



THE SPONGE CITY CONCEPT: A NEW APPROACH TO URBAN WATER MANAGEMENT

Ravanashree M^{1*}, Arunadevi K², Raviraj A³ and Balaji kannan⁴

¹PG Scholar, Department of Soil and Water Conservation Engineering, Agricultural Engineering and Research Institute, Tamil Nadu Agricultural University, Coimbatore, India

²Assistant professor, Department of Soil and Water Conservation Engineering, Agricultural Engineering and Research Institute, Tamil Nadu Agricultural University, Coimbatore, India

³Dean (Agrl. Engg.) Agricultural Engineering and Research Institute, Tamil Nadu Agricultural University, Coimbatore, India

⁴Professor and Head, Department of Physical Science and Information Technology, Agricultural Engineering and Research Institute, Tamil Nadu Agricultural University, Coimbatore, India

*Corresponding Author Mail ID: ravanashreemuthaiah@gmail.com

Introduction

Today, with the increased pace of urbanization worldwide, most cities are very prone to climate change effects such as extreme weather conditions, flooding, and water scarcity.

For these reasons, current traditional urban infrastructure cannot cope with the impacts and presents numerous problems like water runoff and environmental degradation. In this regard, a totally new approach have been envisaged, which is often described as Sponge City.

The innovative Sponge City framework re-conceptualizes urban and water management through the use of natural processes and green infrastructure for absorbing, storing, and recycling rainwater. Transforming the cityscape into a system that mimics the earth's natural water cycle, Sponge Cities provide a resilient solution for city water problems in the face of future environmental pressures.

What is a Sponge City?

A Sponge City, via its construction, emulates nature in its ability to absorb, store, and filter rainwater. Instead of directly allowing the rainwater to flow to the drains and sewers, it retains and reuses the collected rainwater using

modern technological mechanisms. The method not only helps in avoiding flood situations but also incorporates a greener method for water resource management.

Sponge Cities: Key Features

- 1. Permeable Pavements:** One of the primary features of sponge cities is permeable pavements. Conventional asphalt and concrete surfaces inhibit rainwater from reaching the ground; thus, it flows or floods the pavements. Permeable pavements will permit water to filter through the surface, while slowly soaking down into the soil over time, recharging the groundwater while alleviating the burden put on the storm water systems during intense rainfall.
- 2. Green Roofs:** Another critical installation is green rooftops—rooftops covered with vegetation that can absorb rainwater and reduce temperature anomalies. These green rooftops reduce the urban heat island effect and become a form of natural water storages, while the plants absorb the rainwater for irrigation and gradually disperse it to avoid overloading drainage systems.

Rainwater Harvesting System: Advanced rainwater harvesting systems will be installed in Sponge Cities. The collected and filtered

rainwater will be held within storage tanks or underground reservoirs for later use. It is meant for irrigation, landscaping, and other non-potable domestic usages. It may include flushing toilets. Therefore, the cities can greatly, especially during dry periods.

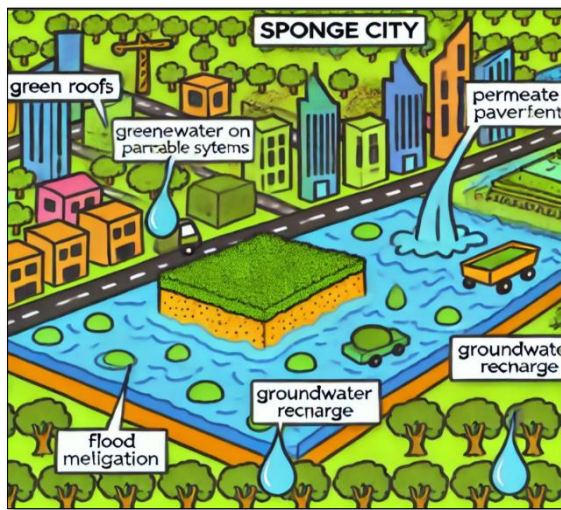
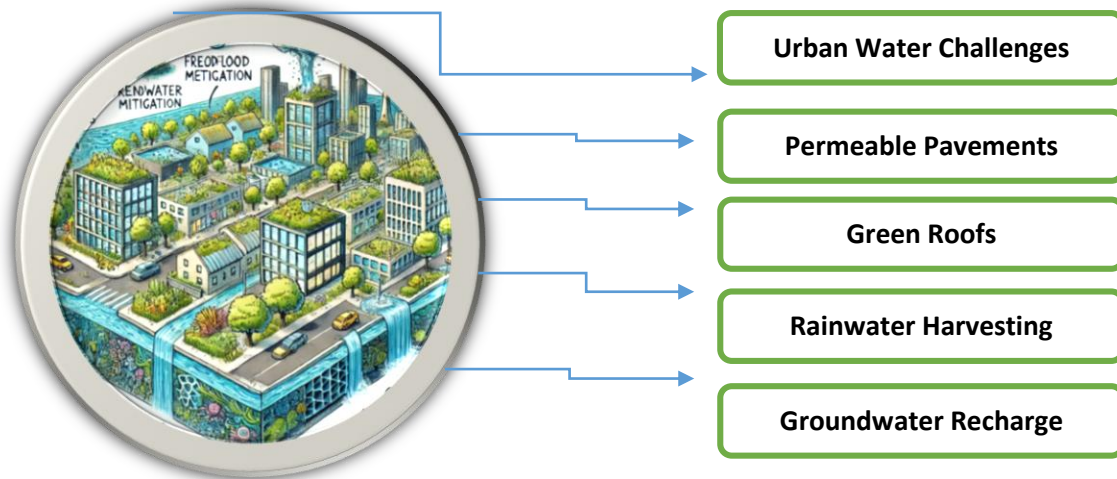
Advantages of Sponge Cities

- **Flood Mitigation:** The concept of Sponge Cities is based upon absorbing excess rainwater; therefore, these cities reduce risks of flooding, especially during heavy storms when drains are generally the most vulnerable.
- **Groundwater Recharge:** Rain water can seep into the ground as will be the case in a sponge city, thus recharging dwindling water resources. This comes in handy in areas where, apparently, groundwater is becoming harder to find due to sheer over-extraction and changes in climate patterns.
- **Environmental Protection:** The Sponge City approach helps clean impurities from rainwater before that rushes into rivers, lakes, or oceans, thus making the waters cleaner and providing a healthier environment. Further, the increased green spaces have promoted biodiversity in the urban centers.
- **Sustainable Water Use:** Innovative harvesting and reusing rainwater systems could ensure that water is used efficiently within cities. This would subsequently lower the pressure put on the traditional supply sources thereby making cities less vulnerable to a water shortage.

The Future of Urban Water Management

The concept of the Sponge City is creative towards modern city solutions. Integrating permeable pavements, green roofs,

and rainwater harvesting systems sets a new approach to managing water resources in cities, helping cities to refuse both flood and drought disasters. It tackles the short-term problems and long-term and decadal challenges; it brings sustainable development of the city in the long term. As environmental challenges facing cities worldwide increase, the Sponge City concept would set forth a very big model in developing and sustaining more resilient, eco-friendly urban environments. It, therefore, acts as a guideline for the future water-sensitive cities that focus on mainstreaming the integration of nature into city planning.



Illustrations of the Sponge City concept, highlighting various aspects like urban water management, green roofs, permeable pavements, and rainwater harvesting systems