

Urban Greenery Status of Some Indian Cities: A Short Communication

Pradeep Chaudhry, Kenjum Bagra and Bilas Singh

Abstract—Due to undergoing urbanization trend worldwide, distance between city inhabitants and nature is increasing. Urban greenery/forestry is one of the ways to bridge this gap between people and nature. Most of the Indian cities are far behind in quality as well as quantity of urban forests than their counterpart in Europe and America. High population density is one of the reasons for underdevelopment of urban greenery sector. India can learn a lot from Chinese model of urban forestry development as both of them are the topmost populated countries of the world. Recently, some of the Indian cities like Chandigarh, Gandhinagar and Delhi have shown some improvement in this field. Status of urban greenery in some of the Indian cities has been discussed in the paper.

Index Terms—forestry, gardens, public parks, urban biodiversity.

I. INTRODUCTION

India is urbanizing at a very fast pace. The proportion of younger generation in the country at present is more in comparison to not only European countries or USA but in comparison to more advanced developing countries also. According to the United Nations sources India will add nearly 241 million people in working age population between 2010-2030; Brazil will add around 18 million, while China will add a meager 10 million people during the same time [1]. Therefore, India will continue enjoying a growing and young workforce, enabling its economy to benefit from a “demographic dividend” in the coming years. In 2009, the mean age of the India’s population stood at 27.5 years, significantly younger than 36.8 in China enabling opportunities for a consumer and investment boom [2]. Such investments generally occur in cities/towns of developing countries, causing creation of more employment opportunities. People move towards these cities not only for employment but also for schooling of their children and due to increase in annual income. All such activities, cause more urban sprawl, noise and air pollution. The enhancement of urban green spaces or urban forests is one of the ways, which has the potential to mitigate the adverse effects of urbanization in a sustainable manner, making cities more attractive and comfortable to live in [3]. Central and state

governments in India are realizing the importance of urban green spaces in cities/towns. Urban green status of some cities and need for research & development of urban forestry in India, is discussed in the article.

II. ROLE OF URBAN GREEN SPACES

Urban forestry is the art, science and technology of managing trees and forest resources in and around urban community ecosystems for physiological, sociological, economic and aesthetic benefits trees provide for society [4]. Urban parks, gardens and natural landscapes are better known for their non-market or intangible benefits than market or tangible benefits e.g. the flow value of annual output of forest ecosystem goods and services of Beijing, China has been estimated around US \$ 6.3 billion [5]. In this study, the value of intangible forest environmental services was six times than that of material goods. In other study, total environmental economic value of Beijing’s urban forest was estimated as 19,339 million Yuan [6]. Out of this fruit, timber and fuel wood accounted only 15.66 % and rest were non-marketable services like carbon dioxide sequestration, oxygen emission, rainfall interception, dust retention, biodiversity conservation etc.

Trees laden parks/gardens are used for morning and evening walks/exercises and recreation by all kinds of people. A study in nine cities of Sweden indicates that people of all categories, professions and age consider parks/gardens/urban forests as most effective means for stress-relieving and relaxation [7]. A study undertaken in Guangzhou, China, indicates that more than 50 % of its residents use urban forests for recreational purpose and for stress-relieving [8]. Urban green spaces are the most effective means of removing atmospheric pollution in big cities. In a study undertaken in fifty five cities of USA, it was found that environmental pollution worth more than seven lakh metric tones per year (valuing US \$ 3.8 billion) was removed by the vegetation [9]. Vegetation of Guangzhou city, China consisting of 7,360 ha of urban forests removed 312 metric tones of atmospheric pollution annually (worth US \$ 11,000), out of which particulate matter accounted for 234 metric tons [10]. 2.4 million Urban trees (over 300 sq km) of Beijing, China with 4.5 million population were responsible for removal of 1261 metric tones of environmental pollution annually, out of which 776 million were particulate matter [11].

III. URBAN GREEN STATUS OF SOME INDIAN CITIES

New Delhi, the capital city of India, has grown to be one

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of the greenest capitals in the world due to the consistent emphasis to grow more trees and strict monitoring of tree cutting permissions. This has been possible despite the infrastructure projects which have come up due to the demands of the Commonwealth Games 2010. At present, about 20 % of Delhi's geographical area is under green cover, making per capita green space availability to around 22 m². Besides department of Environment and Forests of National Capital Territory (NCT) Delhi, there are many agencies working for "Green Capital" mission e.g. Municipal Corporation of Delhi (MCD), New Delhi Municipal Council (NDMC) and Delhi Development Authority (DDA). Recently, the Parks & Garden society has been set up to coordinate the greening activities in Delhi. The city has some well maintained parks and gardens like Lodhi Garden, Mughal Garden, Deer Park, Budha Jayanti Samarak Park, Indraprastha Park and The Garden of Five Senses. Department of Environment and Forests of NCT, Delhi has been mainly responsible for increasing the green cover of the city from 30 km² to 300 km² during last 10 years, despite of acute biotic pressure.

Gandhinagar and Chandigarh are the cities which have been established after India's independence, with integration of urban greenery in their City Master plans. Total area of the Gandhinagar capital project of Gujarat state is around 57 km². By the year 2005, tree cover of the city was 57.13% of the total geographical area amounting to 32.56 km² [12]. Population of the city was around 0.2 million in 2001, resulting in per capita green space availability to more than 160 m² (Table 1 and Figure 1&2). Population of the city is nearing 0.3 million in 2011. Exact figures of 2011 census are yet to come for different Indian cities, for sake of uniformity, population census figures of 2001 have been adopted in the paper for assessment of per capita availability of urban green space in different cities. Remote sensing satellite imageries were utilized by Gujarat state government for assessing changes in tree cover of the city between 1979 to 2005. However, varieties of tree species in the city are on a lower side in comparison to Bangalore and Chandigarh. Semi arid climatic condition, perhaps, is the major reason for this situation.



Figure 1: An evening view of a Gandhinagar city park

Chandigarh city was built as a replacement of Lahore city, the capital of undivided Punjab which went to Pakistan during 1947. The city has more than 35% of its geographical area under forest and tree cover, making it one of the greenest cities of India [13]. Population of the city was 0.9 million in 2001, making per capita availability of

green space around 55 m² (Table-1). Besides department of Environment and Forests, other agencies involved in tree plantation, parks/gardens creation and maintenance are Municipal Corporation of Chandigarh, Horticulture division of Engineering department, Chandigarh administration and Central Public Works Department. Important parks/gardens are Rose Garden, Bougainvillea Garden, Garden of Fragrance, Shanti Kunj, Hibiscus Garden, Botanical Garden and Leisure Valley.

Bangalore city is known as the Garden City of India due to the large number of parks and private gardens, roadside & avenue trees and the magnificent Lalbagh & Cubbon Park. The city has around 705 parks spread across the city in the form of small and medium sized parks as well as large parks. Besides these regular parks, there are around 200 open spaces and green areas, which are waiting to be developed as parks and are without any kind of infrastructure and are basically community amenity sites earmarked for development of community infrastructure such as parks and gardens [14]. Majority of avenue species in Bangalore city is exotic, largely planted for their high growth rate and decorative appearance. There is need to plant trees that provide multiple benefits, particularly in house compounds for providing edible pods, flowers, fruits, leaves etc like *Mangifera indica*, *Murraya koenigii*, *Moringa oleifera*, *Tamarindus indica*, *Artocarpus integrifolia*, *Phyllanthus embelica* and *Syzygium cumini* [15]. Estimated crown cover of the city is about 19.9 % of the geographical area [15-16]. This amounts to per capita green space availability to around 17 m². However, according to the Karnataka State Remote Sensing Applications Centre, the total area under vegetation used to be around 12 % in 2000-01 but is drastically reduced now [17]. If this is the situation then per capita green space availability in the city would further decrease.



Figure 2: Canopy cover & panoramic view of Gandhinagar city

From the global perspective, although there are wide variations both in coverage as well as per capita availability of green spaces, cities renowned for their urban green spaces often has 20 to 40 % coverage of total geographical area and 25 to 100 m² urban green space per capita. In Jaipur city, as per the existing land use analysis the area under park and open space is around 5.43 km² for a population of 2.32 million, making per capita availability of green space about 2.30 m² (Table-1). This is very low as per World Health Organization norms of 9.0 m² green open space per city dweller [18]. Most of the Indian cities, with the exceptions of Gandhinagar and Chandigarh, are far

behind in per capita urban forest availability in comparison to European/Australian/American cities e.g. Average green cover is about 19 % for 22 largest Dutch cities (about 228 sq metre per capita) [19-20]; estimated per capita green space availability in Canberra, Australia and Greater Paris region is 80 sq metre [21-22].

TABLE 1: SOME IMPORTANT INDIAN CITIES WITH PER CAPITA GREEN SPACE

City	Population in million (Census, 2001)*	Forest and tree cover (km ²)	Per capita green space (m ² /inhabitant)
Gandhinagar	0.20	32.56	162.80
Chandigarh	0.90	49.00	54.45
Delhi	13.80	297.00	21.52
Bangalore	5.60	97.00	17.32
Jaipur	2.32	5.43	2.30

Source*: <http://www.censusindia.gov.in/>

IV. DISCUSSION AND CONCLUSION

Urban forests are fundamentally a human dominated ecosystem i.e. the role played by human beings in the urban forestry environment is critical. The educational level and environmental awareness of urban residents play a crucial role in determining species composition, management and overall demand for urban forests. Urban greenery development relies not only on investment and technology, but largely on the attitude and involvement of urban residents. In USA, there is a system of declaring a city as "Tree City USA" and in China as "National Garden City". Both the programs have some fundamental criteria like per capita green space, green space to land ratio, green space canopy coverage ratio to grant above recognitions to different cities in above two countries. Over three thousand cities, towns and communities have been awarded "Tree City USA" recognition since the inception of programme [23]. Over one hundred cities of China have been recognized as "National Garden City" till now. During the last fifteen years, India's neighbour China has set an excellent example in the field of urban forestry development as well as research on various aspects of carbon dioxide sequestration, oxygen generation, removal of gaseous & particulate pollutants and microclimate amelioration by urban forests. A review article describes the various studies conducted on major ecosystem services provided by urban forests in Chinese cities like Beijing, Lanzhou, Guangzhou, Jinan, Harbin, Nanjing, Hangzhou, Yangzhou, Dalian and Zhuhai [24]. India can learn from the Chinese model regarding urban forestry research and development because both of them are facing almost similar urban conditions, being most populous countries [25]. Urban green model of Singapore is also worth emulating. There are few good initiatives like rooftop gardens; reserved wilderness areas like Sungei Buloh; Bukit Timah Nature Reserve and McRitchie Reservoir, another natural area acting as catchment for the city's main freshwater reservoir. The need of the hour in India is to educate people and policy makers about the utility of urban green spaces, because public knowledge of the connection between human well being and ecosystem services is limited. Urban greenery plays a significant role in developing countries towards development of tourism sector, thereby contributing in

city's economy [26-27]. Urban green spaces attract better prices for residential and commercial properties in developing and developed countries equally [28-29-30]. Residents in the cities of developing countries have also shown willingness to pay for developing and maintaining urban forests [31-32]. It is win-win situation for all concerned in creating and maintaining urban greenery in the Indian cities. Therefore, all concerned state governments should pay more attention in developing urban green spaces by involving City residents, NGOs and Resident welfare organizations.

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