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Potential Climate Change Impacts in the Mekong Region

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Workshop on Climate Change Adaptation for Biodiversity Conservation in the Greater Mekong Region
Bangkok, Thailand
July 20-21, 2009

Observed Impacts

- Increased damage, injury, and loss of life from floods, landslides, and droughts (IPCC 2007)
- Loss of mangroves, coastal erosion and altered wetlands due to combination of climate change and land use.
- Altered fire regimes (IPCC 2007)
- Altered relative abundance of bird species in Thailand (Round & Gale 2008)
- Altered tree species distributions and gibbon diets in Khao Yai N.P. (Brockelman 2009)
- Rice yields decline 10% with 1°C increase in minimum temperature (Peng et al. 2004)

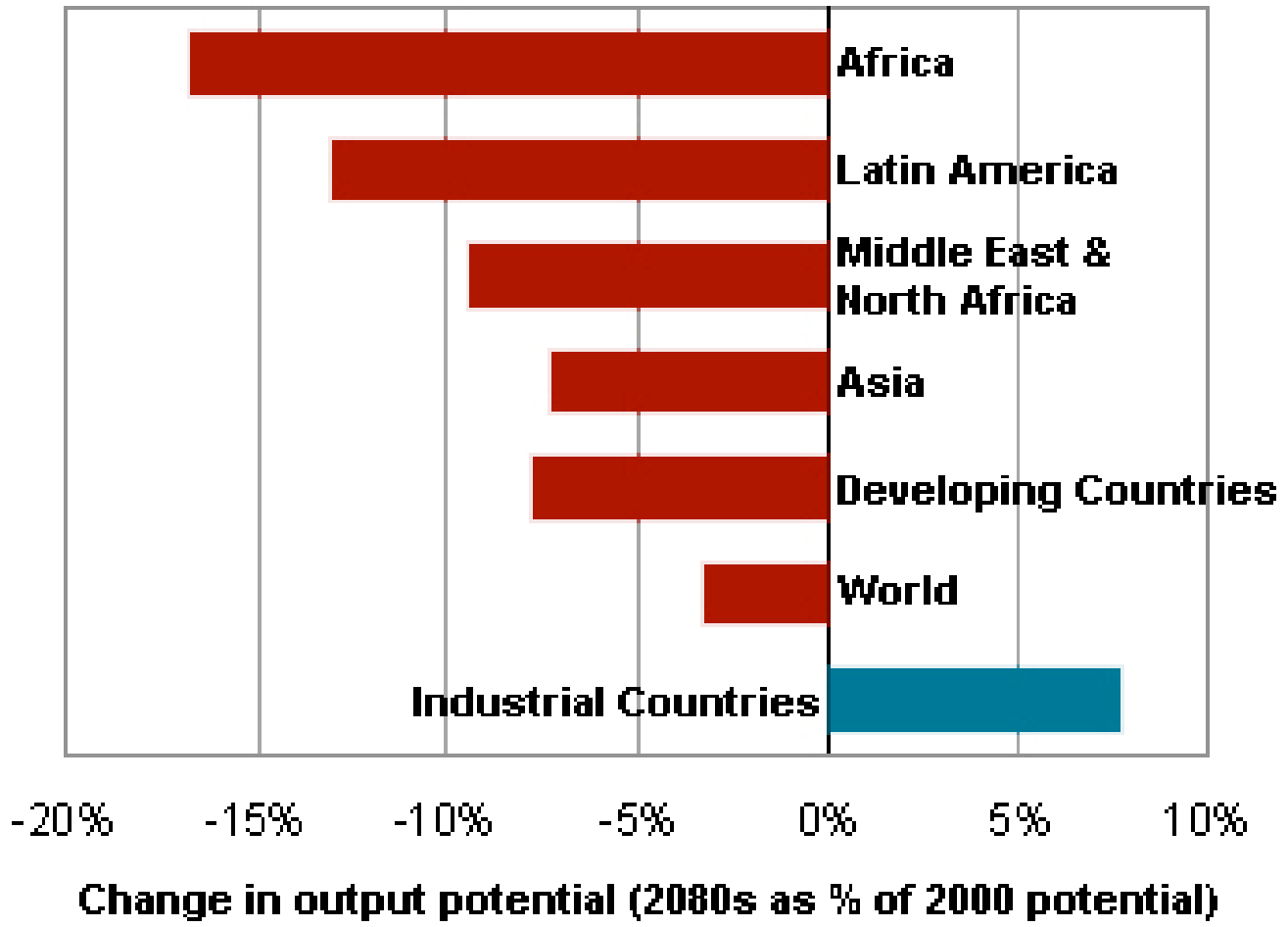
Anticipated Impacts

Warmer temperatures will:

- Alter fire & hydrological regimes
- Dry isolated ponds and seasonal wetlands
- Shift location of species' ranges & alter forest types
- Impact on fisheries & agricultural productivity
- Impact on infrastructure viability
- Add additional pressures on already vulnerable ecosystems
- Increase the severity and frequency of extreme climatic events

Impacts on Agriculture

Change in Agriculture Output Potential Due to Climate Change, 2000-2080



Source: EarthTrends, 2008 using data from Cline, 2007

Impacts on Freshwater Ecosystems

- Maximum monthly flows up 35-45%
- Minimum monthly flows down 17-24%
- Altered flows , warmer temperatures will
  - Diminish water quality
  - Shift location / size of species' ranges
  - Affect migration / breeding success
  - Alter composition / structure of wetlands & flooded forests
- Sea level rise, saltwater intrusion, and loss of coastal ecosystems will also shift species' ranges, abundance, and migration patterns

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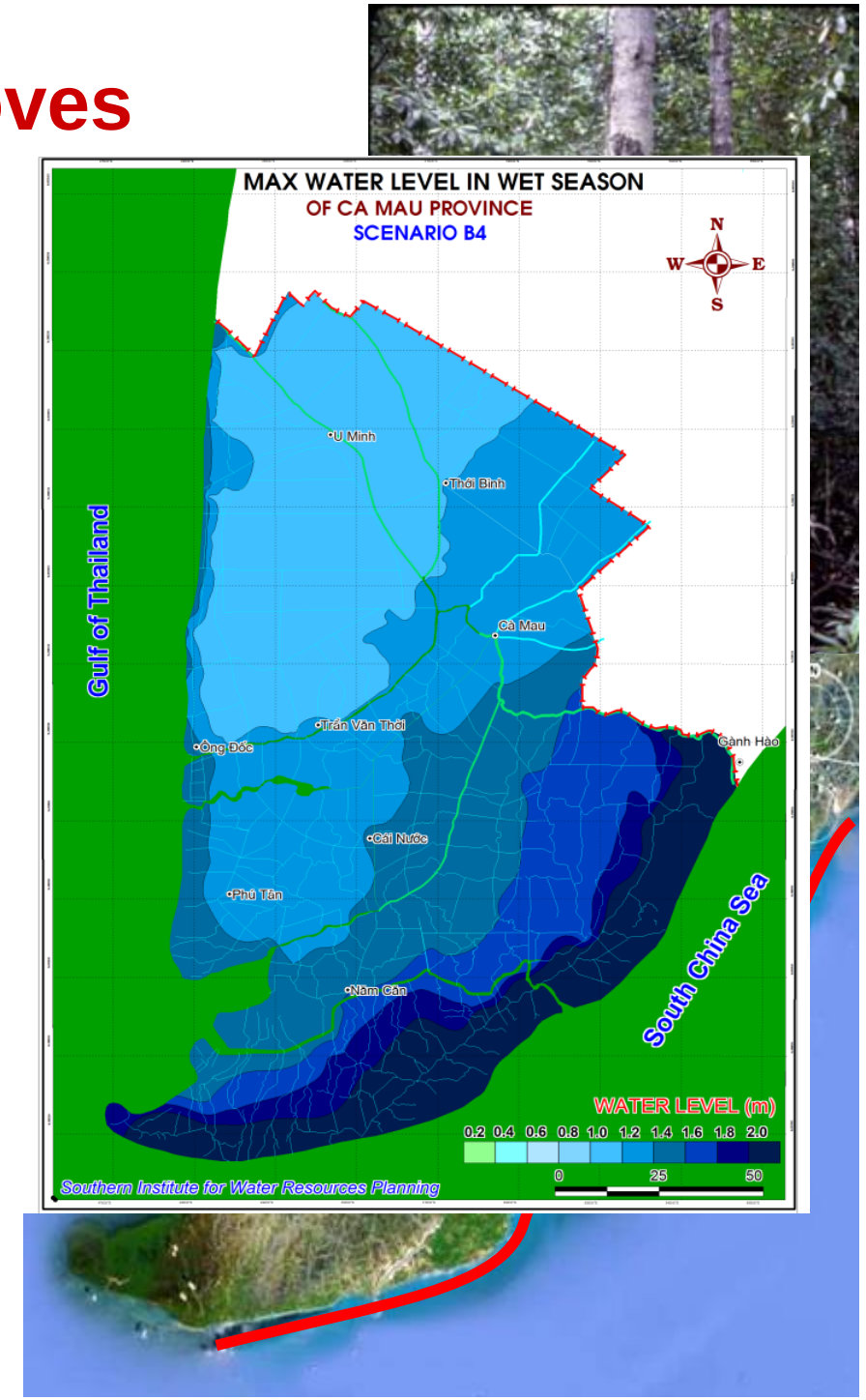
Impacts on Mangroves

- Landward migration limited
- Serious coastal erosion
- SLR vs. sedimentation rates ~3mm/yr
- SLR of 0.5 m “would probably eliminate mangroves from most of the coastal fringe of the Mekong Delta and along the margins of most rivers and canals bordered by dikes.”



Source: Le Tan Loi, Nguyen Van Be, & Barry Clough 2009

Impacts on Dry Forests

Warmer temperatures + altered rainfall patterns may

- Alter fire regimes
- Change forest types
- Dry isolated ponds and seasonal wetlands in Eastern Plains

- Cause range shifts (evidence from Khao Yai NP: *Nephelium melliferum*)
- Alter availability of fruit resources (Khao Yai evidence: impacts on gibbons)

Impacts on Wetter Forests

- *Warmer temperatures + altered precipitation patterns may*
  - Shift or shrink suitable habitat for rare, threatened, endemic species
  - Alter availability of fruit resources
  - Change forest types
  - Cause floods
- Although the Annamites were buffered in past, they may be more vulnerable now because of other drivers (fragmentation, hunting, etc)

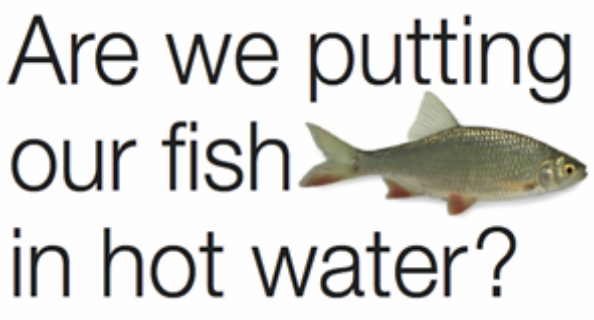
Combined Impacts

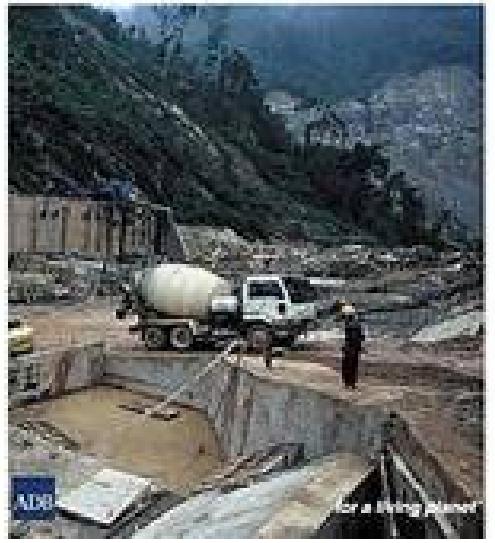
Hunting & wildlife trade

Habitat loss

Infrastructure

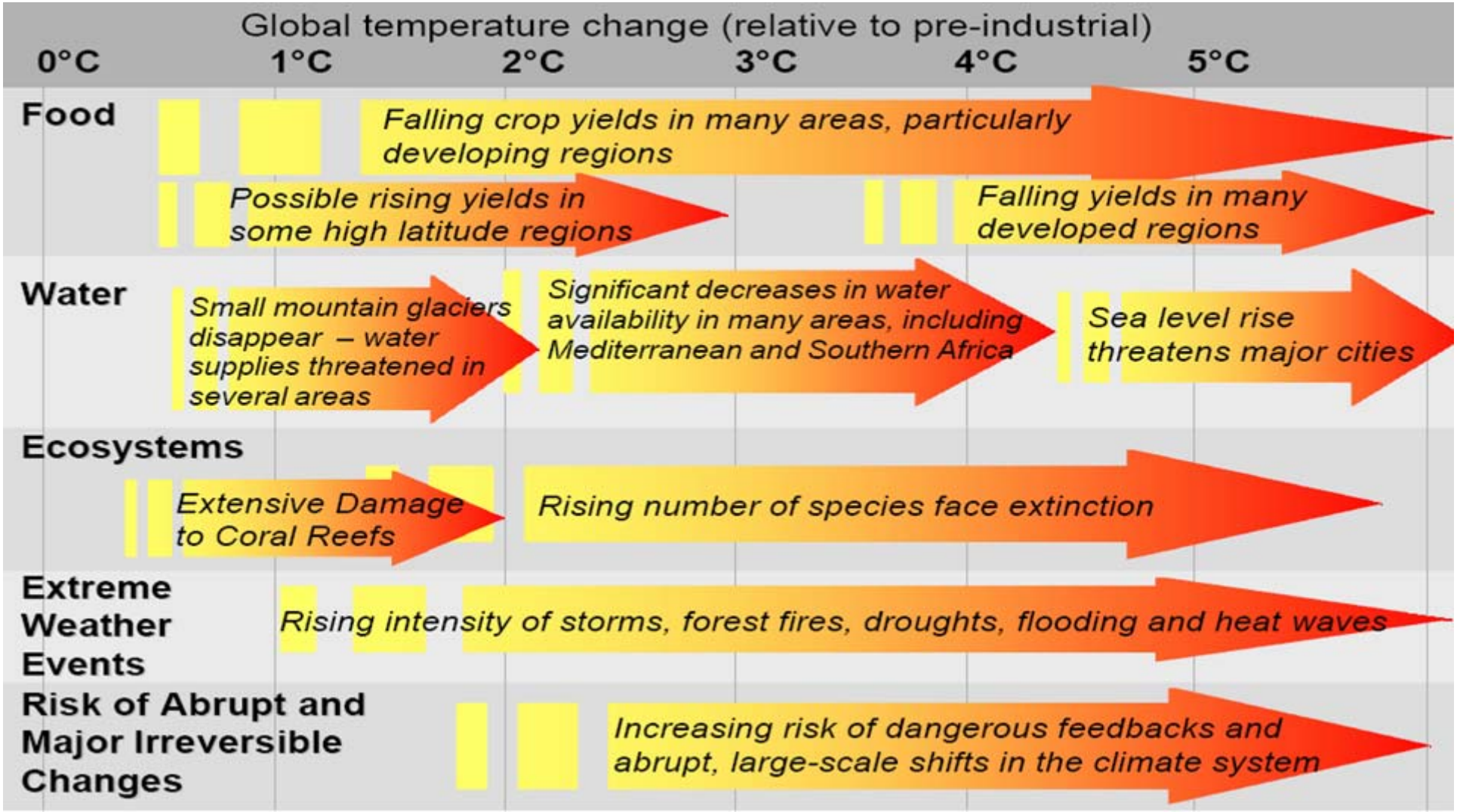
Climate Change





Illegal & unsustainable harvesting

More Warming = More Severe Impacts



Thank you

The Mekong Region Is Vulnerable – for Many Reasons





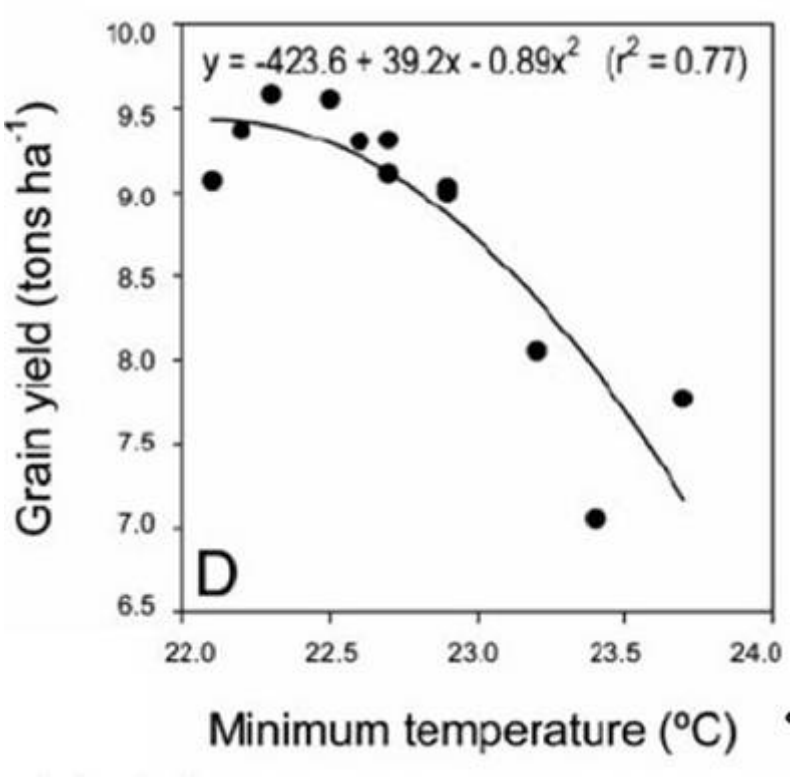
Vulnerability =

- Potential to be harmed
- *f*(exposure, sensitivity, capacity to adapt)

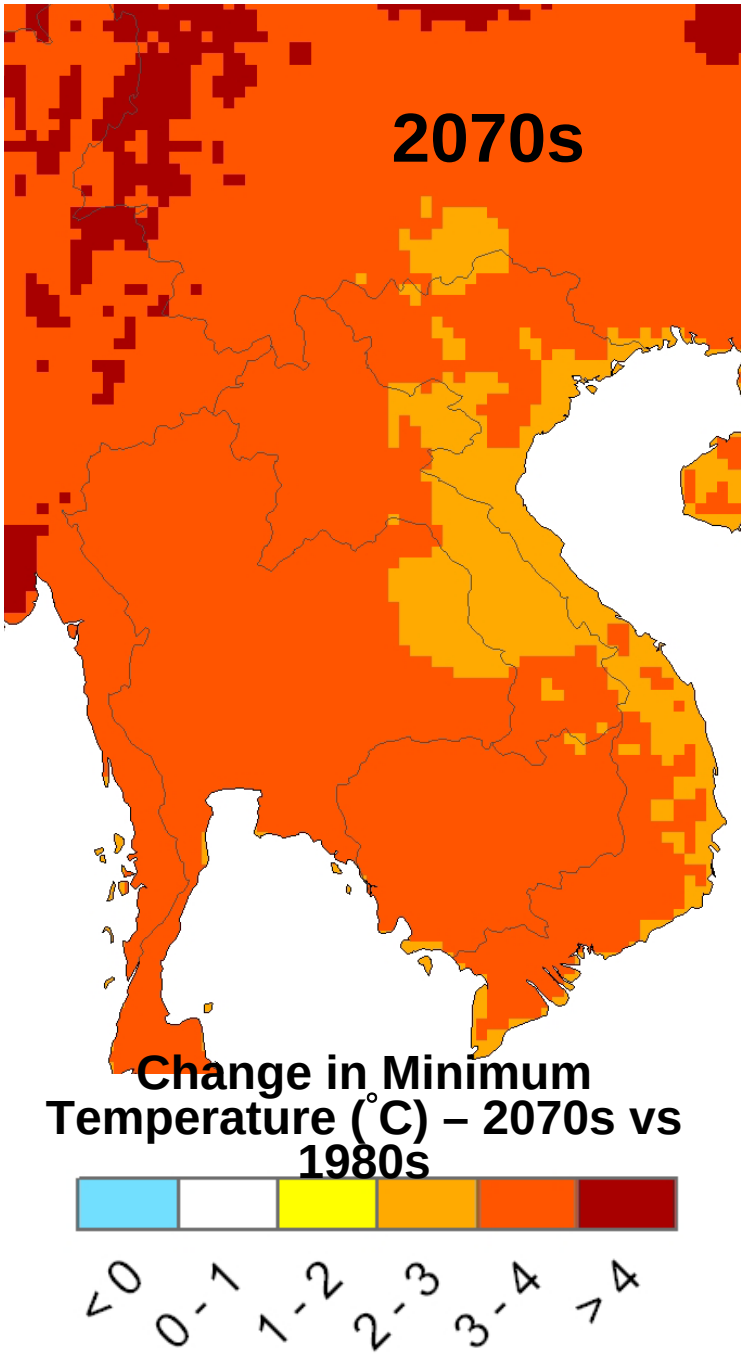
Summary of CC Impacts in SE Asia from IPCC

- Warming similar to global mean
- More rain, more intense rainfall events
- Reduced snow / ice in Himalayas
- More extreme storms → More floods and landslides
- More and longer droughts
- Water stress & decreased water availability
- More glacial melt floods; slope destabilization & decreased river flows as glaciers recede
- Lower crop yields
- Reduced soil moisture / evapotranspiration → degradation / desertification
- Diarrhea risk, heat stress, changing disease vector patterns
- Extinction risk from habitat fragmentation / CC interactions
- Coastal zones – inundation, storms
- Aquaculture / infrastructure will be affected
- Wetlands, mangroves, reefs threatened

Warmer temperatures and changing precipitation patterns will likely reduce agricultural productivity



Source: Peng et al. 2004



Impacts on Water Resources

Physical Change	Impact
Warming	Increased evaporation / evapotranspiration → decreased water for human consumption, irrigation, hydropower generation
Changes in precipitation patterns	Decreased flow / water level in El Nino years → decreased water availability
	Increased flow / water levels in La Nina years → increased water availability in some areas
	Increased runoff / soil erosion / flooding
Sea level rise	Arable land loss
	Saltwater intrusion → decreased freshwater availability

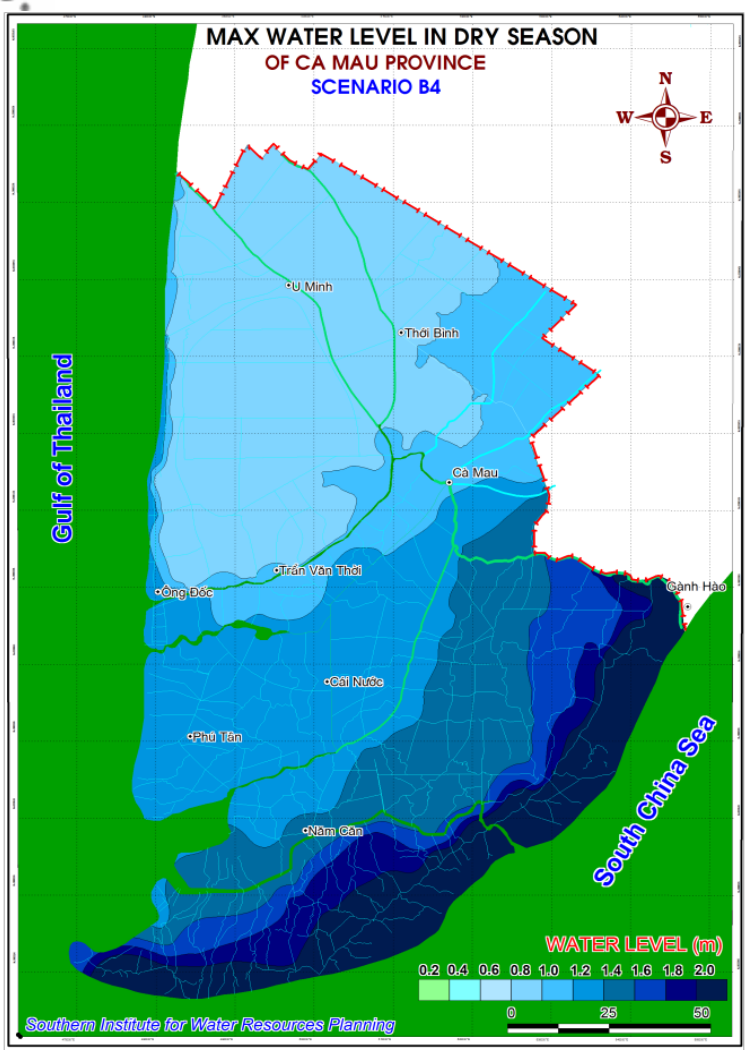
Source: ADB 2009 and references therein

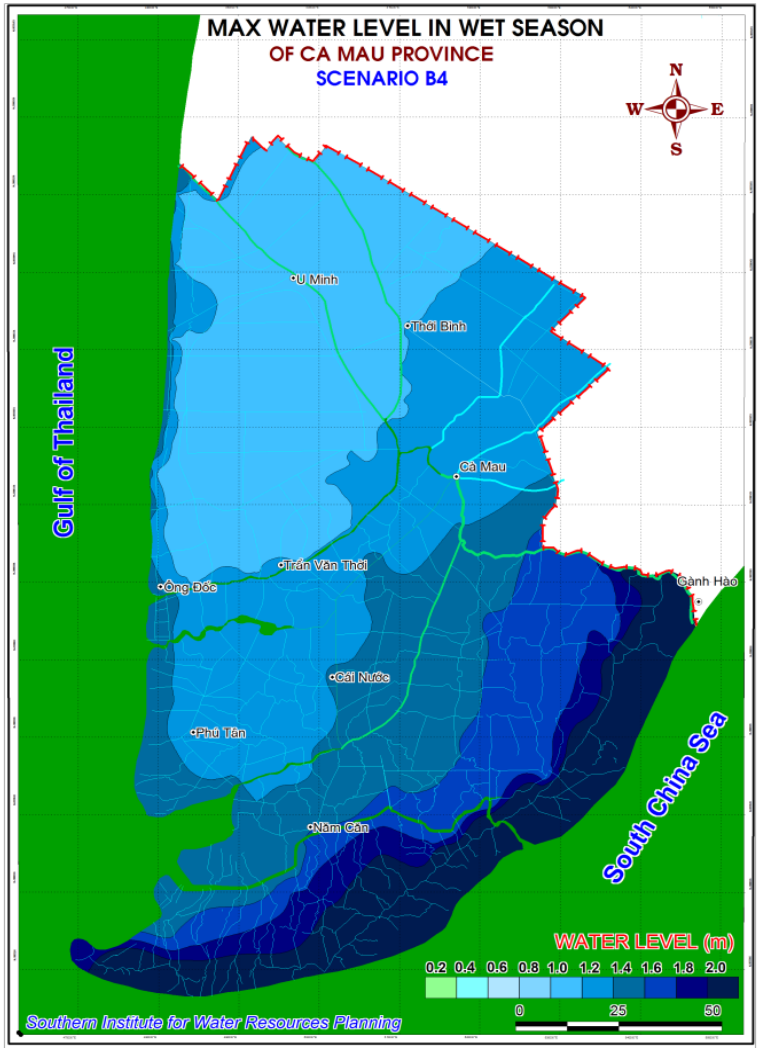
Impacts on Agriculture

Physical Change	Impact
Warming	Heat stress → lower crop yields / livestock deaths
	Increased insect pest and disease outbreaks
Changes in precipitation patterns	More frequent droughts, floods, cyclones → crop damage / loss
	Altered cropping pattern, growing season, sowing period
	Increased runoff / soil erosion → reduced soil fertility / crop yields
Sea level rise	Arable land loss
	Saltwater intrusion → negative impacts on crops / altered livelihood choices

Source: ADB 2009 and references therein

Water levels with a 50cm SLR





Potential Impacts on Biodiversity

- Shifts in species distributions and wholesale change of ecosystem structure, composition, and processes (Williams et al. 2007)
- Species with low tolerance to warming (or altered rainfall) and limited dispersal capacity will be most at risk = many tropical species and especially endemics (Deutsch et al. 2008)
- Mountain and coastal systems are especially vulnerable (IPCC 2007)
- GMS is 1 of 6 most vulnerable biodiversity hotspots: 133 to 2,835 plant species and 10 to 213 vertebrates could become extinct (Malcolm et al. 2006)