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# **Climate Change Impacts to the Water Environment and Adaptation Options in Cambodia**

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# Cambodia is vulnerable to climate change

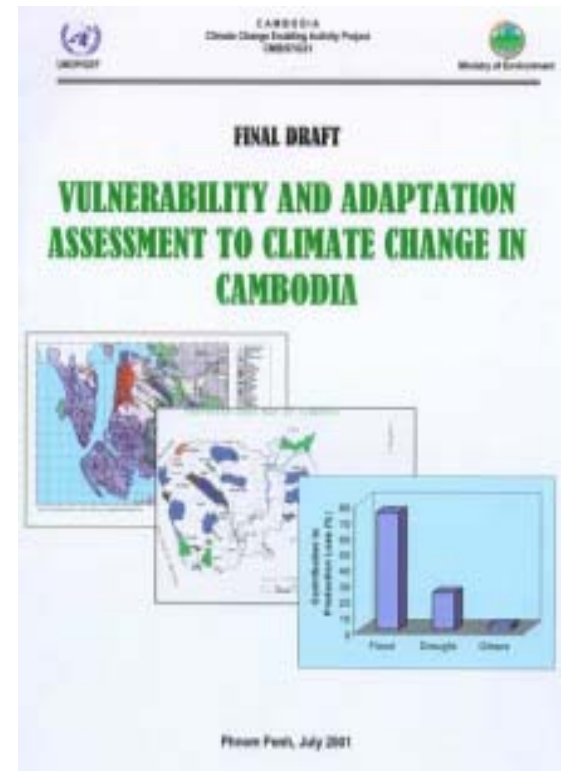
- A Least developed agrarian country are facing many social and economic development priorities,
- 435 km coastline and low elevation of central plain,
- 80-85% of population are farmer and living in rural area of the central flood plains,
- Tropical diseases (malaria, dengue fever, etc.) with weak health care system,
- Limited technical, financial and institutional resources for adaptation,
- Has lowest adaptive capacity compare to other SEA countries,
- More severe and frequent floods and droughts have occurred in recent years.

# Cambodia Efforts to Address Climate Change

- ❑ December 1995 Cambodia ratified the UNFCCC,
- ❑ July 2002: Accession to the Kyoto Protocol,
- ❑ October 2002: Submission of the Initial National Communication (INC) to the CoP 8,
- ❑ June 2003: Established a climate change office and 2009 promote to department of climate change,
- ❑ July 2003: Appointment of MoE as the Interim Designated National Authority (iDNA) for CDM,
- ❑ April 2006: Establishment of the National Climate Change Committee (NCCC),
- ❑ October 2006: Approval of the Cambodian NAPA,
- ❑ 2007: Preparation of Second National Communication.

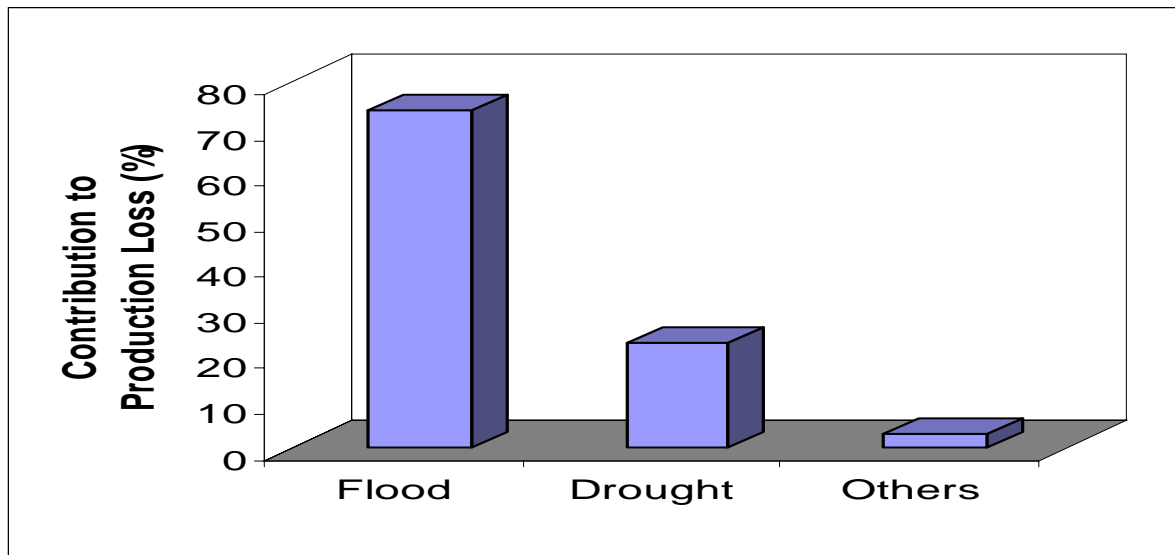
# Impact of Global Warming on Cambodia Climate

- ❑ This assessment was conducted in the INC by using two GCM models: CCSR & CSIRO, and two emission scenarios: SRESA2 & SRESB1, showed that:
  - Cambodia's temperature would increase up to 1.35 - 2.5°C in 2100.
  - Annual rainfall would increase between 3 and 35% from current condition and lowland areas seem to be more affected than high land areas.



# Impact of Climate Change on Agriculture

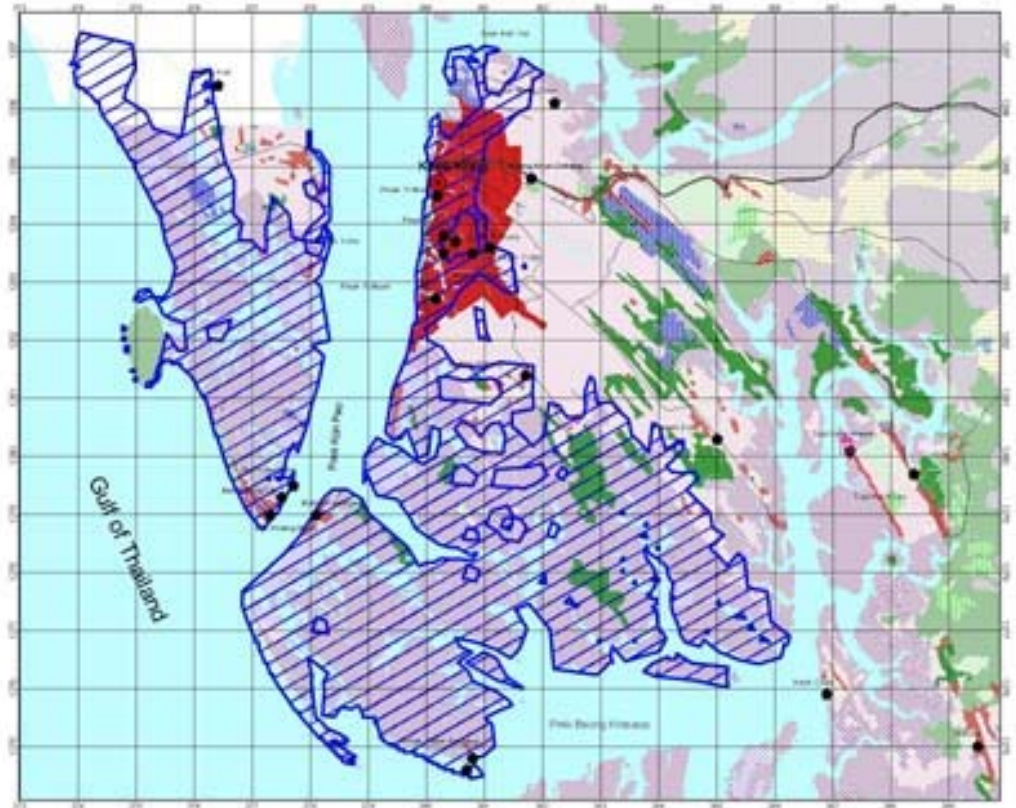
Based on the past 5 years data (1996-20000), rice production loss occurred mainly due to the occurrence of flood (>70%), drought (~20%) and others such as pest & disease (~10%)



- Flood and drought were not always associated with the ENSO events, flood mostly occurred due to the increase of water level of Mekong River and Tonle Sap Lake.

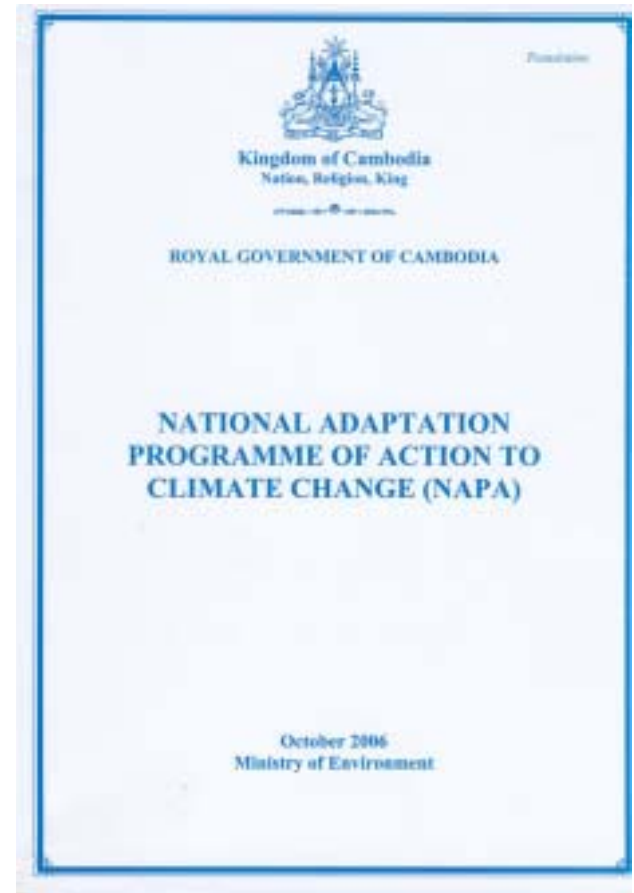
# Impact of Climate Change on Coastal Zone

- ❑ In Koh Kong province (1,160 km<sup>2</sup>), if 1m sea level rise, about 0.4% (4,444 ha) will be under water;
- ❑ The rainfall of 4 main river basins of Koh Kon will increase between 2 and 15%, so increase water flow 2-10m<sup>3</sup>/s.



## 6. National Adaptation Program of Action to Climate Change (NAPA)

- 2003 -2005 and endorsed by the Government of Cambodia in October 2006, aims to develop a realistically achievable country- driven program of action and priority activities addressing the urgent and immediate needs and concerns of the country for adaptation to climate change in 4 key sectors: agriculture, water resources, coastal zone, human health.

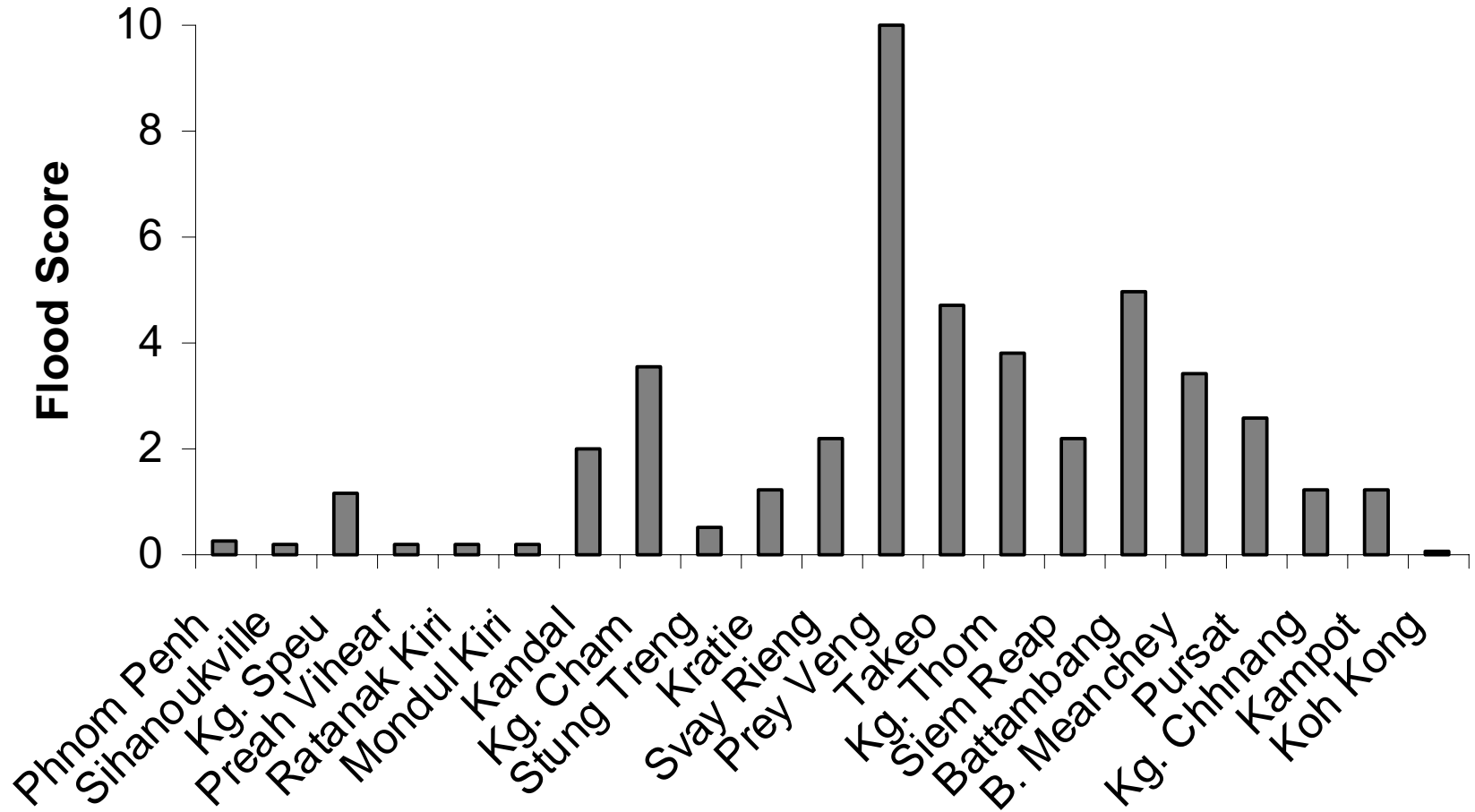


# NAPA Field Survey

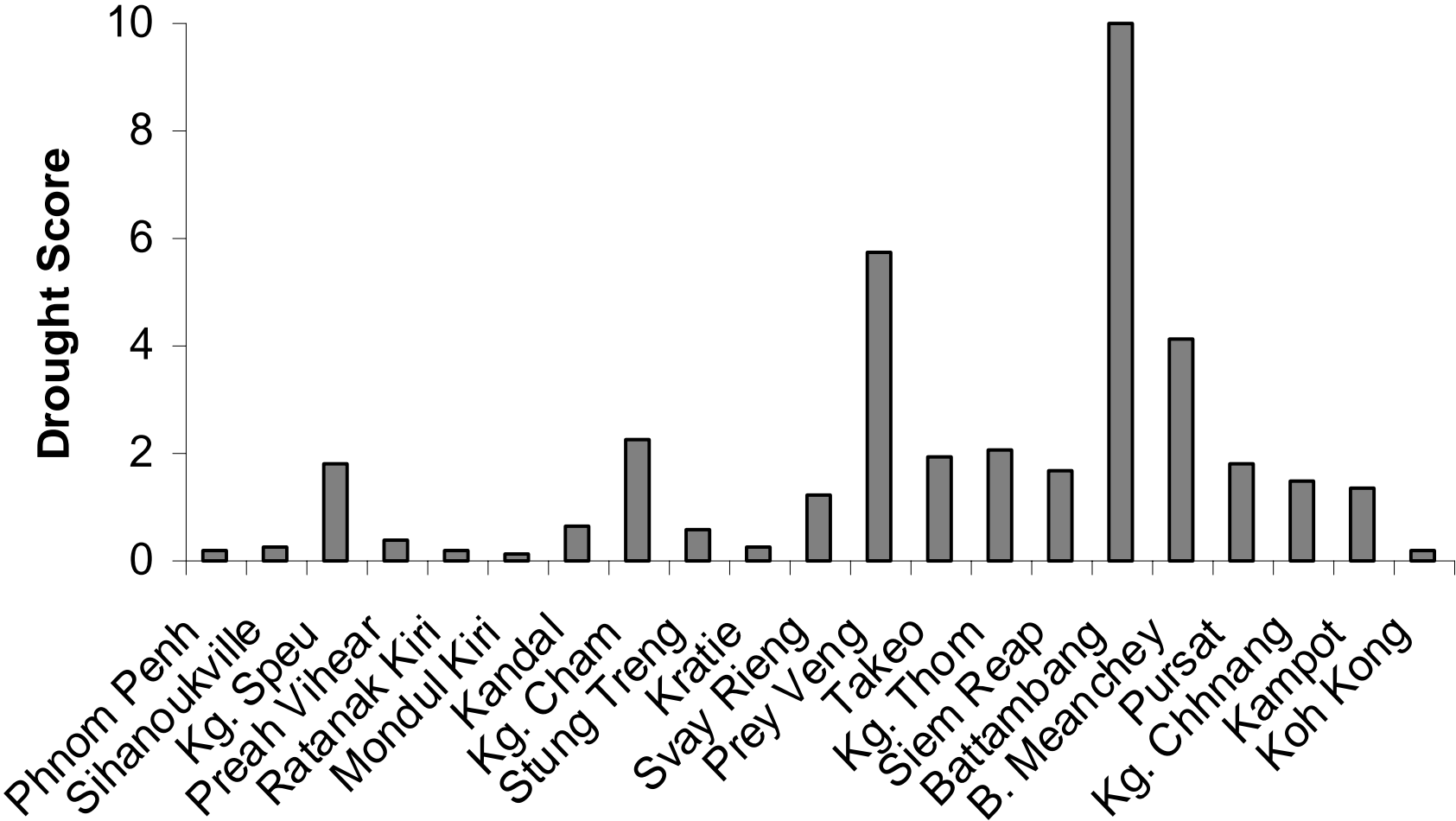
- About 1,000 respondents from households, local authorities and NGOs in 42 communes of 17 provinces
- To understand the main characteristics of climate hazards in Cambodia
- To understand coping mechanisms at the grassroots level
- To identify adaptation activities to climate hazards and climate change



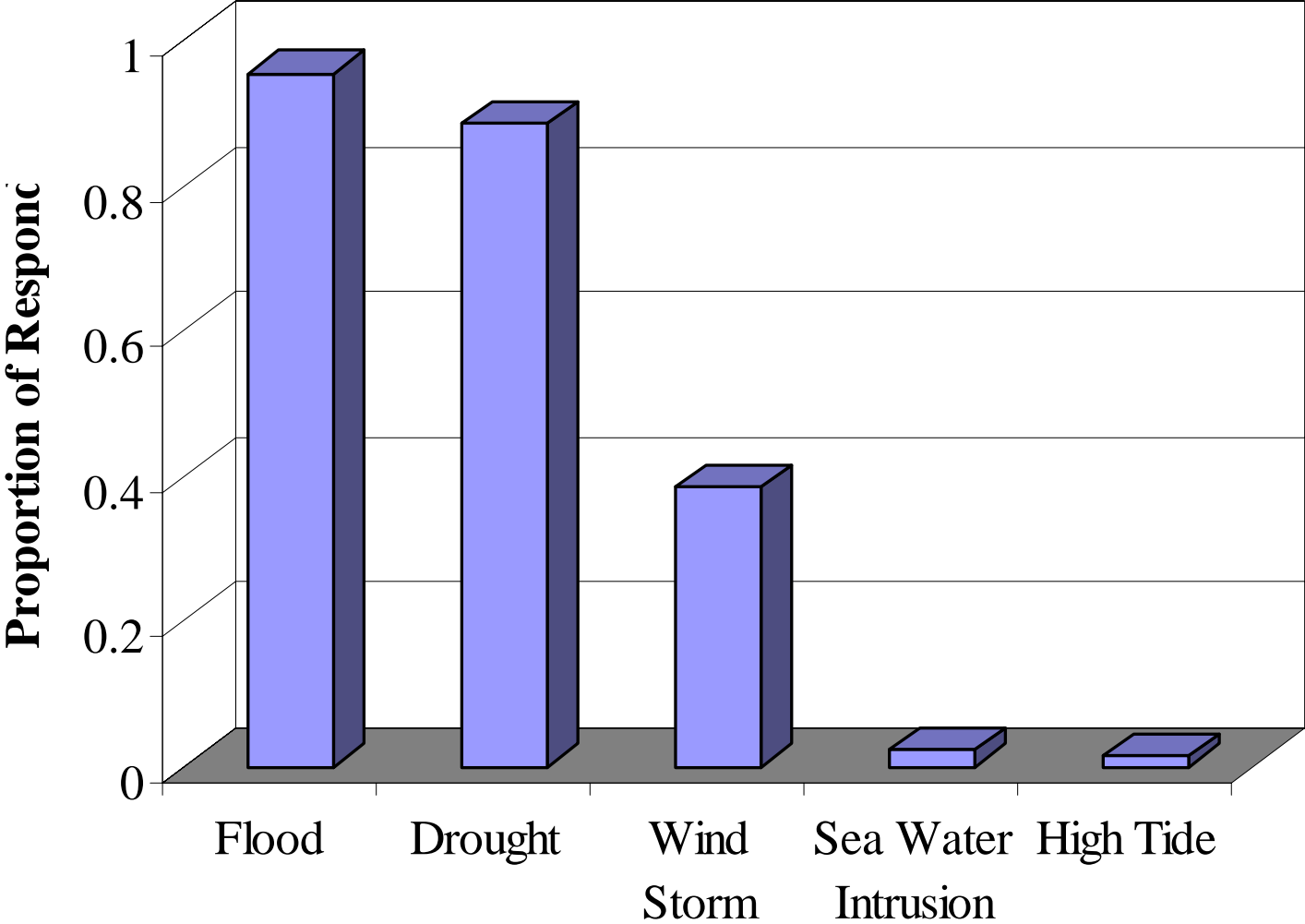
# Level of Vulnerability to Floods by Provinces



# Level of Vulnerability to Droughts by Provinces

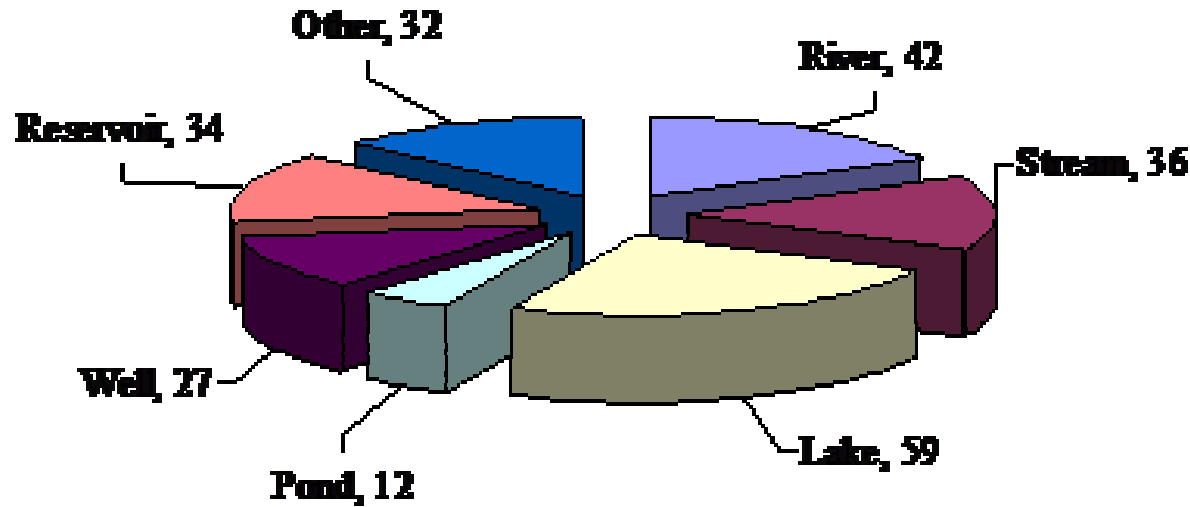


# Natural Hazards Characteristics

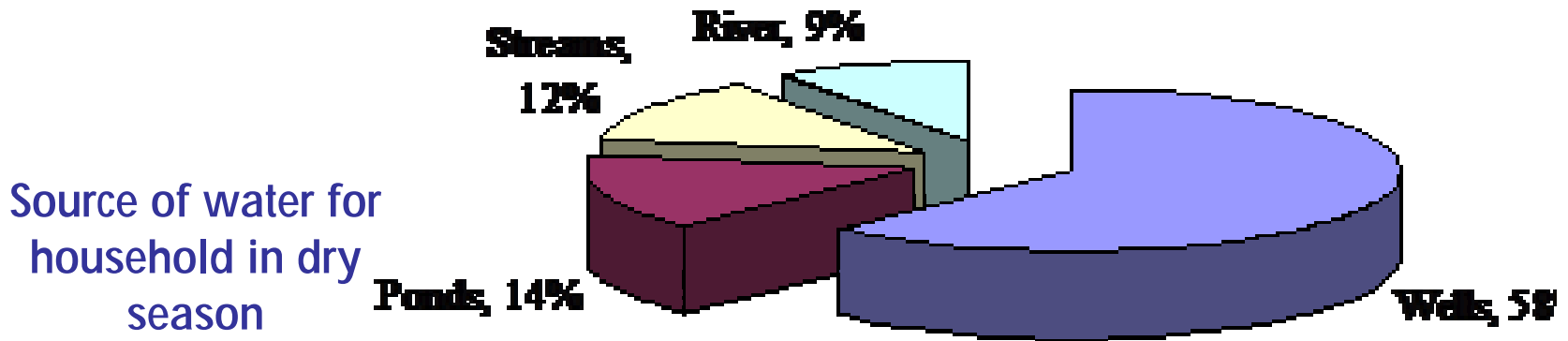


Proportion of respondents on type of climatic hazards affecting them

# Water Supply



Source of water for agriculture in dry season



Source of water for household in dry season

# Proposed Adaptation Projects

## By sector:

- Cross-sectoral: 5 projects
- Water resources/agriculture: 20 projects
- Coastal zone: 8 projects
- Human health (Malaria): 6 projects

## By climate hazard:

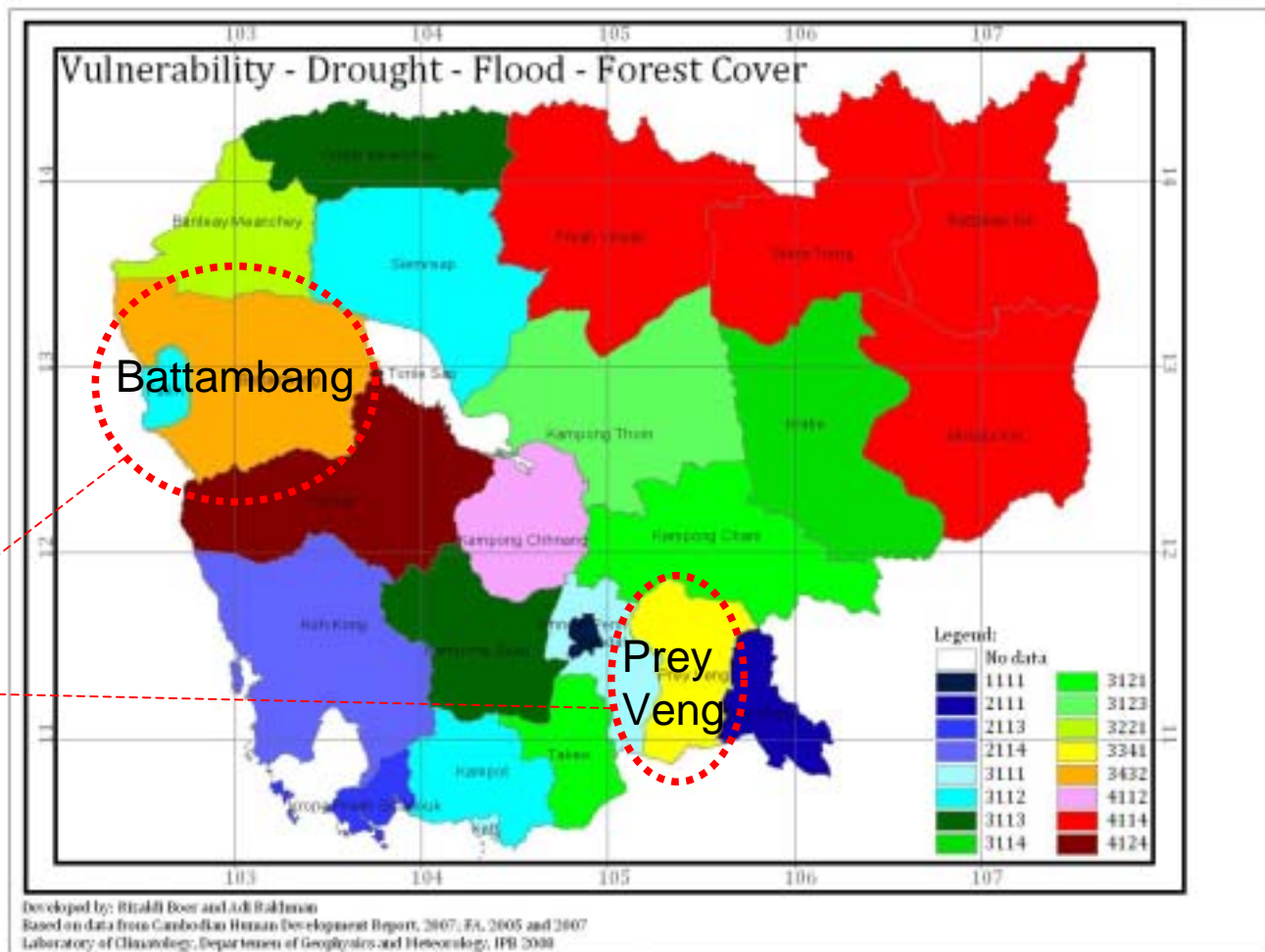
- Flood: 5 projects
- Drought: 9 projects
- Malaria: 6
- Coastal protection: 3 projects
- Multiple climate hazards: 16 projects

Total 39 proposed projects with US\$ 196,350,00, of which 20 are high priority (US\$128,850,000)

# Some adaptation projects related to water under NAPA

- Development and improvement of community irrigation systems
- Water gates and water culverts construction
- Safer water supply for rural communities
- Development and rehabilitation of flood protection dikes
- Rehabilitation of dams in Takeo and Kampong Speu province
- Construction of community water reservoirs
- Water supply for households
- Development and rehabilitation of irrigation systems
- Rehabilitation of coastal protection infrastructure
- Community agro-forestry in deforested watersheds.

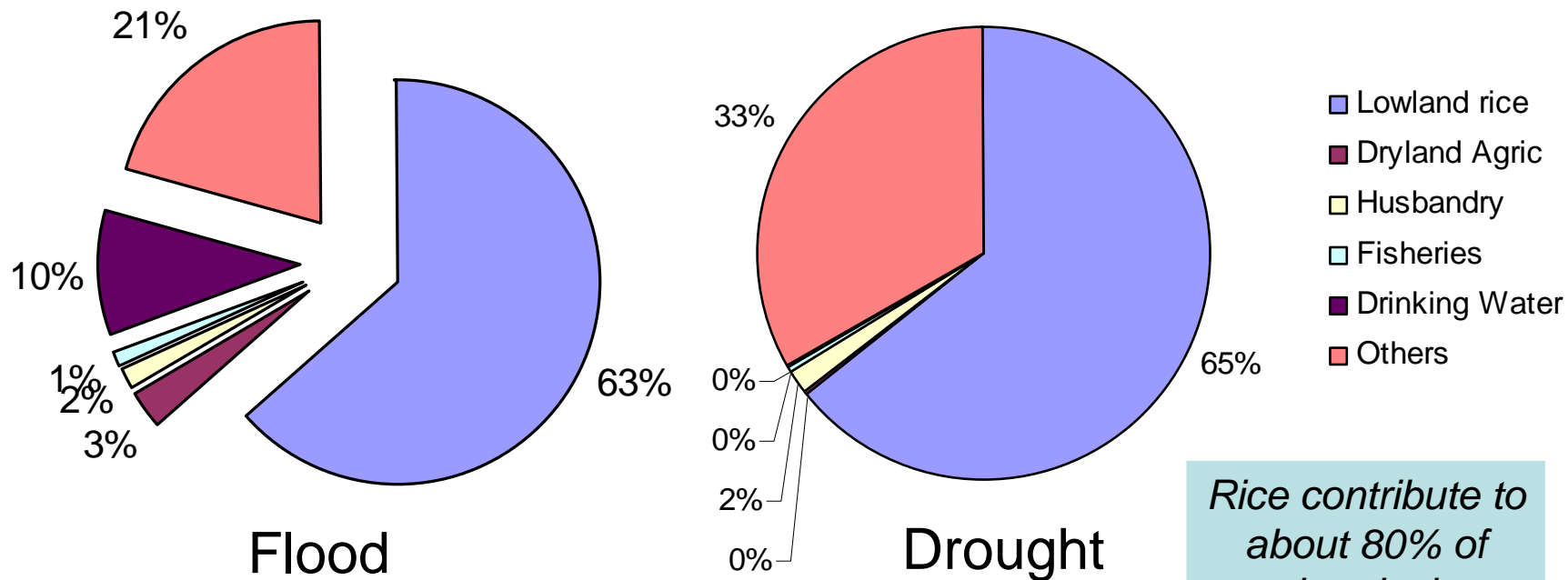
# 7. Assessment in the SNC: Climate-Vulnerability Index for Agriculture



- CVI-1111 means the province has low level of vulnerability (Category 1), has low flood (Category 1) and drought (Category 1) experience and low forest cover (Category 1)

# Vulnerable sub-sector in Agriculture to climate hazards

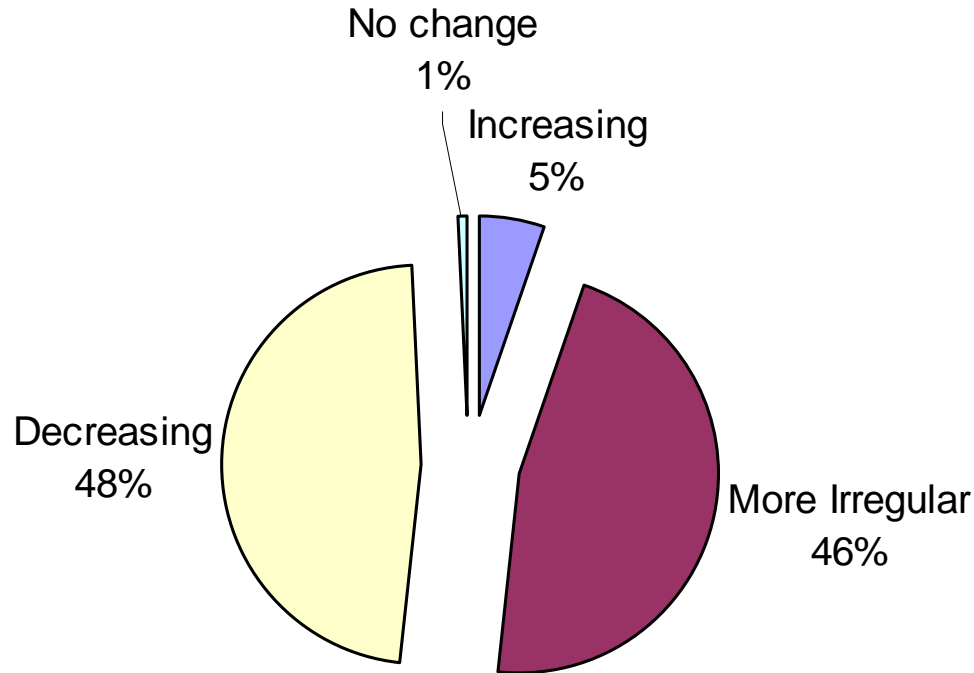
Based on Survey at Prey Veng, the most vulnerable province to climate hazards, rice farming is the most vulnerable sub-sector to climate hazards



Based on interview with 417 respondents

*Rice contribute to about 80% of total agriculture commodities production*

# Farmers perception on change in drought and flood severity?



Flood frequency and intensity



Drought severity increase?

Based on Survey at Prey Veng Province , 2009

# Key message

- Under high emission scenarios (SRESA2)
  - DS rainfalls DJF and MAM will decrease with high probability and WS JJA and SON rainfall may increase but with lower probability than the DS rainfall. This suggests that the onset of rainy season may delay in the future under this emission scenario.
  - WS rainfall DJF will decrease until 2025 and then increase again in 2050 and 2080
- Under low emission scenarios (SRESB1)
  - Similar with SRESA2 DS rainfall will increase but with lower probability.
  - Different with SRESA2, WS rainfall DJF will increase in 2025 and then decrease again in 2050 and 2080
- Global community achievement in reducing GHG emission will have different implication on Cambodia

# Example: Horizon Plan for Adaptation

2005

2010

2015

2020

2025

2030



- *Measures: Adjust the cropping pattern following the climate forecast*
- *Improve crop management*
- *Improved irrigation facility and irrigation efficiency*
- *Provide more opportunity and alternative economic activities*
- *Set up policy to ban conversion of rice field to other uses, stand by funding, insurance system*
- *Expand the rice growing system*
- *Maintain and increase forest cover in the upstream*
- *Diversify food consumption*
- *Develop new irrigation facility in vulnerable rice production centre areas whenever possible to allow for increasing planting index and productivity*
- *Inter basin transfer*

# Thank You!

[www.camclimate.org.kh](http://www.camclimate.org.kh)

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