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Urban Climate



Urban green space planning for climate adaptation in Indian cities



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ABSTRACT

Indian cities are currently facing high challenges because of growing urbanization and the impacts of climate change. And there is a lack of understanding on using urban green spaces for climate adaptation and mitigation. This article highlights urban green spaces as a cost effective measure for climate adaptation. Following a review of global literature, it also recommends best practices in green space planning for the conservation of urban biodiversity, climate change adaptation, disaster risk management and enhancement of ecosystem services for Indian cities. The article proposes that there should be guidelines for urban planners and foresters on green space planning, by using integrated approaches that meet the social and ecological needs of the cities.

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1. Introduction

Urban green space planning in the 21st century requires greater insights in social, ecological and economical aspects that provide a sustainable urban form (Thompson, 2002). Urban Centers are a key driver of climate change; and while being the prime emitter of Green House Gases (GHGs), they are also vulnerable to the impacts of climate changes. The major effects of urbanization on the environment are an increase in temperature (urban heat island effect) (Wilby and Perry, 2006), increase on the runoff due to impervious surfaces and a surge in the emission of carbon dioxide (Whitford et al., 2001). Urban and suburban expansion deteriorates native ecosystems, and affects air and water quality (McKinney, 2002). Changes in the precipitation pattern and sea level rise, on

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the other hand, are increasing the vulnerability of urban centers lying in low coastal areas, often leading to extreme events such as floods (De Sherbinin et al., 2007) that are likely to cause economic losses and damages in billions of dollars (Hallegatte et al., 2013).

1.1. Climate change and Indian cities

India, being a tropical region, is more susceptible to extreme events such as cyclones and floods. Such hazards are likely to increase in the future, as predicted by the IPCC fifth assessment report (IPCC, 2013). In many Indian cities temperatures have rised over the years. Kumar and Hingane (1988), for instance, have noted a marked rise in temperatures in the three Indian cities of Kolkata, Mumbai and Bangalore; while Ramachandra and Kumar (2010) observed a temperature rise of \sim 2 °C in Bangalore city due to an urban heat island effect. In 2005, Mumbai, one of India's most populated cities, was completely shut down due to extreme rainfall and flooding, with flood waters rising up to a 0.5–1.5 m level in low-lying areas, causing severe economic losses and damage to infrastructure. Ranger et al. (2010) noted that though the city is prone to frequent floods, because of its geographical location in a tropical region that receives abundant monsoon rains, its risks to flooding gets more aggravated due to manmade interventions in its geography—especially due to the inhibition of natural runoff surface water and loss of a network of drains, rivers, creeks and ponds that drain directly into the sea. There is thus a clear need for adaptation to future climate changes in Indian cities (Revi, 2008). Urbanization is important for India's economic growth and the Indian Government has recently emphasized the need for creating smart and sustainable cities. Climate resilience should be an important component for future and existing cities in the country. Mainstreaming climate adaptation in urban development planning (Sharma and Tomar, 2010) is one such option to build climate resilience, along with climate change adaptation and emergency management.

This essay proposes that Urban Green Spaces is a cost effective ecosystem-based approach for climate adaptation in Indian cities; and recommends a strategy of Green Spaces Planning in the Indian context, drawn from global best practices for climate adaptation, environmental and social sustainability.

2. Urbanization and green spaces in India

India has been experiencing rapid urbanization since 1970, with its urban population rising from 109 million in 1971 to 377 million in 2011, a percentage increase from 19.9 to 31.6 over four decades. The number of million-plus cities in the country, meanwhile, has steadily increased from 23 in 1991, and 35 in 2001, to 53 in 2011 (Census of India, 2011). The vehicular traffic in Indian cities has also risen from 5.4 million in 1981 to 141 million in 2011, which is a phenomenal growth. The transport sector of Indian cities contribute to over 7% of total GHG emissions in India. High vehicular emissions in many cities have raised air pollution to unbearable levels (Ghose et al., 2004). By 2030 India is projected to have six cities with a population over 10 million, and more than a 100 million-plus cities (IIHS, 2012). Environmental degradation and loss of green spaces are likely to increase too; and combined with climate change challenges, the environmental sustainability of Indian cities will face serious threats, going forward.

Green spaces across many cities in India have decreased significantly and are further decreasing with growing urbanization and population increase. To take the case of Bangalore city, it has lost much of its open spaces and urban wetlands due to urban sprawl, which has affected its drainage network, local hydrology and ground water table levels (Sudhira et al., 2004). With rise in urban population the per capita availability in many urban areas has reduced drastically and can be expected to decrease further.

It can be noted from Table 1 that many cities in India already fall short of green space available per capita, which is much below the WHO recommended norms of 9 sq m/capita. Gandhinagar and Chandigarh being post-independence planned cities of India, their City Master Plans offer better integration of urban greenery. Chandigarh city, in fact, is one of the greenest cities of India.

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