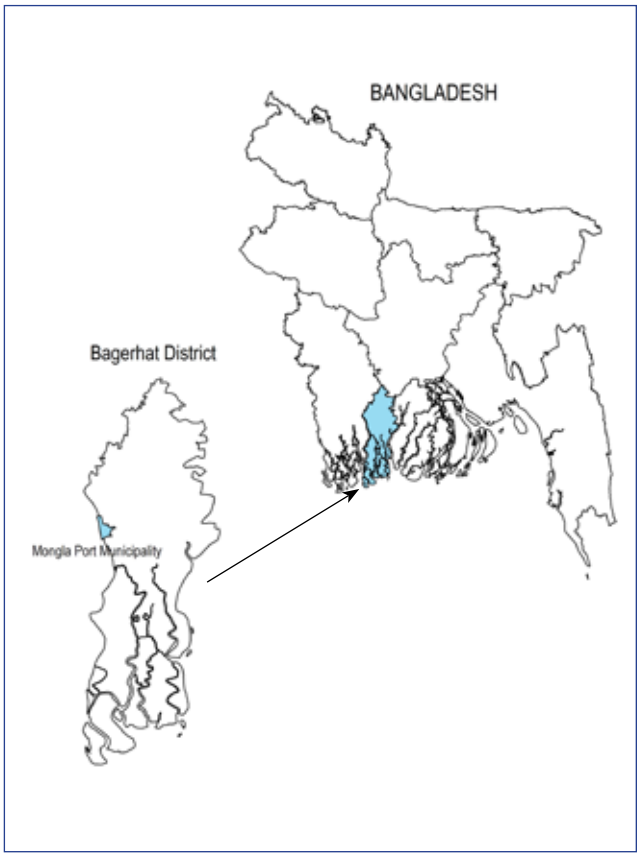
City Resilience Strategy: Mongla

Mongla is the main sea port in the Bagerhat district of South-Western Bangladesh. It is located at 22°29'20"N and 89°35'43"E, surrounded and well protected by the Sundarban mangrove forest. The port is situated at the confluence of the Pashur River and the Mongla River. The population of Mongla Port Municipality was 39,837 in 2011, distributed among nine wards spread over 19.40 sq. km. Mongla Paurashava was established in 1990 and is the largest of the Bagerhat district.



The average annual temperature in Mongla is 26.1°C with May being the hottest month and January being the coolest. The rainfall averages 1,910 mm. The city of Mongla is highly vulnerable to cyclones, the frequency of which has been increasing over time.

Climate Risks

The three climate risks identified through the ICLEI ACCCRN Process (IAP) for Mongla are:

Changing Climate Conditions	Climate Scenario Summary Statements
High intensity rainfall	There will be an increase in the amount of run-off and rainfall intensity.
Increased temperature	Mean temperatures across Bangladesh are projected to increase between 1.4°C and 2.4°C by 2050 and 2100, respectively.
Increase in the frequency of cyclones	The frequency of tropical cyclones in the bay of Bengal may increase and, according to the Intergovernmental Panel on Climate Change's Third Assessment Report, there is "evidence that the peak intensity may increase by 5% to 10% and precipitation rates may increase by 20% to 30%" (IPCC 2001). Cyclone-induced storm surges are likely to be exacerbated by a potential rise in sea level of over 27cm by 2050.

Vulnerability Assessment

The fragile urban systems and their corresponding climate fragility statements for Mongla are:

Fragile Urban Systems	Climate Fragility Statements
	• Existing supply of water will fall short in case of greater demand causing greater stress on the system.
	• As the system is dependent on rainfall, it will be impacted by shortage of rain.
	• System failures can occur due to flooding caused by cyclones and salinization of water reservoirs.
	• Water logging due to excess rain can spread solid waste on streets and cause health issues.

Fragile Urban Systems		Climate Fragility Statements
		• Destruction of roads will occur due to excess rainfall or cyclones. Furthermore food import that is dependent on water transport will be disrupted. This can create stress on the economy and health systems.
		• Can cause stress on existing infrastructure which cater to heat related health disorders, disproportionately affecting children and the elderly.
		• Water logging can cause water borne and skin diseases, increasing stress on facilities.
		• Malnutrition can occur due to effect of cyclones on import of food.
		• Odour pollution and health issues will increase.
		• In the absence of secondary drains, excessive rainfall due to cyclones can cause water logging leading to water borne diseases.
		• Agricultural productivity may decline due to lack of water because of greater demand on water resources.
		• Can lead to salinization of soil, damaging agriculture, fishery, animal husbandry.
		• Can cause health impacts leading to loss of life and productivity.
		• Odour pollution and health issues due to lack of proper disposal of sewage can put health facilities under stress.

Through the vulnerability assessment, the adaptive capacity of the key actors identified in the IAP was scored based on three parameters: capacity to organize and respond, availability of resources, and access to information. Actors who receive a low adaptive capacity score are classified as vulnerable while those who receive medium and high scores are classified as supporting and can aid the local government in resilience building activities. The table below presents an overall analysis of actors across the different fragile urban systems.

Actor Analysis for Mongla City

Vulnerable Actors	Supporting Actors
• Low Income Group • Middle Income Group • Children • Elderly • Farmer • Irrigation Department • Daily Wage Labourer • St. Paul's Hospital • Private Clinics • Paribarik Shastha Clinics	• Mongla Port Municipality • Mongla Port Authority • Transport Department • Health Department • Port Authority Hospital • Agriculture Department • Fishery Department

The municipality has medium to high adaptive capacity, with good access to information regarding disasters but limited access to technical and financial resources, which limits their ability to respond to disasters appropriately.

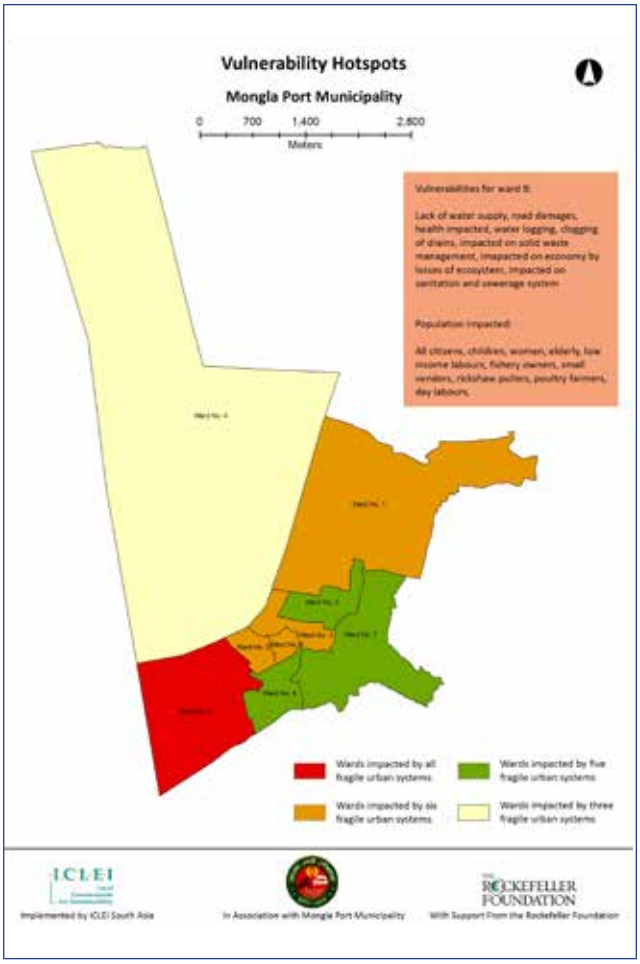
The adaptive capacities of the fragile urban systems are assessed on the basis of five broad categories – economic, technology/ infrastructure, governance, social, and ecosystem services. Each of these five categories was rated as high/medium/low and averaged across all the urban systems to generate an overall score for each parameter in the city as detailed in the following table.

Overall Adaptive Capacity of Systems in Mongla City

Adaptive Capacity Parameters	Adaptive Capacity Score		
	Low	Medium	High
Technological/ Infrastructural			
Economic			
Governance			
Societal			
Ecosystem services			

In Mongla, ward 9 is the vulnerability hotspot which is vulnerable to all seven fragile urban systems, while ward 1, 3, 5 and 6 are vulnerable to six fragile urban systems (refer map). It is

important to note that ward 9 is vulnerable to tidal influences and is downstream of two rivers therefore it is often flooded or water logged. Other wards 2, 7 and 8, are impacted by five fragile urban systems.



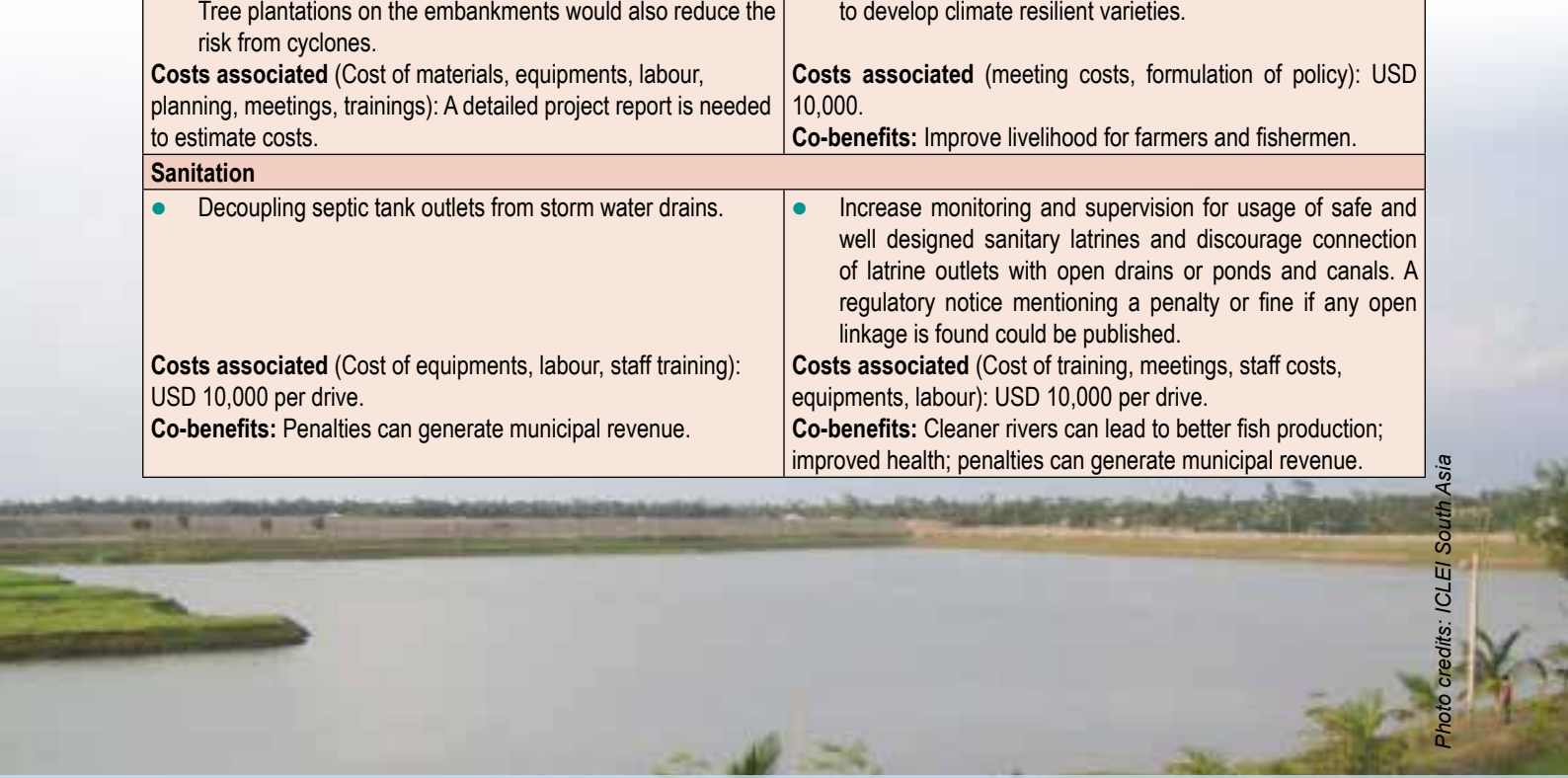
Possible adaptation interventions were identified for the seven fragile urban systems in Mongla on the basis of their climate risks and vulnerabilities, the vulnerable areas and the vulnerable actors to adapt to the possible impacts of climate change on these systems. These prioritized interventions were inter-linked with ongoing programmes and projects. The way forward for the city to build resilience includes:

- **Inter-departmental coordination:** Building coordination between different government departments for better integration of developmental activities with urban resilience and allocation of resources to more vulnerable sectors.
- **Policy improvement:** Several urban systems lack proper policy under which action can be taken for improving the operation and maintenance like decoupling of sewage lines from drains, prevention of littering, conservation of water and rainwater harvesting. This needs to be coupled with awareness generation programmes that can assist residents to adopt newer practices for improved urban services.
- **Capacity Development:** The municipality staff requires training on natural resource management to improve urban service delivery and on operation and maintenance of newer and up-to-date systems. Research and development in the field of agriculture and fishery that can be applied by the farmers and fishermen can also improve resilience.
- **Service level improvement:** Basic urban services in the city are inadequate needing substantial improvement. Structural and policy measures can be undertaken as outlined in the resilience interventions to improve water resource and solid waste management, and sanitation and drainage.

Key Interventions Identified for Mongla City

Infrastructural Measures	Non-Infrastructural/ Policy Measures
Water Supply and River System Management	
• Rain water harvesting program for the storage of rainwater in surface (public) ponds/tanks and recharging ground water where appropriate. The Municipality can also encourage citizens to apply this rainwater harvesting program in their building rooftops for both potable and non-potable usage. **Costs associated** (Civil and construction costs, labour, equipments, materials, staff costs, training, meetings): USD 10,000 per unit **Co-benefits:** Improve soil conditioning, green area development	• Awareness building activities on accessing and using safe water during floods. **Costs associated** (Cost of IEC materials, publication costs, trainings, meetings, logistics): USD 3,000 per drive. **Co-benefits:** Can be used for other systems together
Transportation	
• During construction of drains, appropriate height of drains need to be maintained so that they are at a lower level from the roads to prevent water logging of roads. **Costs associated** (Planning costs, material, equipments, labour, staff costs, training, meeting): A detailed project report needs to be prepared. **Co-benefits:** Improved drainage.	

Infrastructural Measures	Non-Infrastructural/ Policy Measures
Health	
• Provision of resilient health care infrastructure – building hospitals at elevated locations, with facilities to meet challenges of water related and heat related diseases and stresses. **Costs associated** (Civil and construction costs, equipments, materials, staff costs, trainings): A detailed project report needs to be prepared.	• Preparation of a health emergency response plan jointly by the municipality and city hospitals to respond to climate and disaster emergency events. This may include regular drill/practice sessions, staff specific emergency situation guidelines, containment of risks, check lists for post emergency situation and treatment etc. **Costs associated** (Meetings, training, planning cost, staff costs, logistics): USD 15,000 to formulate plan.
Storm Water Drainage	
• Regular maintenance of drains. **Costs associated** (Per km costs of staff, materials, repair): USD 2,500 per km of drains. **Co-benefits:** Improved health.	• Build awareness among the citizens aimed at bringing about a behavioural change and ensure that dumping waste in the open and in drains is not carried out. Education programs can be undertaken which must be aimed at encouraging children to share the learning with families. **Costs associated** (Cost of IEC materials, publication costs, staff costs, training, meetings, logistics): USD 3,000 per awareness drive. **Co-benefits:** Can be used for other systems together.
Solid Waste Management	
• Setting up of a monitoring and complaint centre. **Costs associated** (Cost of equipments, materials, staff training, response team trainings, policy development): A detailed project report needs to be prepared to estimate costs. **Co-benefits:** Improved governance.	• Development of an Integrated Solid Waste Management Plan for the city. **Costs associated** (Cost of consultants, trainings, meetings, logistics): USD 15,000 for development of plan.
Urban/Peri-Urban Agriculture/Animal Husbandry	
• Construction of flood protection embankments on river banks. Tree plantations on the embankments would also reduce the risk from cyclones. **Costs associated** (Cost of materials, equipments, labour, planning, meetings, trainings): A detailed project report is needed to estimate costs.	• Coordination with the fisheries/agriculture sector departments to develop climate resilient varieties. **Costs associated** (meeting costs, formulation of policy): USD 10,000. **Co-benefits:** Improve livelihood for farmers and fishermen.
Sanitation	
• Decoupling septic tank outlets from storm water drains. **Costs associated** (Cost of equipments, labour, staff training): USD 10,000 per drive. **Co-benefits:** Penalties can generate municipal revenue.	• Increase monitoring and supervision for usage of safe and well designed sanitary latrines and discourage connection of latrine outlets with open drains or ponds and canals. A regulatory notice mentioning a penalty or fine if any open linkage is found could be published. **Costs associated** (Cost of training, meetings, staff costs, equipments, labour): USD 10,000 per drive. **Co-benefits:** Cleaner rivers can lead to better fish production; improved health; penalties can generate municipal revenue.



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