

CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY



The IPCC Special Report on Managing the Risks
of Extreme Events and Disasters to Advance
Climate Change Adaptation



An underwater photograph of a coral reef. The water is a deep, murky green. The reef is covered in coral, but many of the coral polyps are missing, leaving behind a skeletal, brownish structure. In the center, there is a prominent, circular, light-colored coral structure that appears to be a remnant of a colony. The overall scene depicts a degraded and dying coral reef ecosystem.

WIDESPREAD OBSERVED IMPACTS

A CHANGING WORLD

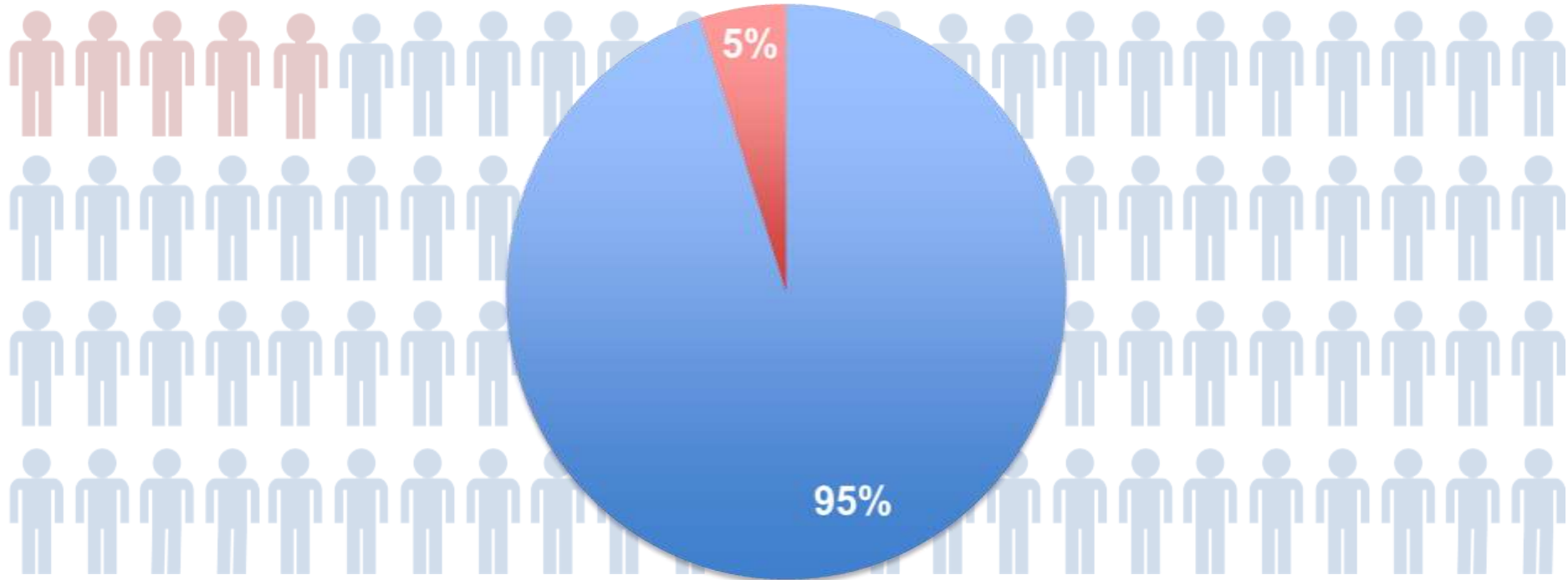
A changing climate leads to changes in extreme weather and climate



Economic disaster losses are higher in developed countries



Fatalities are higher in developing countries



From 1970-2008, over **95%** of natural-disaster-related deaths occurred in developing countries

Increasing exposure of people and assets has been the major cause of changes in disaster losses



Floods surround houses in Vietnam's Ha Tinh province after torrential rain submerged tens of thousands of houses (October 2016). Photograph: STR/EPA



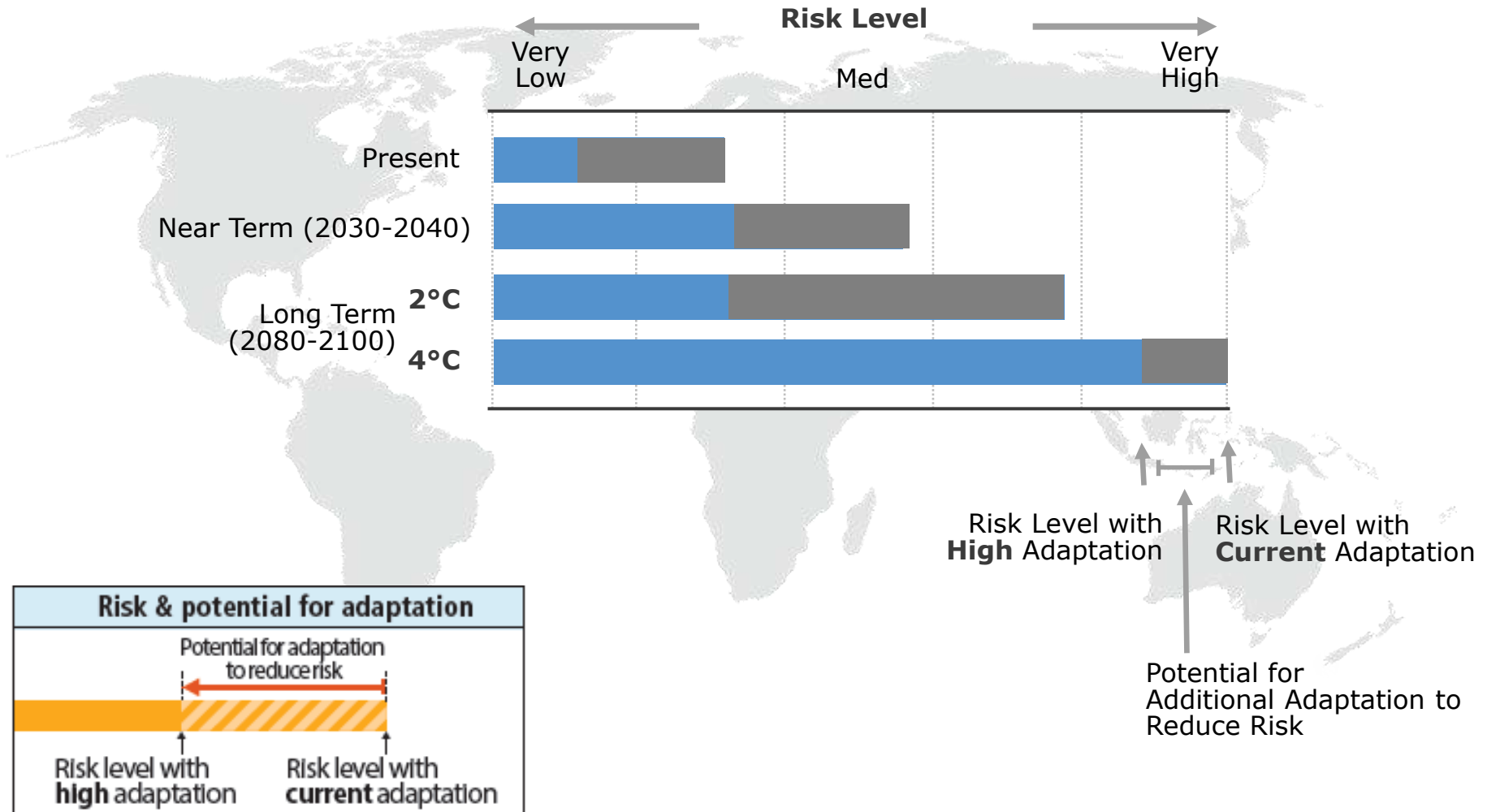
CLIMATE CHANGE

REDUCING AND MANAGING RISKS

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INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Assessing risk



Asia

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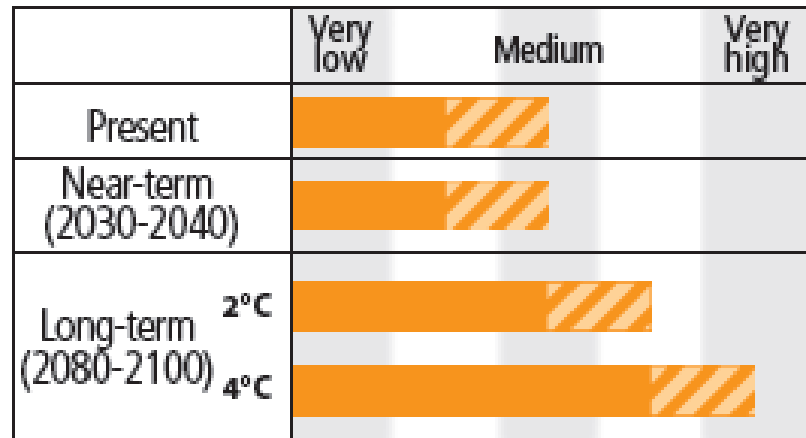
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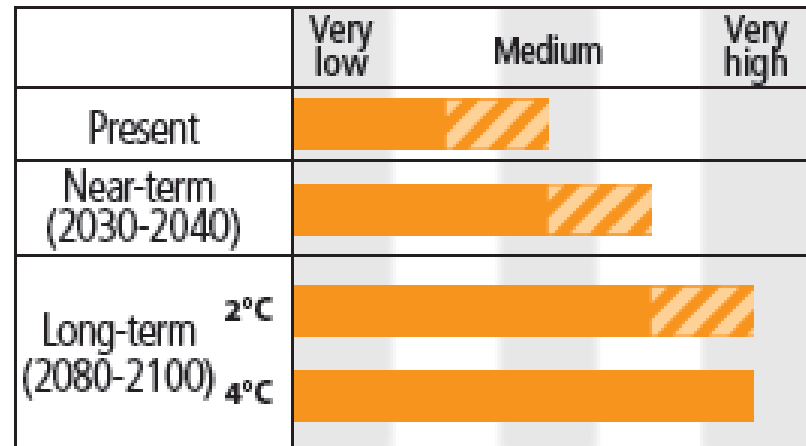
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Key Risks in Asia

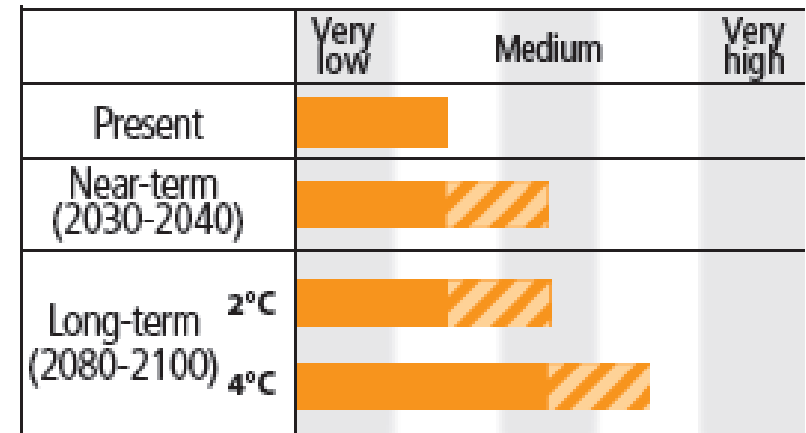
Increased coastal, riverine and urban flooding leading to widespread damage to infrastructure and settlements in Asia (medium confidence)



Increased risk of heat-related mortality (high confidence)



Increased risk of drought-related water and food shortage causing malnutrition (high confidence)

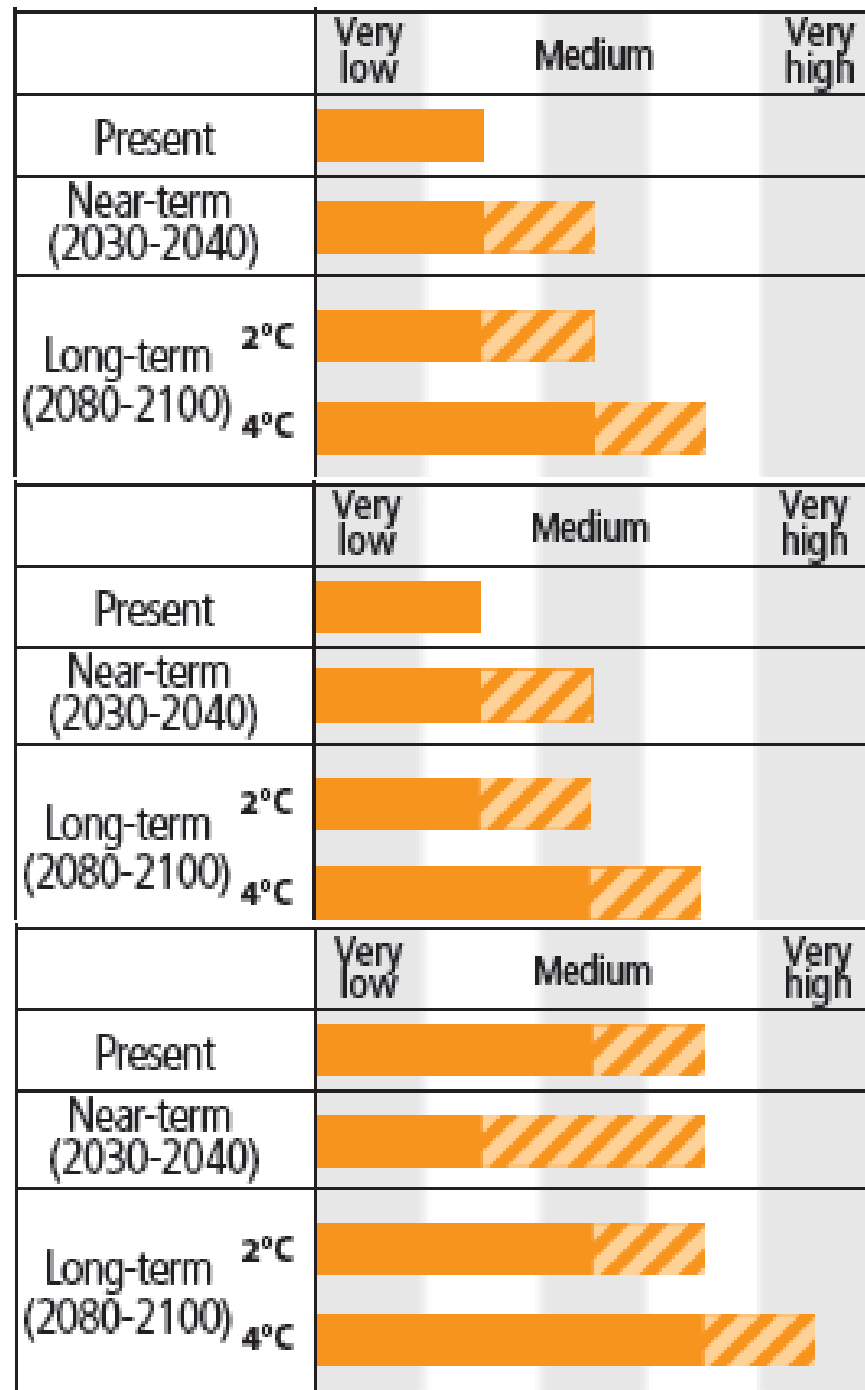


Key Risks in Asia

Increased risk of flood-related deaths, injuries, infectious diseases and mental disorders (medium confidence)

Increased risk of water and vector-borne diseases (medium confidence)

Exacerbated poverty, inequalities and new vulnerabilities (high confidence)



Key Risks in Asia

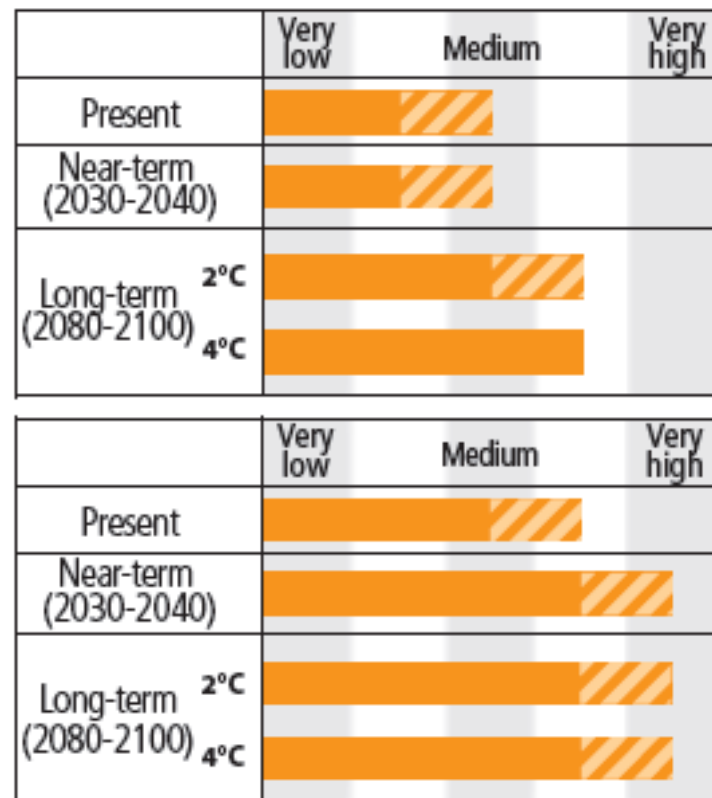
Increased risk of crop failure and lower crop production could lead to food insecurity in Asia (medium confidence)

Water shortage in arid areas of Asia (medium confidence)

KEY CONCLUSIONS: IPCC-WG2

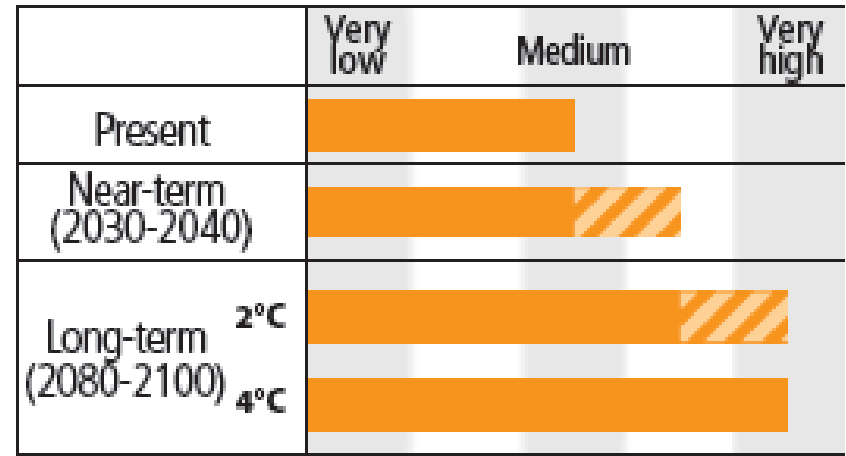
Chapter 24, Asia

- ❑ Water scarcity is expected to be a major challenge for most of the region due to increased water demand and lack of good management (*medium confidence*)
- ❑ There is *low confidence* in future precipitation projections at a sub-regional scale and thus in future freshwater availability in most parts of Asia.
- ❑ Integrated water management strategies could help adapt to climate change, including developing water saving technologies, increasing water productivity, and water reuse.

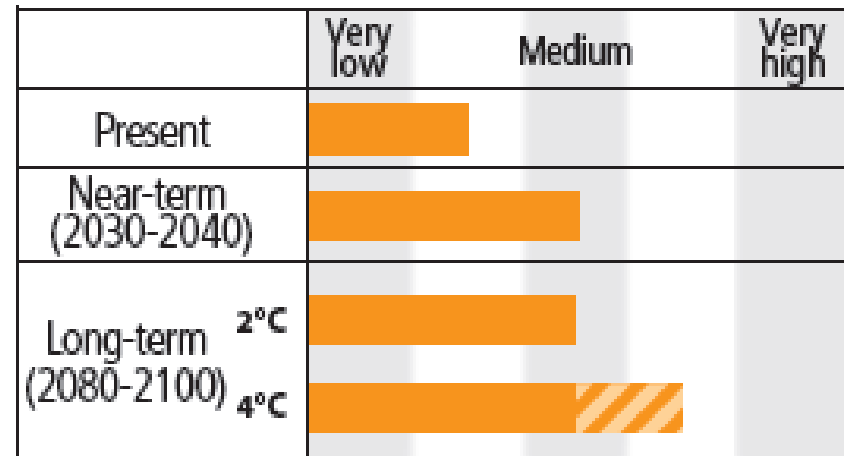


Key Risks in Asia

Coral reef decline in Asia (high confidence)



Mountain-top extinctions in Asia (high confidence)



Adaptation is already occurring

- 
- Combining Traditional and Scientific Knowledge
 - Adapting Communications Infrastructure
 - Coastal & Water Management
 - Environmental Protection & Land Planning
 - Disaster Risk Management
 - Municipal-Level Actions
 - Adapting Energy & Public Infrastructure
 - Development Planning
 - Early Warning Systems
 - Mangrove Reforestation
 - Water Resources Management
 - Disaster Risk Management
 - Basic Public Health
 - Livelihood Diversification
 - Ecosystem-Based Adaptation
 - Water Resources Management
 - Resilient Crop Varieties
 - Planning for Sea-Level Rise
 - Planning for Reduced Water Availability
 - International Cooperation
 - Marine Spatial Planning

Effective risk management and adaptation are tailored to local and regional needs and circumstances

- Changes in climate extremes vary across regions
- Each region has unique vulnerabilities and exposure to hazards
- Effective risk management and adaptation address the factors contributing to exposure and vulnerability



Source: IPCC, 2012

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INTERGOVERNMENTAL PANEL ON climate change

Observations of Past Events

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

| Climate Phenomenon | Asia | Southeast Asia |
|--------------------|--|--|
| Heat Waves | It is likely that the frequency of heat waves has increased in large parts of Asia. | No Specific Observations (published in peer reviewed literature) |
| Drought | There is medium confidence that more megadroughts occurred in monsoon Asia and wetter conditions prevailed in arid Central Asia monsoon region during the Little Ice Age (1450–1850) compared to the Medieval Climate Anomaly (950–1250). | No Specific Observations (published in peer reviewed literature) |
| Floods | With high confidence, past floods larger than recorded since the 20th century occurred during the past five centuries in eastern Asia. There is medium confidence that in the Near East and India modern large floods are comparable or surpass historical floods in magnitude and/or frequency. | No Specific Observations (published in peer reviewed literature) |

Future Projections

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

| Climate Phenomenon | Asia | Southeast Asia |
|--|--|---|
| <p>Precipitation</p> | <p>Future increase in precipitation extremes related to the monsoon is very likely in East Asia, South Asia and Southeast Asia.</p> | <p>Future increase in precipitation extremes related to the monsoon is very likely in Southeast Asia.</p> |
| | <p>Indian monsoon rainfall is projected to increase. For the East Asian summer monsoon, both monsoon circulation and rainfall are projected to increase.</p> | <p>There is low confidence in projections of future changes in the Madden-Julian Oscillation due to the poor skill in model simulations of this intraseasonal phenomenon and the sensitivity to ocean warming patterns. Future projections of regional climate extremes in Southeast Asia are therefore of low confidence.</p> <p>Reduced precipitation in Indonesia in Jul-Oct due to pattern of Indian Ocean warming (RCP 4.5 or higher end scenarios)</p> |
| <p>El Niño-Southern Oscillation</p> | <p>Natural modulations of the variance and spatial pattern of El Niño-Southern Oscillation are so large that confidence in any projected change for the 21st century remains low. Confidence is low in changes in climate impacts for most of Asia.</p> | <p>Low Confidence in any projected change for the 21st century.</p> |

Chapter 24, Asia: Coverage of Information

| Sector | Topics/issues | North Asia | | East Asia | | Southeast Asia | | South Asia | | Central Asia | | West Asia | |
|--|--------------------------------------|------------|----|-----------|----|----------------|----|------------|----|--------------|----|-----------|----|
| | | O | P | O | P | O | P | O | P | O | P | O | P |
| Freshwater resources | Major river runoff | / | x | / | / | / | / | / | x | x | x | x | x |
| | Water supply | x | x | x | x | x | x | x | x | x | x | x | x |
| Terrestrial and inland water systems | Phenology and growth rates | / | / | / | / | x | x | x | x | x | x | x | x |
| | Distributions of species and biomes | / | / | / | / | x | x | x | / | x | x | x | x |
| | Permafrost | / | / | / | / | / | x | / | / | / | / | / | x |
| | Inland waters | x | x | / | x | x | x | x | x | x | x | x | x |
| Coastal systems and low-lying areas | Coral reefs | NR | NR | / | / | / | / | / | / | NR | NR | / | / |
| | Other coastal ecosystems | x | x | / | / | x | x | x | x | NR | NR | x | x |
| | Arctic coast erosion | / | / | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Food production systems and food security | Rice yield | x | x | / | / | x | / | x | / | x | x | x | / |
| | Wheat yield | x | x | x | x | x | x | x | / | x | x | / | / |
| | Corn yield | x | x | x | / | x | x | x | x | x | x | x | x |
| | Other crops (e.g., barley, potato) | x | x | / | / | x | x | x | x | x | x | / | / |
| | Vegetables | x | x | / | x | x | x | x | x | x | x | x | x |
| | Fruits | x | x | / | x | x | x | x | x | x | x | x | x |
| | Livestock | x | x | / | x | x | x | x | x | x | x | x | x |
| | Fisheries and aquaculture production | x | / | x | / | x | / | x | x | x | x | x | x |
| | Farming area | x | / | x | / | x | x | x | / | x | / | x | x |
| | Water demand for irrigation | x | / | x | / | x | x | x | / | x | x | x | x |
| Pest and disease occurrence | x | x | x | x | x | x | x | / | x | x | x | x | |
| Human settlements, industry, and infrastructure | Floodplains | x | x | / | / | / | / | / | / | x | x | x | x |
| | Coastal areas | x | x | / | / | / | / | / | / | NR | NR | x | x |
| | Population and assets | x | x | / | / | / | / | / | / | x | x | x | x |
| | Industry and Infrastructure | x | x | / | / | / | / | / | / | x | x | x | x |
| Human health, security, livelihoods, and poverty | Health effects of floods | x | x | x | x | x | x | / | x | x | x | x | x |
| | Health effects of heat | x | x | / | x | x | x | x | x | x | x | x | x |
| | Health effects of drought | x | x | x | x | x | x | x | x | x | x | x | x |
| | Water-borne diseases | x | x | x | x | / | x | / | x | x | x | x | x |
| | Vector-borne diseases | x | x | x | x | / | x | / | x | x | x | x | x |
| | Livelihoods and poverty | x | x | / | x | x | x | / | x | x | x | x | x |
| | Economic valuation | x | x | x | x | / | / | / | / | x | x | x | x |

Vulnerability in Vietnam: Flood areas corresponding to 75 cm and 100 cm sea-level rise

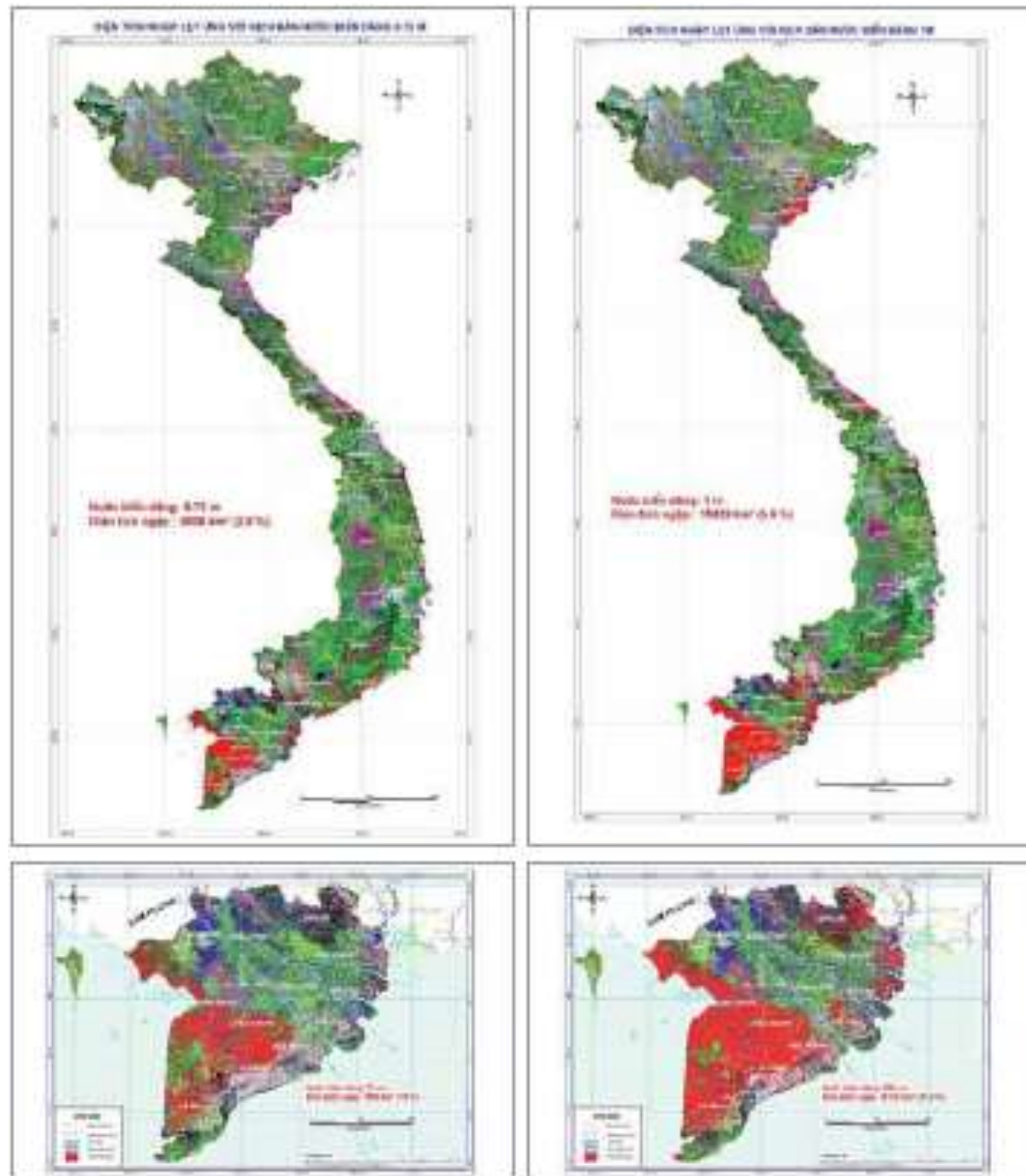


Figure 8.5. Flood area corresponding to 75 cm and 100 cm sea-level rise