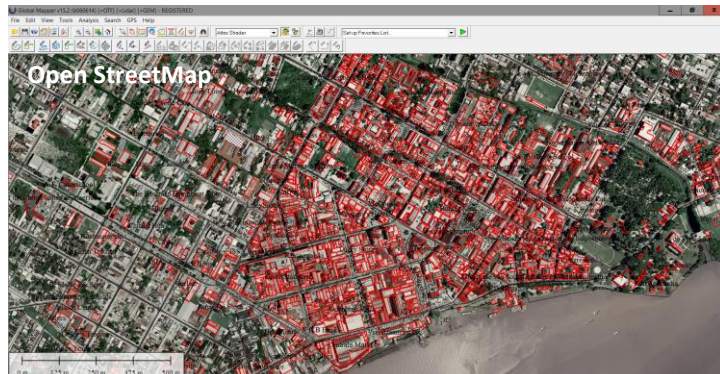
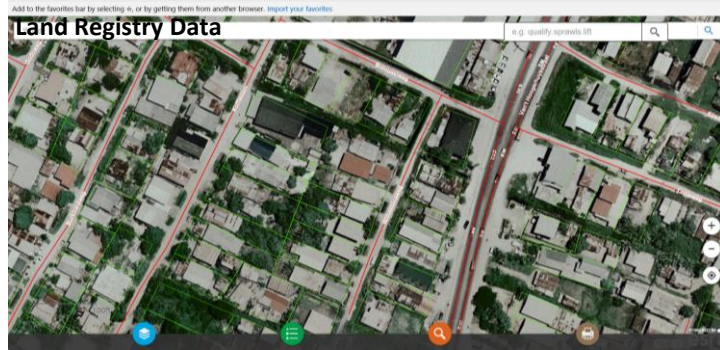
# Flood Hazard Mapping



Scenario	Area of inundation > 0.15m (Km <sup>2</sup> )			
	10 Year	50 Year	100 Year	200 Year
Baseline pluvial design event	421	444	450	455
Baseline tidal design event	97	122	132	142
Future pluvial design event (2050)	432	452	457	461
Future Tidal design event (2050)	151	168	177	190



# Exposure



# Vulnerability

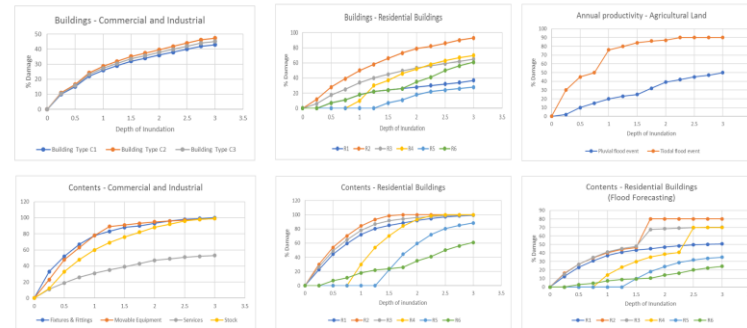
## Cost estimates

Commercial contents value	US\$/m <sup>2</sup>	Residential contents value	US\$
Furniture and fittings	400	Sofa + chairs	1,000
Movable equipment	160	Fridge	800
Stock	440	Cooker	400
Services	490	Washing machine	400
		TV + electrical goods	600
		Table + chairs	600
		Carpets	100
		Bedding etc.	1,500
		Clothes and personal	500
		<b>Total</b>	<b>5,900</b>

Building costs	
Residential	Construction cost (US\$/m <sup>2</sup> )
R1 - Concrete (masonry)	430
R2 - Wooden	375
R3 - Combined concrete-wood	400
R4 - Wooden building on concrete stilts	590
R5 - Concrete building on concrete stilts	695
R6 - Multi-story	350
Commercial/Industrial	
C1 - Steel construction	700
C2 - Full concrete	700
C3 - Combined steel-concrete	750

## Vulnerability - Depth damage curves



Exposure database – GIS grid containing information on building type, usage, value and density

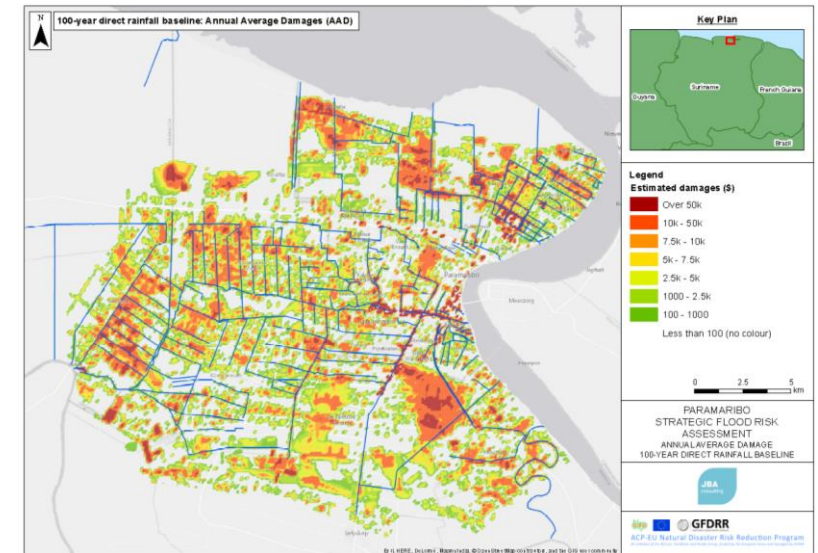
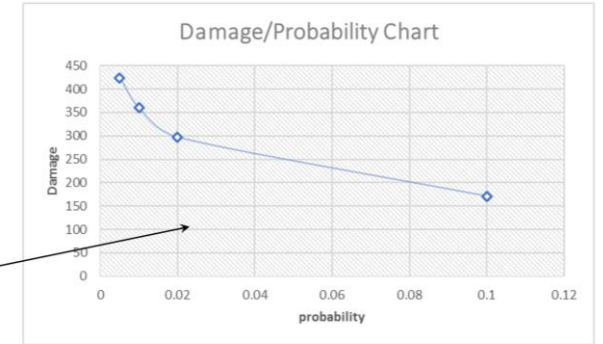


# Risk

## Vulnerability curve

Return Period	Probability	Damages
10	0.1	171
50	0.02	297
100	0.01	360
200	0.005	424

Calculate the area under the curve = **AAD** (US\$m)



## Total Event Flood Damages and AAD

Scenario	Calculated total damages (US\$ M)				
	10 Year	50 Year	100 Year	200 Year	Total AAD
Baseline pluvial design events	171	297	360	424	60.4
Future pluvial design events (2050)	218	377	451	530	76.7
Baseline tidal design events	1,069	1,488	1,684	1,886	350.4
Future tidal design events (2050)	2,185	2,747	3,001	3,256	695.1



# Options Appraisal

## Get the “right” balance between structural and non-structural measures

### Keep the water away from the people

#### Hard engineered

- Flood conveyance
- Flood storage
- Urban drainage systems
- Ground water management
- Flood resilient building design
- Flood defenses

#### Eco-system management

- Utilizing wetlands
- Creating environmental buffers
- Urban greening efforts

### Keeping the people away from the water

#### Increased preparedness

- Awareness campaigns
- Urban management

#### Flood avoidance

- Land use planning
- Resettlement

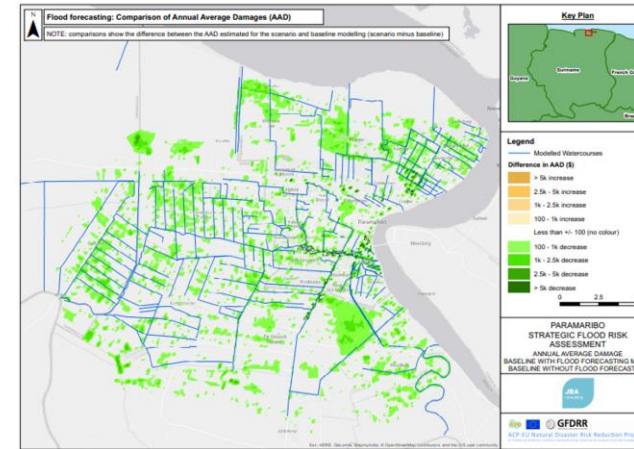
#### Emergency planning & management

- Early warning systems and evacuation
- Critical infrastructure

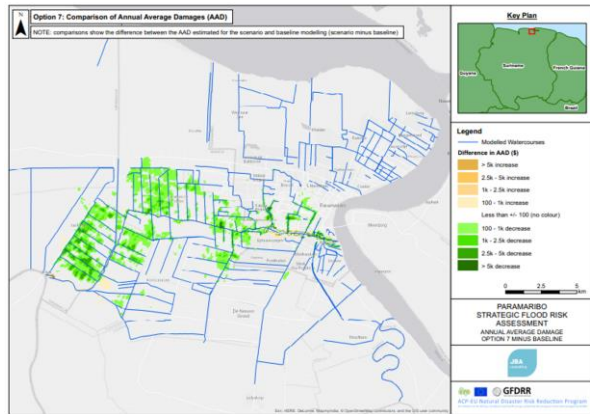
#### Speeding up recovery

- Building back safer
- Risk insurance

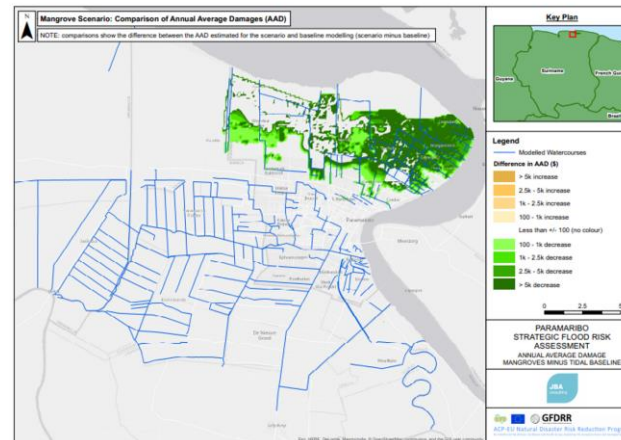
**Option 12:** Flood forecasting and early warning – assume flooding still occurs, but vulnerability can be reduced i.e. reflected through contents depth damage curves



**Option 7:** Saramacca Canal improvements – widen and increase conveyance along the canal through dredging and removal of vegetation.



**Option 13:** Increased mangrove forests – reduced coastal inundation as defined by Coastal study



# Key outcomes – support tools for:

- Risk reduction decision making, with knowledge of the levels of risk faced
- Investment planning, with improved understanding of costs through knowledge annual average damage (AAD)
- Policy development through better understanding of key risk factors
- Climate change impact assessment, with ability to test different future scenarios
- Capacity building – a key objective of the project, through training and a legacy of data and tools that can be used in the future for a wide range of detailed as well as strategic studies.

