AMRUT Funded Centres of Urban Planning for Capacity Building – SPAV

Targeted Urban Research Project:

Urban Blue-Green Infrastructure (BGI) Toolkit for Enhanced Resilience towards Urban Flooding: Case of Machilipatnam.

Project Summary

A critical aspect of climate change is the increasing frequency and severity of extreme weather events. Climate change is expected to change the frequency and intensity of rainfall, triggering more frequent flooding. Many Indian cities, particularly coastal cities, are already facing frequent flooding causing extensive damage to society and city infrastructure. In addition, urban development increases flood risk in cities due to local changes in hydrological conditions. The increase of impermeable surfaces in cities reduces the infiltration of rainwater and increases surface runoff resulting in urban flooding. Both climate change and urbanization exacerbate the flood risks in many coastal cities and strain existing urban infrastructure systems.

In this scenario, the development of nature-based solutions such as Blue-Green Infrastructure (BGI) is recommended as a solution. BGI refers to the strategically planned network of natural and semi-natural areas with other environmental features designed to provide water resource management by introducing the natural water cycle into urban environments. BGI provides effective measures to manage urban flooding, water supply, and quality regulation while delivering a wide range of ecosystem services. BGI includes elements such as urban forests, parks, playgrounds, retention and detention waterbodies, bio-swales, urban open space, permeable surfaces, green roads, and green roofs etc. BGI can be implemented at regional, neighbourhood and site scales.

Due to the variety of BGI components and spatial heterogeneity of cities, regional characteristics influence the development of BGI components for a city and, subsequently, the benefits derived from it. Thus, cities in each

region need to develop the layout and design of BGI components that are appropriate to the topography, and climate, particularly precipitation patterns. BGI Toolkits are crucial for cities for equipping local agencies with the resources needed to support the realization of climate resilience through the development of Blue-Green Infrastructure.

Methodology

This research aims to develop a Blue-Green Infrastructure Toolkit for a sub-city (a sub-watershed within a city) located on the east coast of southern India. The proposed process and methods are shown in the flowchart below:

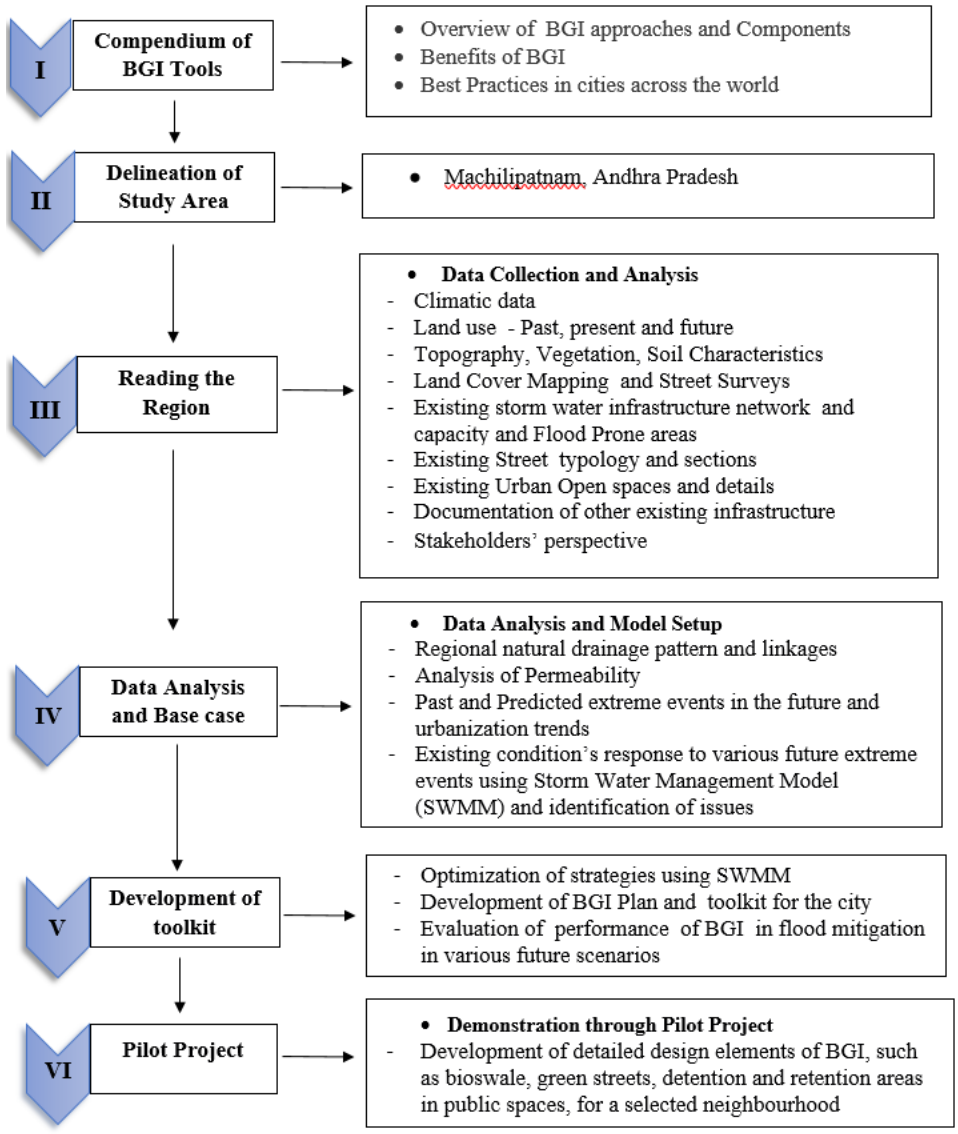

Figure 1 Methodology Flow Chart (Source: Authors)

Relevance to any Urban Local Body

- Urban local bodies in India play a crucial role in the development and growth of urban areas and in improving the quality of life for citizens. They are typically the first to experience the impacts of floods and are on the front lines of developing infrastructure, and emergency responses. The BGI toolkit will enable the ULBs to comprehend the benefits of BGI as a stormwater management and climate-resilient strategy, compare best practices across cities in the world and draw lessons from different approaches.

- The BGI toolkit will provide the details of specific BGI tools and techniques for the pilot project at the neighbourhood scale. The Urban Local Bodies can directly implement the given BGI tools and techniques and realize the benefits of BGI.

- The conceptual Blue-Green Infrastructure Plan (BGIP) for the sub-city provided by the BGI toolkit will be a stepping-stone towards the larger-scale implementation of BGI by the ULB

Deliverables and Outcomes

- Blue-Green Infrastructure (BGI) toolkit for Machilipatnam, Andhra Pradesh. BGI toolkit as a document will provide the following:
  - Overview of BGI approaches and Components
  - Best Practices across the world
  - Conceptual Blue-Green Infrastructure Plans (GIP) and methodology with BGI components such as retention areas, green streets, conveyance streets, bioswales etc., for the selected sub-city
  - Pilot Project demonstrating the application of BGIP with BGI components design at neighbourhood scale

Study Location – Machilipatnam, Andhra Pradesh

Machilipatnam, located at 16.17°N 81.13°E on India's southeast coast, lies along the eastern coastline of Andhra Pradesh. The historic port town was home to European traders in the 16th century. At present, the city of Machilipatnam is vulnerable to the impacts of cyclones and coastal flooding.

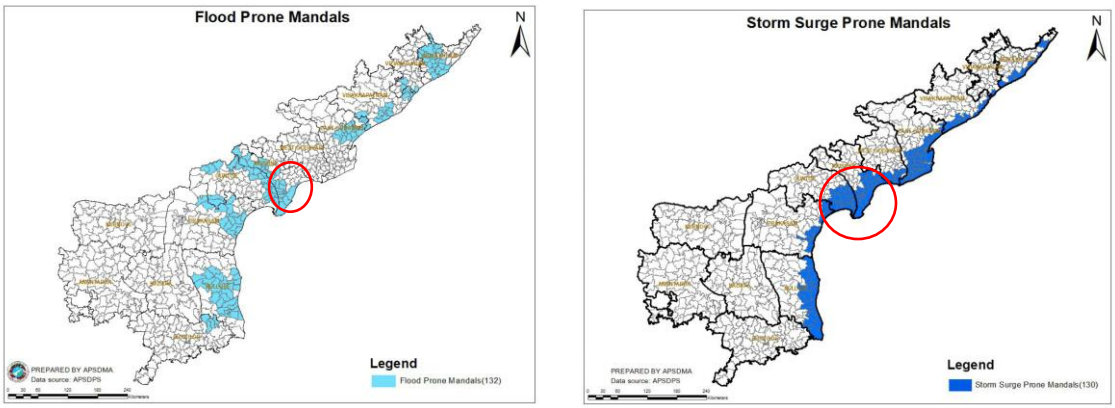

Figure 2: Flood and Storm Surge Prone Mandals of Andhra Pradesh
(Source:APSDMA - https://apsdma.ap.gov.in/hazardmap.php)

Being near the sea, Machilipatnam faces risks from storm surges during cyclonic events, which can lead to significant flooding. Additionally, heavy rainfall from monsoons can contribute to flooding in the region. Its low-lying geography further increases the city's vulnerability to flood risks, especially during severe weather events. Thus, Machilipatnam is selected for the study.

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