

MAPS MATTER

Approaching Resilience through Spatial Risk Analysis

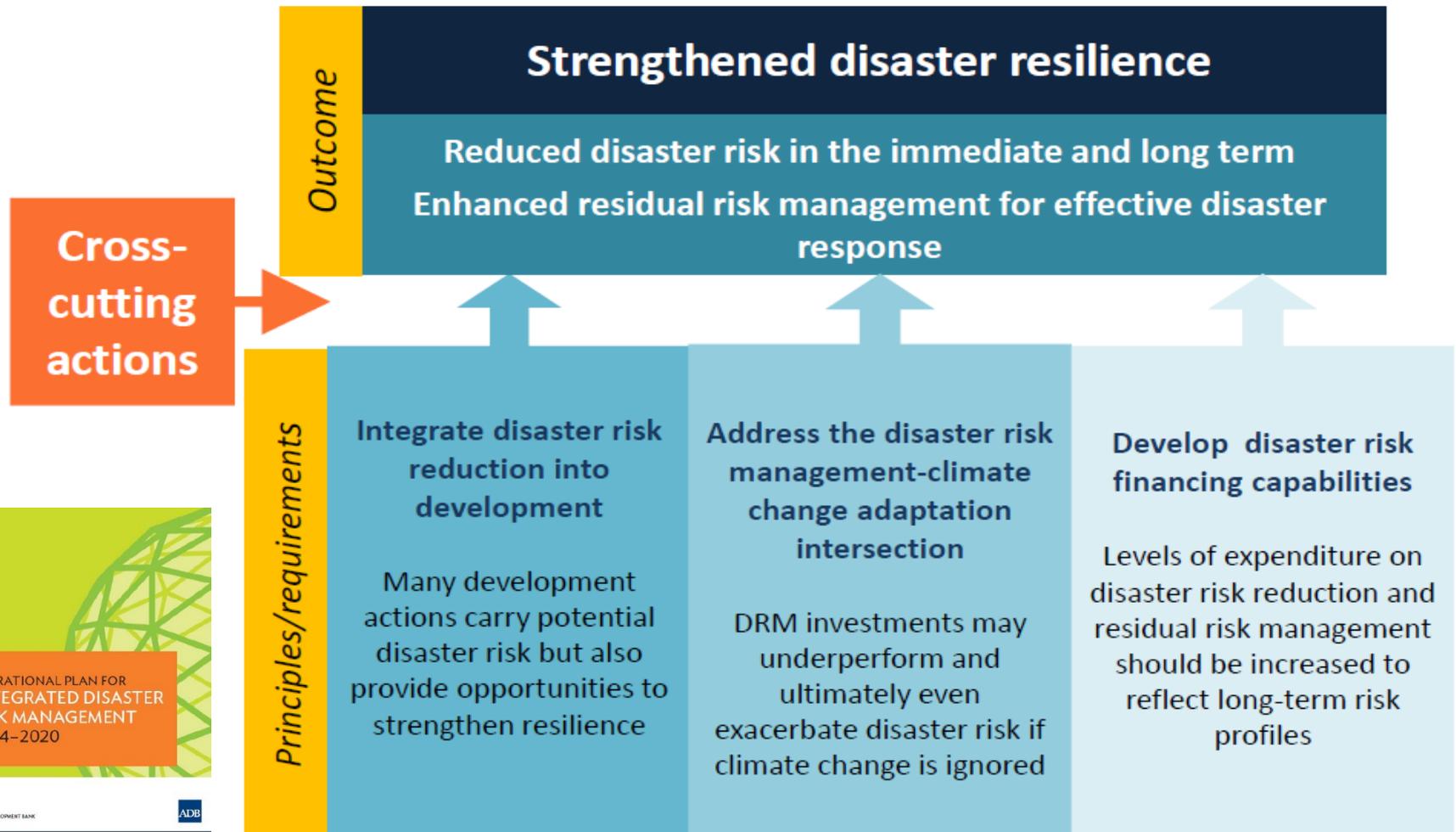
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Disaster Risk Management Specialist

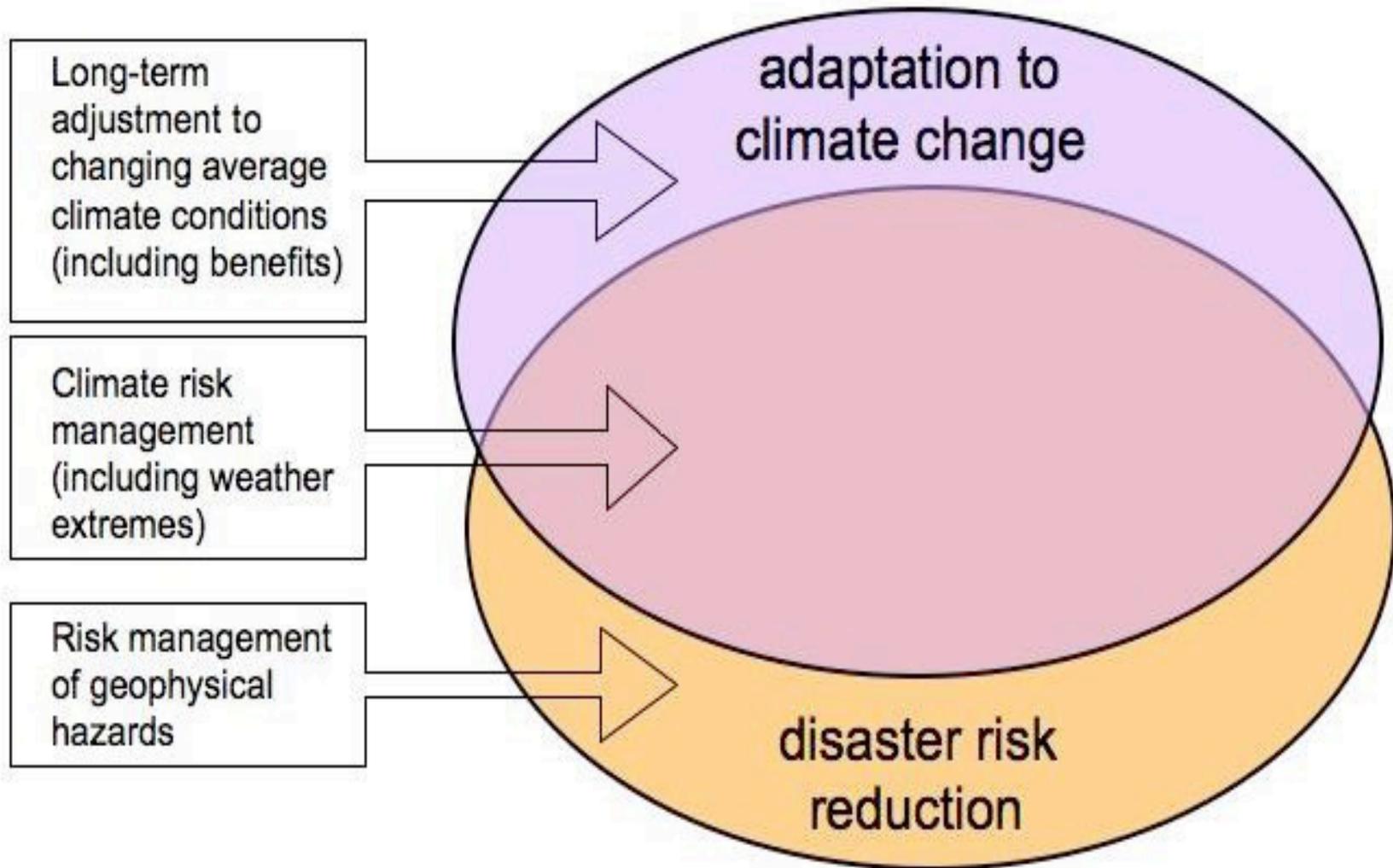
SAOD-PR, ADB Manila

Dhaka, 23 April, 2019

ADB Integrated Disaster Risk Management Approach



Disaster Risk Reduction and Climate Change Adaptation



Risk-Informed Programming

Emergency interventions should be less shock-driven and more focused on vulnerability.

Development interventions should not be 'blind' to disaster risk and climate change

→ Risk-informed programming incorporating

- disaster risk
- climate change
- conflict risk
- economic volatility

Resilience



Disaster Risk Indicators

Natural Hazards

Earthquake

Cyclone

Heat wave

Landslide

Drought

Extreme rainfall

Flood

Wild fire

Coastal hazard

Disaster risk = Hazard x Exposure x Vulnerability

Exposure

Population

GDP

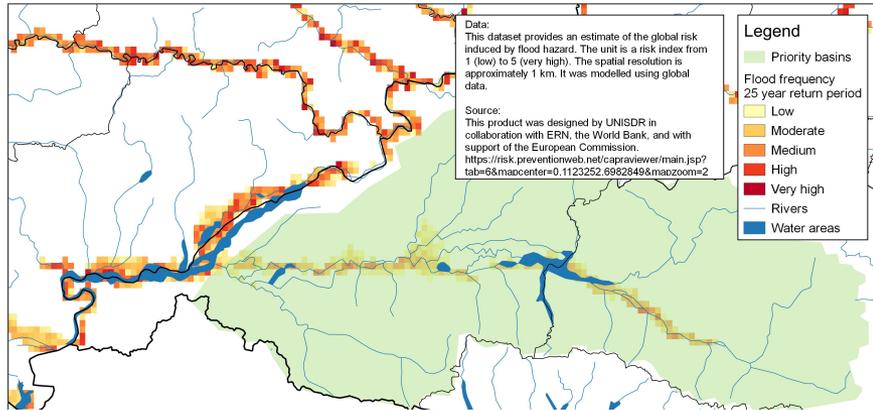
Vulnerability

Human Development Index

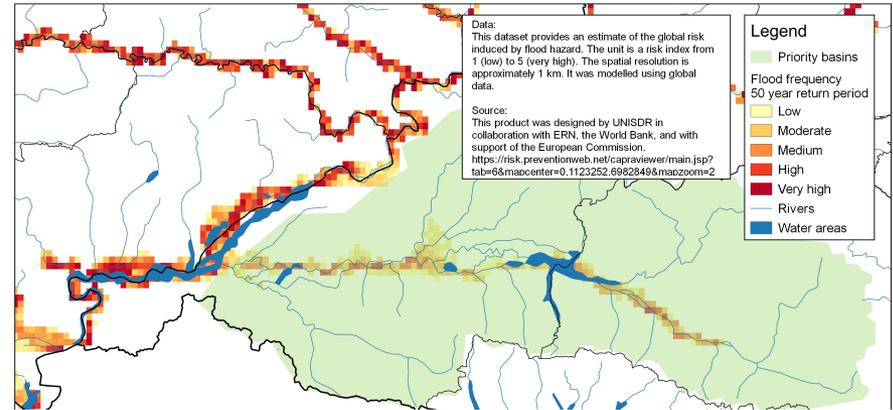
Gender Development Index

Probabilistic Risk Assessments

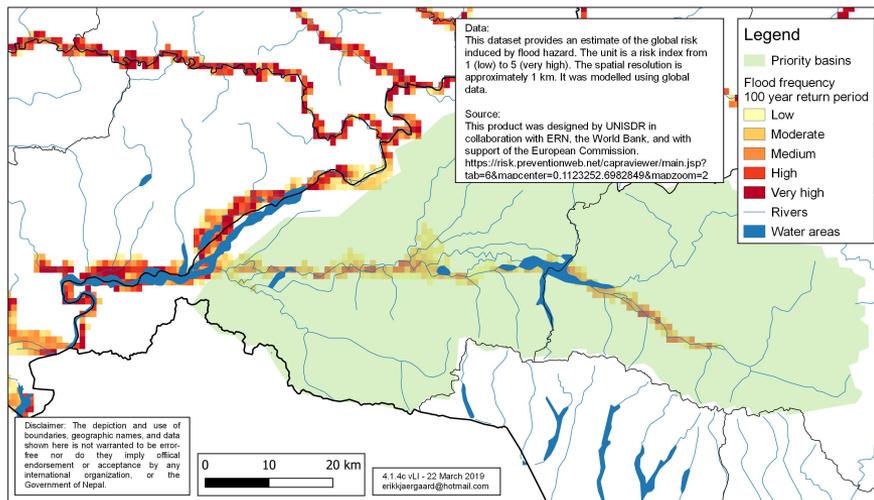
Modelled 25-year Flood Hazard of East Rapti



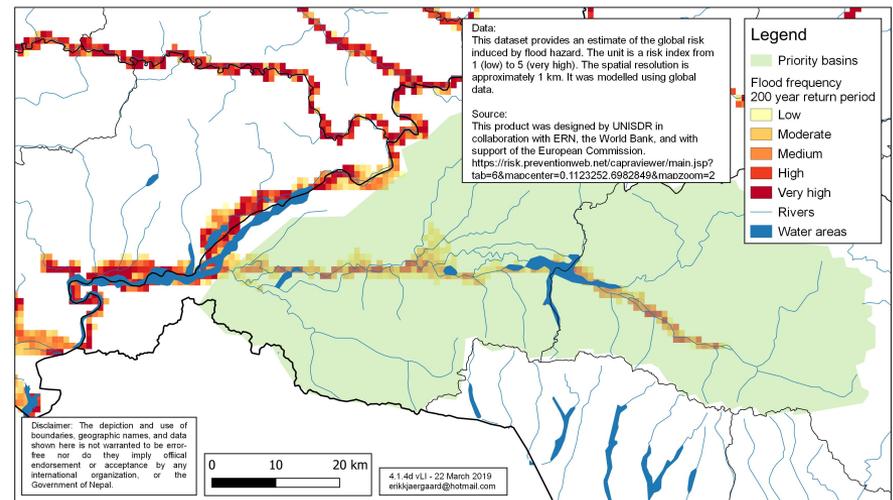
Modelled 50-year Flood Hazard of East Rapti



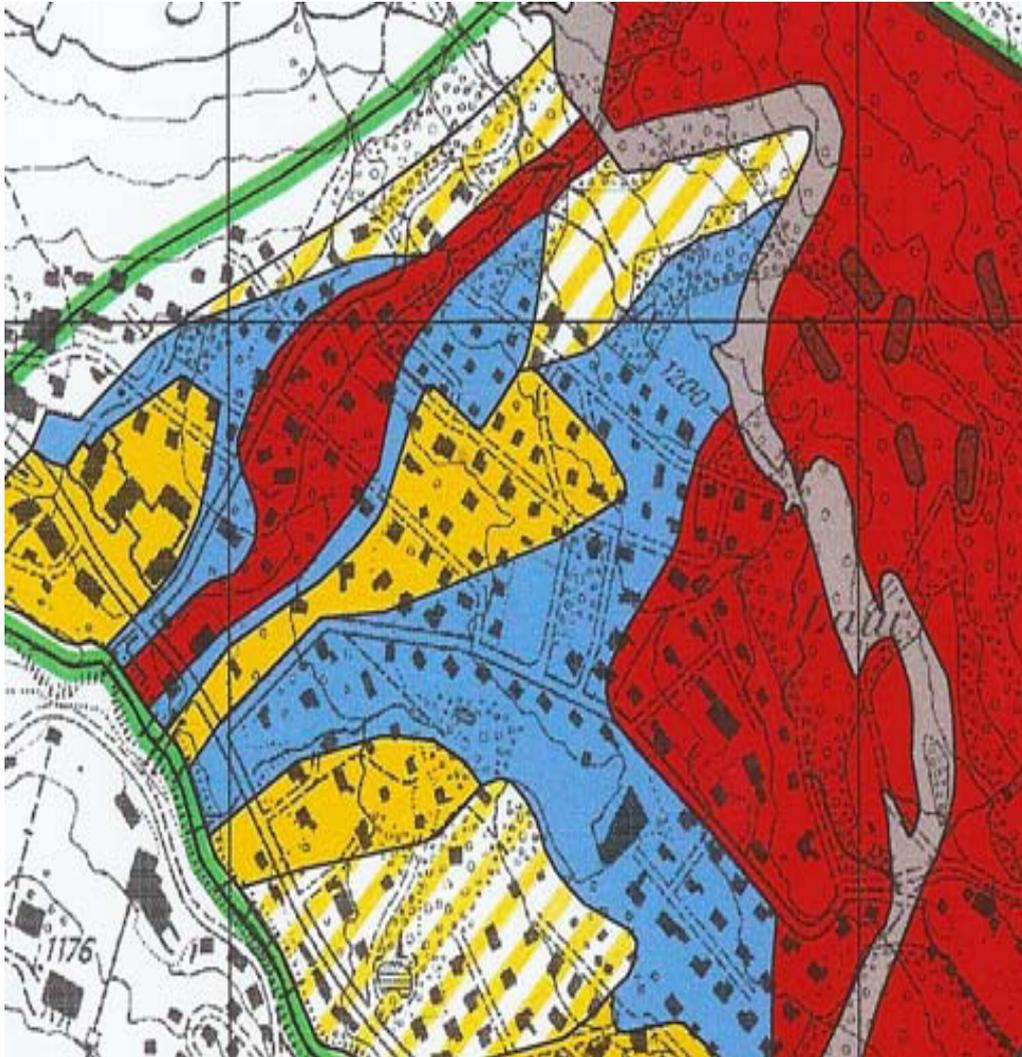
Modelled 100-year Flood Hazard of East Rapti



Modelled 200-year Flood Hazard of East Rapti



Swiss Example of Land Zoning



Hazard map based on:

1) Intensity

2) Probability

Red: high danger →
prohibited area

Blue: medium danger →
conditional use

Yellow: low danger →
awareness zone

White: residual →
awareness zone

Greater Dhaka and Surroundings



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Greater Dhaka Flood Hazard Map

Legend

Flood Hazard

- Low
- Moderate
- Medium
- High
- Very High

Data:

This flood hazard map is based on NASA timeseries satellite data year 2000-2017. A flood algorithm was applied to detect flood pixels on each eight-day satellite image to map the monthly, seasonal and annual flood extent over South Asia. The colour gradients indicate the relative flood frequency based on eighteen years of data at 500 m resolution.

Source:

NASA MODIS Terra (MOD09A1) 8-day surface reflectance data.
<https://search.earthdata.nasa.gov/search>
Data extracted by IWMI, Colombo, Sri Lanka.

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Greater Dhaka Population Map

Legend

Population

- Low
- Moderate
- Medium
- High
- Very high

Data:

This population map depicts data from the finest resolution global population distribution database available. The LandScan algorithm uses spatial data and imagery analysis technologies and the most up-to-date census data within an administrative boundary. The colour gradients indicate the relative population number across South Asia at 1 km resolution.

Source:

The LandScan Global Population Database developed at the Department of Energy's Oak Ridge National Laboratory in USA.
<http://www.eastview.com/online/landscan>
Data extracted by IWMI, Colombo, Sri Lanka.

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0 25 50 km

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Greater Dhaka Flood Population Exposure Map

Legend

Flood Population Exposure

- Low
- Moderate
- Medium
- High
- Very High

Data:

This flood population exposure map illustrates the number of people exposed to flooding in South Asia. Flood pixel values were multiplied with population values in order to obtain a relative picture of the distribution of flood population exposure. The colour gradients indicate the population exposed to flood in South Asia at 500 m resolution.

Source:

Kummu et al. (2018).
<https://doi.org/10.5061/dryad.dk1j0>
Data extracted by IWMI, Colombo, Sri Lanka.

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0 25 50 km

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Greater Dhaka GDP Map

Legend

GDP 2015

- Low
- Moderate
- Medium
- High
- Very high

Data:

This Gross Domestic Product (GDP) map is based on the GDP data set obtained from the Dryad Digital Repository together with the full national GDP data set from the 2015 World Bank Development Indicators Database. The constant 2015 international US dollars of CIA fact sheets were converted to constant 2011 international US dollars, the unit in which national GDP from the World Bank was given. For missing countries, the study used data from the CIA's World Factbook. The colour gradients indicate the relative GDP in South Asia at 5 km resolution.

Source:

Kummu et al. (2018).
<https://doi.org/10.5061/dryad.dk1j0>
Data extracted by IWMI, Colombo, Sri Lanka.

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Greater Dhaka Flood Economic Exposure Map

Legend

Flood Economic Exposure

-  Low
-  Moderate
-  Medium
-  High
-  Very High

Data:

This flood economic exposure map illustrates the total GDP exposed to flooding in South Asia. Flood pixel values were multiplied with GDP values in order to obtain a relative picture of the distribution of flood economic exposure. The colour gradients indicate the GDP exposed to flood in South Asia at 500 m resolution.

Source:

Kummu et al. (2018).
<https://doi.org/10.5061/dryad.dk1j0>
Data extracted by IWMI, Colombo, Sri Lanka.

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0 25 50 km



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Greater Dhaka Flood Hazard Map

Legend

Flood Hazard

- Low
- Moderate
- Medium
- High
- Very High

Data:

This flood hazard map is based on NASA timeseries satellite data year 2000-2017. A flood algorithm was applied to detect flood pixels on each eight-day satellite image to map the monthly, seasonal and annual flood extent over South Asia. The colour gradients indicate the relative flood frequency in districts based on eighteen years of data.

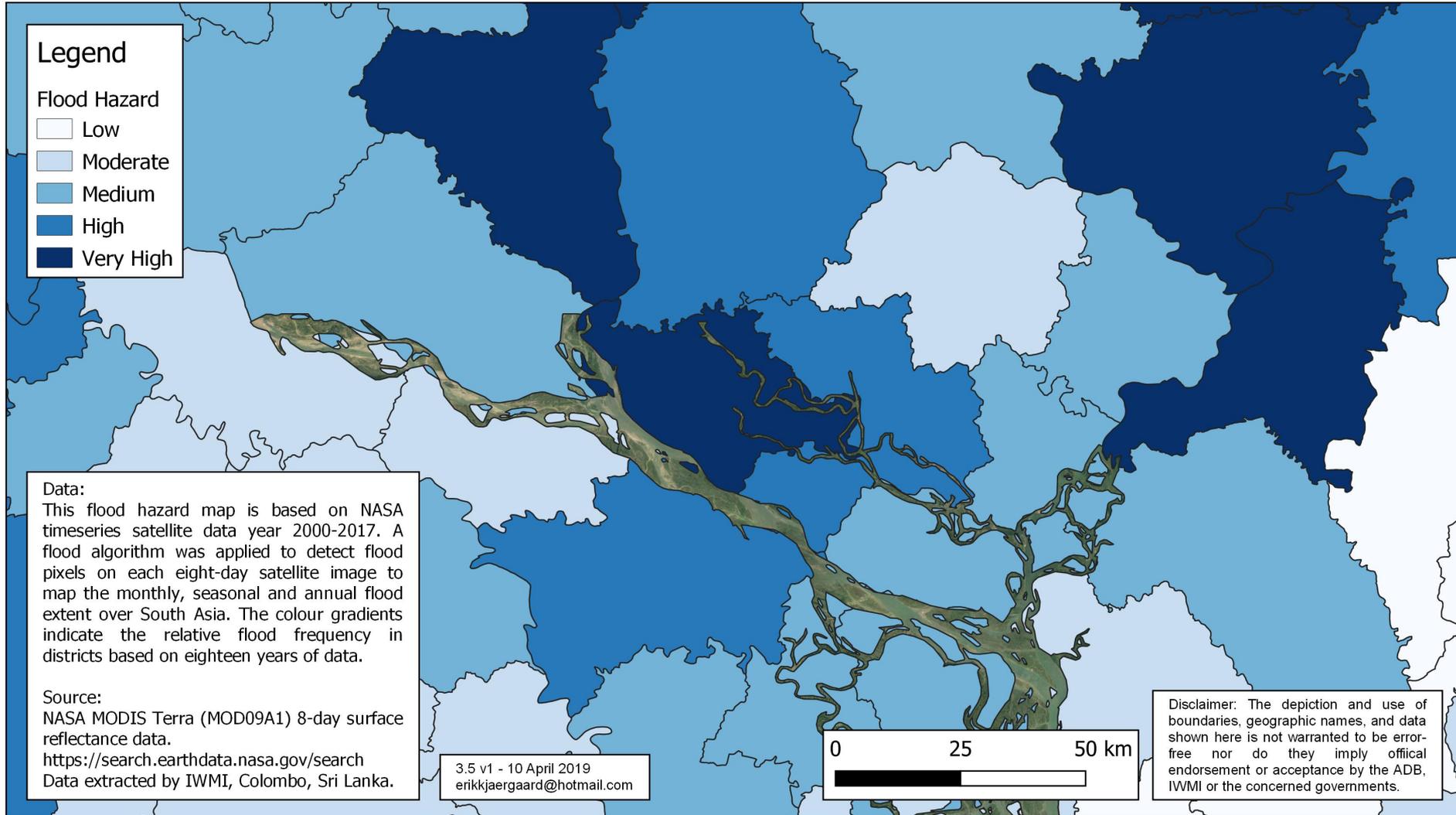
Source:

NASA MODIS Terra (MOD09A1) 8-day surface reflectance data.
<https://search.earthdata.nasa.gov/search>
Data extracted by IWMI, Colombo, Sri Lanka.

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0 25 50 km

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Greater Dhaka Flood Population Exposure Map

Legend

Flood Population Exposure

- Low
- Moderate
- Medium
- High
- Very High

Data:

This flood population exposure map illustrates the number of people exposed to flooding in South Asia. Flood pixel values were multiplied with population values in order to obtain a relative picture of the distribution of flood population exposure. The colour gradients indicate the population exposed to flood in South Asia at district level.

Source:

Kummu et al. (2018).
<https://doi.org/10.5061/dryad.dk1j0>
Data extracted by IWMI, Colombo, Sri Lanka.

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0 25 50 km

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Greater Dhaka Flood Economic Exposure Map

Legend

Flood Economic Exposure

- Low
- Moderate
- Medium
- High
- Very High

Data:

This flood economic exposure map illustrates the total GDP exposed to flooding in South Asia. Flood pixel values were multiplied with GDP values in order to obtain a relative picture of the distribution of flood economic exposure. The colour gradients indicate the GDP exposed to flood in South Asia at district level.

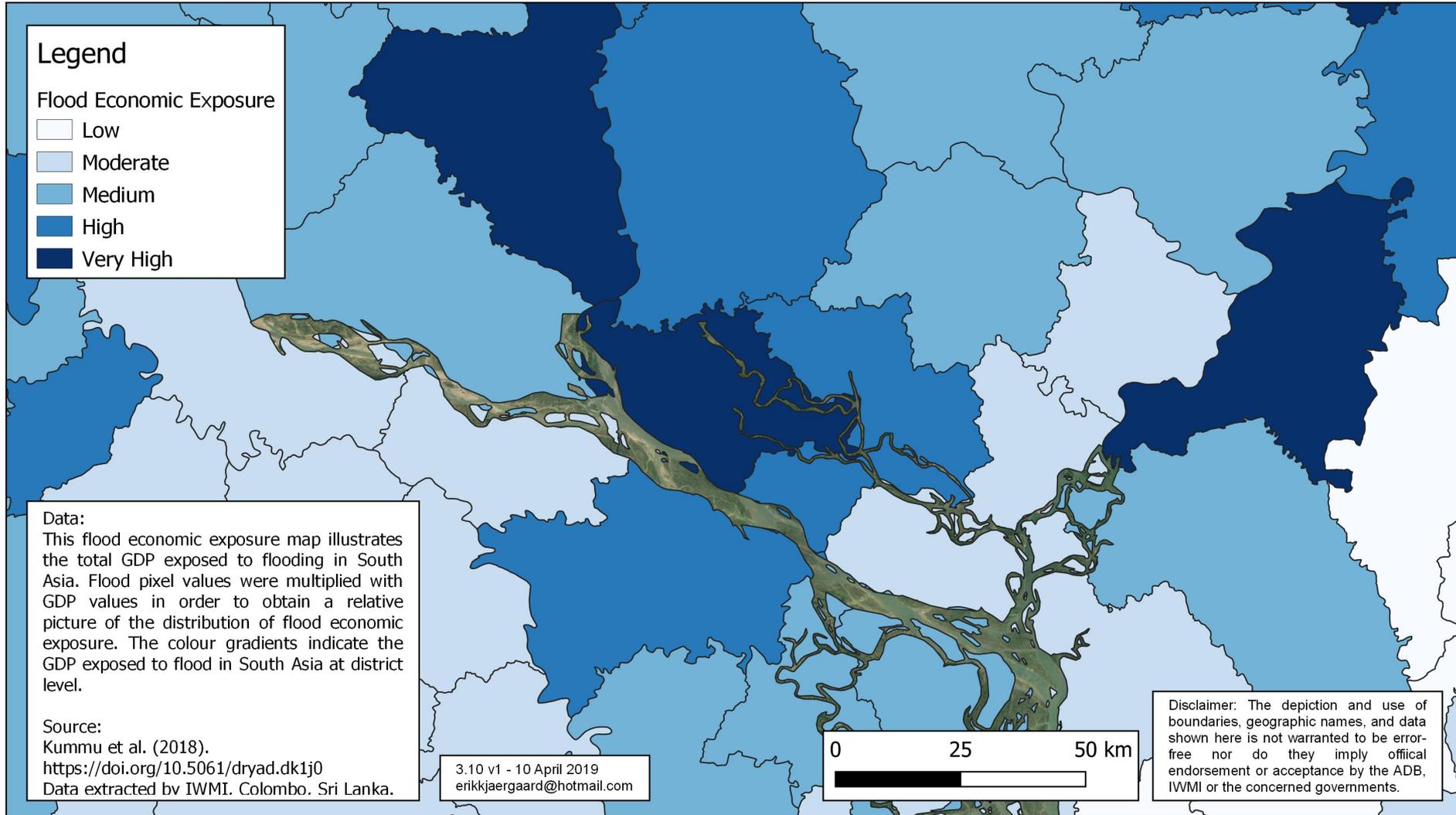
Source:

Kummu et al. (2018).
<https://doi.org/10.5061/dryad.dk1j0>
Data extracted by IWMI, Colombo, Sri Lanka.

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0 25 50 km

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Key Messages

- Publicly available datasets and open source software open doors to new ways of approaching resilience
- Spatial risk mapping has great potential to enhance ADB's approach to DRM and adaptation
- Not only natural hazards and climate change matters – exposure and vulnerability are equally or perhaps more important
- Disaster risk reduction offers baseline data for adaptation and resilience