

Disaster Risk Reduction Towards Disaster Resilience in Prey Veng, Cambodia



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Key Messages

- Floods pose the most significant threat to Prey Veng city, and it is anticipated that its impacts would be further exacerbated under projected climate scenarios
- Trans-boundary communication and early warning systems need to be established to reduce the impacts of floods in Prey Veng
- Droughts are emerging as a climate threat in Prey Veng; however, more detailed study is required and mitigative measures are to be explored
- Mapping exercises that cover hazards, socio-economic profiles, asset profiles and other key aspects need to be undertaken in Prey Veng to support effective planning and implementation
- The city requires a climate-sensitive disaster management plan, that considers anticipated climate impacts and can draw on the assessments of loss and damage at the national and provincial level
- The recently adopted Disaster Management Law would provide an opportunity for Prey Veng to implement its climate-sensitive Disaster Risk Reduction (DRR) plan



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City Introduction

Prey Veng is the capital city of Prey Veng Province in Cambodia (refer Figure 1). The city harbours a population of 33,079 (2008 census) and is situated at an elevation of 23 feet above mean sea level. Prey Veng's climate is classified as tropical. When compared with winter, the summers have much more rainfall. The average annual temperature in Prey Veng is 27.8 °C. The annual rainfall in the city averages 1,603 mm. Primarily an agrarian province, around 53 percent of the people are below the poverty line, 36 percent below the national average.

Approach

Data available from online national disaster loss and damage database (<http://camdi.ncdm.gov.kh>) was analysed. The database was established with UNDP support and is now maintained by the National Committee for Disaster Management (NCDM) of the Government of Cambodia. The data analysis aimed at correlating trends in loss and damage from disasters to the country and district levels to assess whether these could help prepare resilience strategies for cities. The database was used to identify the most impacted



Figure 1: Location of Prey Veng in Cambodia

provinces and a prominent city within each was selected for further analysis.

Impact on human life due to natural disasters was considered of prime concern while prioritizing the impacts and given the highest weightage, followed by the number of injured people, followed by the number of victims (a wider population that incurred varying range of losses) and finally the damage to and destruction of houses due to the disaster. Provinces were thus prioritized and two top ones selected. The capital city of each was taken up for detailed study. The steps followed are summarized in the figure below.

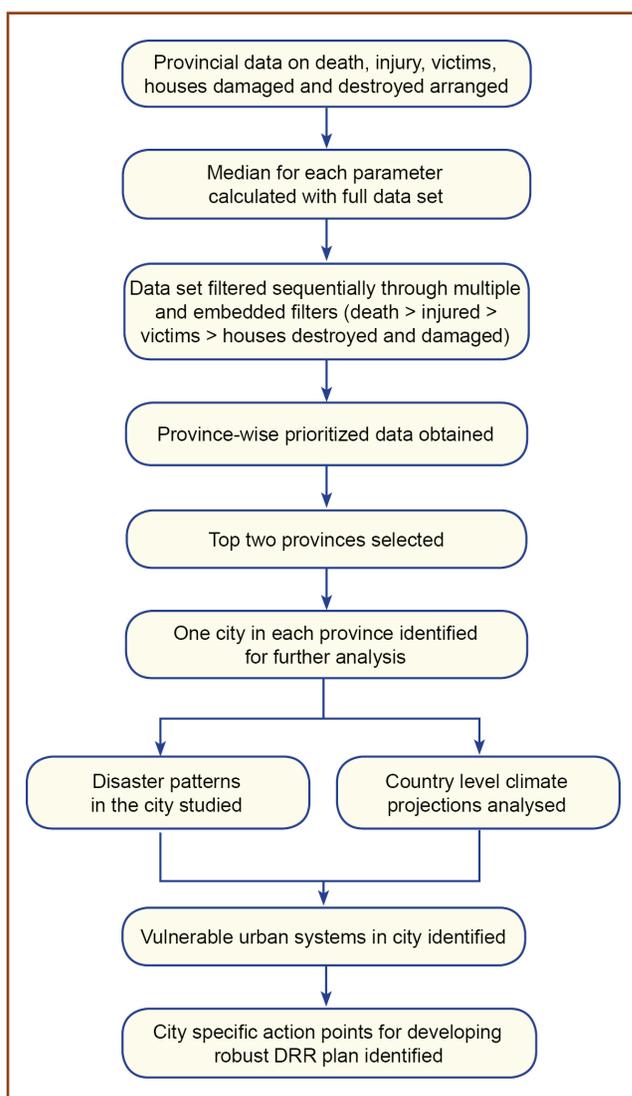


Figure 2: Detailed Methodology

Correlating Disaster Patterns and Impacts

An analysis of the disaster patterns at the country level shows that floods are most frequent (40 percent), followed by fire, storm, lightning, and drought which have frequency of 19, 17, 9, and 7 percent respectively (refer Figure 3).

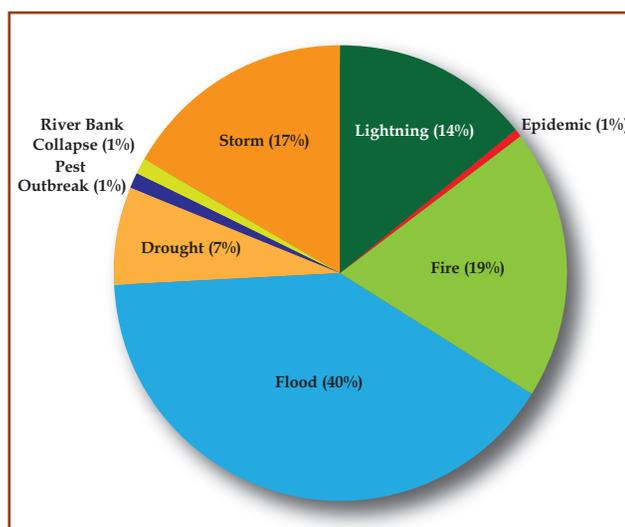


Figure 3: Frequency of Disasters at the country level in Cambodia

A similar analysis was undertaken at the provincial level and it was found that Prey Veng province is affected by floods, fire, storm and lightning. Floods are the predominant disaster. Table 1 details the events, along with their relative frequency and percent impact in Prey Veng province as compared to the frequency and impacts at the national level. This clearly shows a similarity in trend between the disaster patterns at the national and provincial levels.

A district-wise analysis within Prey Veng province was also carried out. Flood and drought are the significant natural disasters (refer Figure 4 and 5). Even though the highest number of events was not recorded from Krong Prey Veng district, the city of Prey Veng was selected for further analysis as it is the province capital and the most significant urban centre in the entire province. City level interactions¹ revealed that, apart from flood, which is the major disaster, drought is gradually becoming another major disaster in the province.

Detailed interactions at the city level¹ revealed that flood, storm and lightning are the prominent disasters of which flood has the maximum impact. Prey Veng, being located in a low-lying area is highly vulnerable to floods. The water flows in from the neighbouring provinces (e.g. Kampong Cham), inundating Prey Veng. The city has witnessed floods on a regular basis. The flood in 2013 led to maximum damages in the recent past wherein the water level in the city lake rose by 7.66 m, leading to inundation for nearly a month. This flood had affected more than 55,000 ha of paddy fields in the province, breached roads and led

¹ Interactions with Provincial Committee for Disaster Management, Department of Environment, National Committee for Disaster Management, National League for Communes and Ministry of Climate Change

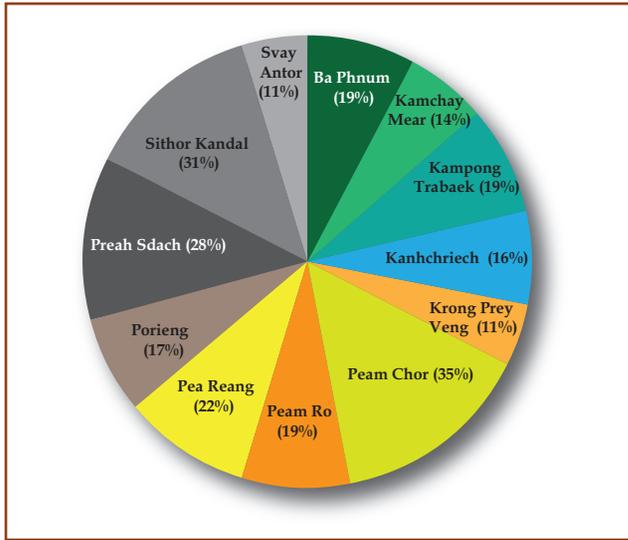


Figure 4: Frequency of Floods within Districts under Prey Veng Province

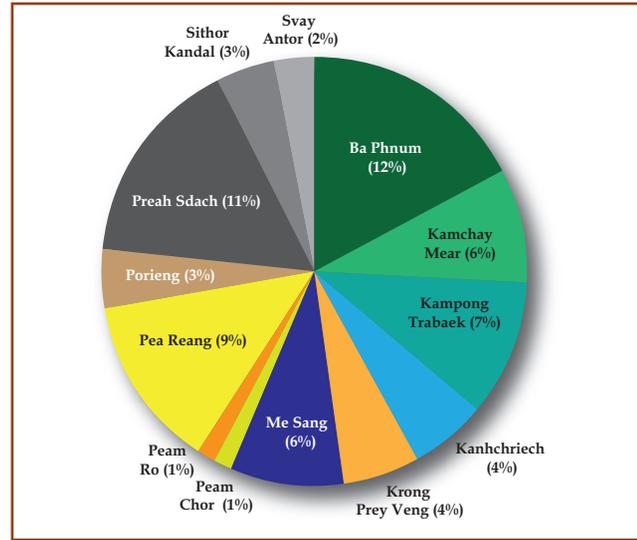


Figure 5: Frequency of Droughts within Districts under Prey Veng Province

to 26 people losing their lives. Figure 6 summarizes the impacts of the floods in Prey Veng in 2013.

In addition, drought is gradually becoming a major disaster in Prey Veng and there has been one in 2015. Though there has been no loss of human life due to drought, Prey Veng faced water shortage issues, especially for the agricultural fields and water has been pumped to the agricultural fields from the lake in the city for the same.

The multi-level analysis of past disaster patterns indicate that floods are the major natural disaster at the national, provincial and city level. Therefore, resilience building strategies for flood proofing at the national and provincial level can also inform and guide the necessary city level strategies.

Looking at Disasters through the Lens of Climate Change

The analysis of past patterns of disasters was then reviewed through the lens of anticipated climate change impacts. In the absence of downscaled climate impacts for Prey Veng city, the country level projections for Cambodia were reviewed (refer World

Bank Group, 2011). It was found that the following impacts would be expected:

- An increase in the mean annual temperature by 0.7-2.7°C by the 2060s and 1.4 -4.3°C by the 2090s
- Though a clear picture for precipitation change is not clear, due to large model uncertainties, increases in rainfall are projected during the monsoon (May- August)

Additionally, review of existing literature as well as direct interactions with city level representatives were undertaken to capture the perceptions on climate change impacts at the city level. The fact that Prey Veng has been experiencing a rise in temperature and an amplified frequency of high intensity rainfall along with a decrease in the total number of rainy days came out very promptly in all the city level discussions. These trends are aligned with the national level projections.

Considering that floods are currently the natural disaster with the maximum impact in Prey Veng, and that climate projections and local perceptions highlight a scenario of amplified frequency of high intensity

Table 1 : Events and their Relative Frequency and Impacts

Province	Event	Relative Frequency	Percent Impact			
			Deaths	Injured	Houses Damaged	Victims
Prey Veng	Flood	7.26	78.99	36.36	70.39	99.75
	Fire	3.48	2.19	4.55	6.07	0.02
	Storm	5.69	0.63	4.55	23.55	0.24
	Lightning	5.66	18.18	54.55	0	0

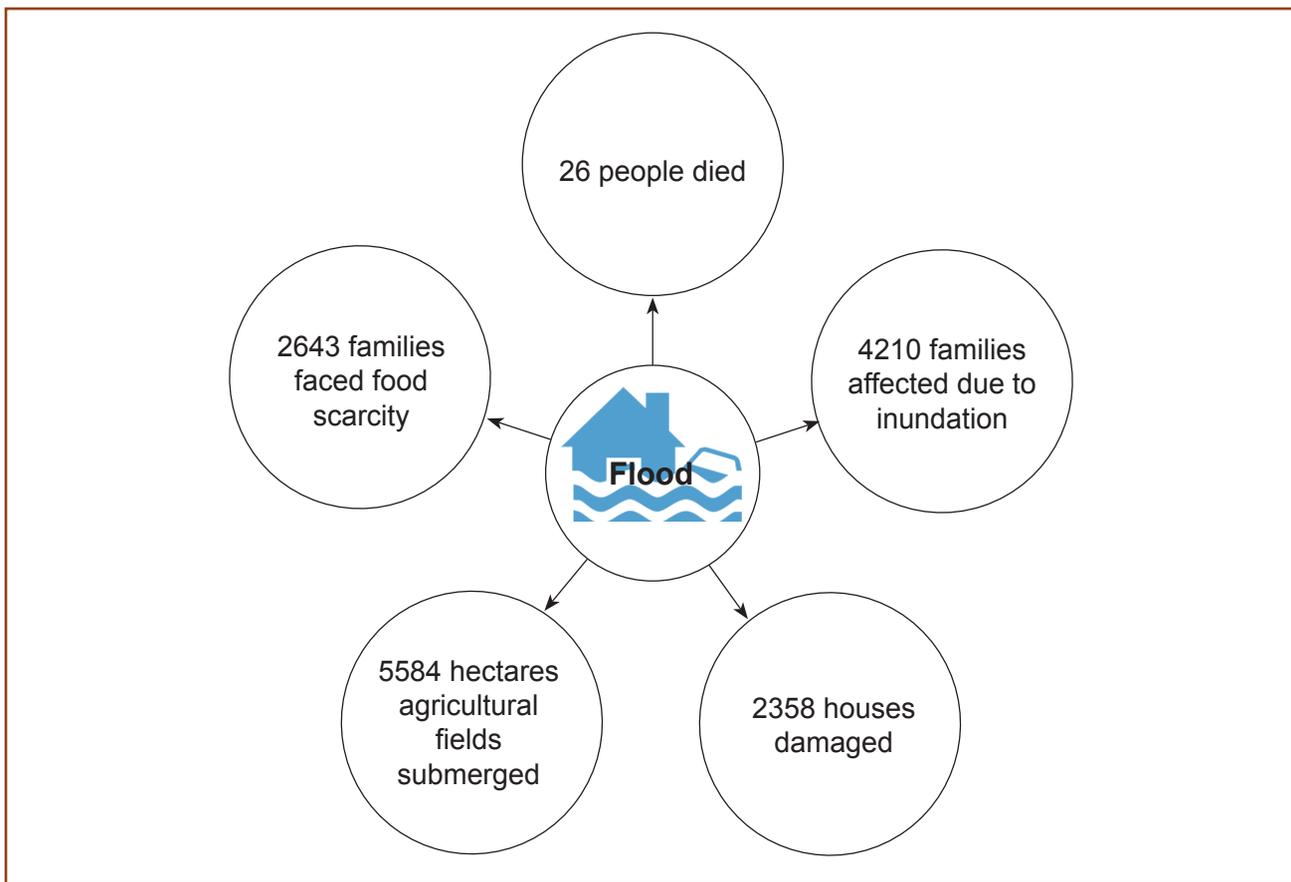


Figure 6: Impact of flood in 2013 in Prey Veng

rainfall, there is a high probability of increased incidences of floods with greater adverse impacts in the city. Urban systems are comprised of the processes by which life in a city is organised and operated. An analysis of the urban systems in Prey Veng shows that five systems (sanitation, food supply, health, transport and storm water drainage) are particularly vulnerable to the impacts of increased precipitation (refer Table 2) and have been affected by floods earlier as well. In addition, the city is also looking into a climate scenario of increased drier spells in the non-monsoon months, that could lead to drought or drought-like situations. Urban systems are vulnerable to the same as well and an analysis of the impact of the same is provided in Table 2. The most vulnerable people in the city are the urban poor who have limited access to resources and facilities.

Way Forward

The city of Prey Veng has initiated some steps to build city resilience to disasters. The city authorities pay attention to the problem of solid waste management and awareness generation among the residents on the need for the same. In addition to the private company that handles solid waste collection in the city, there is a citizen-based volunteer group that has been formed by the city for the same. The Department of Environment emphasises on tree plantation drives

in the city and undertakes awareness generation activities. The Department of Public Works and Transport is working on a plan to increase the diameter of the storm water drainage pipes. The governor has also established a special core group, comprising of members of all departments and youth volunteers with the aim to manage disaster in a more effective manner. However, the most immediate need for taking up DRR interventions is assured funding. At present, on an average, less than one percent of the total budget of Prey Veng is spent for disaster risk reduction initiatives. A law on disaster management has been passed by the Government of Cambodia on 30th June 2015. The city now hopes to be able to get some assured funds for undertaking activities aimed at disaster risk reduction.



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Table 2: Fragile Urban Systems in Prey Veng

Urban Systems Impacted by Past Events	Current Status	Climate Change Scenario: Increased Precipitation Potential Impacts	Climate Change Scenario: Increased Temperatures & Decreased Precipitation Potential Impacts
Sanitation: Solid Waste and Water Management	Limited infrastructure for garbage collection, no waste segregation and landfill on the verge of reaching its full capacity	Heightened unhygienic conditions and health hazards due to increased incidences of water borne diseases	Drier conditions can lead to increased incidences of fire in the landfill
Food Supply	There is complete dependence on surrounding sub-urban for agricultural supplies and food security	Flooding and water logging could lead to crop loss due to submerge of agricultural fields and also affect access to the city depleting food stock in city, and decrease in food supply to the city	Drought can lead to decline in agricultural productivity and decrease in food supply to the city
Health	Increasing incidences of vector-borne diseases like malaria	Water logging/flooding which will increase chances of water/vector-borne communicable diseases	Increasing temperatures could cause greater incidences of heat stress
Transport	Majority of the roads, particularly in sub-urban areas are not made of concrete	Flooding situation leading to washing away of the non-concrete roads, resulting in loss of connectivity/access	Reduced reliance on modes non-motorized transport due increased temperatures potentially leading to higher emissions
Storm Water Drainage	Network exists in city, but pipes have narrow diameter and prone to clogging	Increased water logging due to clogged pipes with narrow diameter which will increase health hazards and create further damage to infrastructure	(No direct impact, but could lead to poor maintenance of drainage systems that would exacerbate flooding in case of high intensity precipitation)



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Snapshots depicting vulnerability of Prey Veng to floods



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Table 3: Towards Disaster Resilience

		Urban Systems				
		City Specific Action Points				
		Storm Water Drainage	Sanitation	Food Supply	Health	Transport
Infrastructural Measures		<ul style="list-style-type: none"> ● Revamping existing network through laying of fresh and broader diameter pipelines 	<ul style="list-style-type: none"> ● Improvement in garbage collection infrastructure to cater to entire city ● Development of sanitary landfill ● Scouting possibilities with neighbouring cities for development of common landfill site 	<ul style="list-style-type: none"> ● Improved storage facilities (cold storage) in the city using renewable energy ● Allocating land for urban agriculture 	Improved health facilities in the city	Construction of roads with permeable material and concrete.
Social Empowerment		Capacity building of city officials and community members on importance of storm water drains and necessity to keep them clean	Capacity building of city officials and community members in waste segregation	Capacity building of city officials and community members in roof top gardens; vertical farming, urban farming	Capacity building of city officials and community members on importance of hygiene and measures to maintain the same Capacity building to deal with heat stress and flooding situation	Capacity building of city officials and community members on importance of public transport and non motorised transport
Strengthening disaster preparedness and response		<ul style="list-style-type: none"> ● Developing hazard maps, socio-economic profile maps ● Usage of GIS based planning tools ● Access to climate projection data at provincial and city levels ● Development of early warning systems to address floods ● Intensification of research on development of climate resilient crop varieties 				
Risk reduction through continuous assessment and monitoring Blue: data already being collected by the city Red: data collection required by the city		<ul style="list-style-type: none"> ● Incidences of water logging / flooding (number) 	<ul style="list-style-type: none"> ● Percent waste water treated ● Efficiency of solid waste collection (%) ● Scientific solid waste disposal (%) ● Extent of recovery (% treated / recycled) 	<ul style="list-style-type: none"> ● Food shortage duration (Nil; 0-2 days; 3-5 days; more than 5 days) 	<ul style="list-style-type: none"> ● Mortality (numbers) ● Morbidity (numbers) 	<ul style="list-style-type: none"> ● Length of roads destroyed (km) ● Duration of access lost (hrs) ● Incidence of waterlogging and flooding (numbers)

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An improved understanding of climate risks, especially from floods, and the preparation of a City Resilience Strategy with implementable actions is the need of the hour in Prey Veng in order to address issues related to flood management and mitigation, vulnerability reduction and improvement of preparedness and adaptation. Prey Veng city is vulnerable to floods (being situated in a low-lying province) and events of increased precipitation in neighbouring districts and even in China can exacerbate the flooding situation as it will bring in additional volumes of water into the river. Thus, apart from coordination with the national and provincial initiatives, the city, through the National Government and Mekong River Commission, needs to develop an early warning system in coordination with Chinese authorities in order to address floods. In addition, the city also needs to focus on drought resilience. Mandatory rain water harvesting is an essential step. Development of crop varieties, resilient to climate change is also necessary in the primarily agrarian Prey Veng province. Steps which the city needs to take to build a robust DRR plan are summarised in Table 3.

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