URBAN INDIA: CHALLENGES FOR GREEN INFRASTRUCTURE

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Summary

Cities and towns in India are centres for economic activities, investments, technologies, livelihoods and innovations. Skill, capital and knowledge are readily available in urban areas than rural India. Continuous migration alongwith natural growth of population adds pressure on urbanization. Vertical city with green infrastructure (GI) is the image of urban aspiration for India's cities and towns now. Examples for GI are rapid rail transit, urban forestry, water bodies etc. They bring benefits to urban environment and thus offer better urban experience.

GIs can be categorized in several systems with set of functions under each of them. Policies and strategies for development and implementation of these GI are evolving with time to accommodate citizens' aspirations. There are certain implementation issues which require redressal from various urban authorities who develop or maintain GIs. Multiple approving authorities, disparity in resource sharing within same city and among different cities, affordability of users, short-term solution inviting/triggering problems in longer time frame, objective performance appraisal, maintaining standard of facilities and quality are some such problems in general and with specific reference to Indian cities. Efforts and challenges faced by different Indian cities and framework to evaluate GI is the focus of this article.

Keywords: India, urban development, green infrastructure, greener evaluation

1 Introduction

In India, population and urbanization has increased manifolds in recent times. The Census of India, 2011 (Provisional Data) provides a glimpse of such changes; with a population base of more than 1.22 billion, urban housing deficit is touching 23 million, and 40 million rural Housing units are required to meet the demand. Increased migration to urban areas has increased phenomenally as economy has grown at 8 % per annum. The Town & Country Planning Organisation of India defines a settlement as a town when it has a minimum population of 5000 and at least 75 percent of male working population engaged in non-agricultural pursuits; and lastly a density of population of at least 400 persons per sq. km. There are 31 cities with more than 10 lac (1 million) population.

Cities and towns in India are centres for economic activities, investments, technologies, livelihoods and innovations. Skill, capital and knowledge are readily available in urban areas than rural India. Continuous migration alongwith natural growth of population adds pressure on urbanization. Vertical city with green infrastructure is the image of urban aspiration for India's cities and towns.

2 Challenges for urbanity in India

Rapid urbanization, young aspirational cititizens, land scarcity are character of India's urban face. Multiple approving authorities, disparity in resource sharing within same city and among different cities, affordability of users, objective performance appraisal, are some such problems in general and with specific reference to Indian cities.

Green space is one among the three components which complete the matrix of urban built environments; buildings and other open spaces like pavement, parking being the other two. Urban neighbourhood in a way reflects social characters like education, economy, technology etc. They contain many built elements of varying scales and different levels like individual building, street or entire neighbourhood. Building is most noticed urban fabric in a neighbourhood. It modifies the ambient surrounding environment while creating protective, efficient internal spaces for users. It occupies ground and introduces new horizontal and vertical surfaces; intercepts solar radiation, wind movement, rain etc. In a way it is the cause for changes in the environment where it has entered/intruded. Depending on strategies employed it brings varied degree of modification in ambient thermal environment and contributes to Urban Heat Island (UHI) phenomenon. In each level, green and other open spaces play distinct roles which inadequately get acknowledged for environmental impact assessment, whereas buildings get the prime attention.

Greenery has the quality to naturalize and complement a man-made environment. It can directly contribute to physical and psychological comfort of users. Many scientific studies conducted all over the world have quantified the benefits of greenery in terms of temperature reduction, wind flow modification, humidity control and boost of work capacity. They can be strong mitigation tool for many anthropogenic or natural disasters as well. In a very similar way impact of other open spaces are also being explored scientifically and will continue to be studied.

In recent times, sustainability dilemma in urban development brought debate on issues like "sustainability and sustainable development", "preservation and conservation", "adaptation and mitigation" and/or "new development and restoration" in the forefront. A campus, by virtue of being a regulated idealistic autonomous society in any country, can play role model for built-environment; and a short-or long- term residential experience within these would create a constructive impression on young generation to carry forward for future. So, a neighbourhood can play a much bigger role in 4D i.e. time, and shall accommodate all three urban elements with right balance to respond to sustainability dilemma. But there is no such quantitative simplistic method towards this balancing act. The interrelationship depends on their quantitative and qualitative presence, which in turn depend on issues like activity requirements, climate, socio-economical & technical etc. So the question how and to what extent greenery needs incorporation in neighbourhoods will again fetch different answers/requirements. Any two neighbourhoods are different in terms of location, area, focus group, facilities etc. Even in the same city they will receive different responses.

So, for a country like India, where a lot of diversity is easily identifiable, neighbourhoods and greenery within them ask for diverse concerns or requirements when they search for a desired balance. To achieve this goal, identification of certain parameters is required so that the planners or estate managers in campuses can assess their state of development. In India, it is the lack of quantitative data on the greenery condition in order to maintain or improve the condition. The greenery condition means the greenery

parameters such as the area, the type, age and density of the greenery etc. The greenery database in neighbourhoods is usually collected from the archive of the landuse drawings; landuse plans do not represent the real time green scenario mostly. Even to decide on making a shift in greenery and other open spaces' objective, scarcity of quality data is an important issue.

3 Green Infrastructure

Green infrastructure (http://greeninfrastructure.net/content/definition-green-infrastructure) is 'strategically planned and managed networks of natural lands, working landscapes and other open spaces that conserve ecosystem values and functions and provide associated benefits to human populations. The foundation of green infrastructure networks are their natural elements – woodlands, wetlands, rivers, grasslands – that work together as a whole to sustain ecological values and functions. Healthy functioning natural or restored ecological systems are essential to ensure the availability of the network's ecological services'.

Natural England's (http://www.urbanspaces.eu/files/ Green Infrastructure Guidance. pdf) definition of green infrastructure is *'Green Infrastructure is a strategically planned and delivered network comprising the broadest range of high quality green spaces and other environmental features. It should be designed and managed as a multifunctional resource capable of delivering those ecological services and quality of life benefits required by the communities it serves and needed to underpin sustainability. Its design and management should also respect and enhance the character and distinctiveness of an area with regard to habitats and landscape types.*

Green Infrastructure includes established green spaces and new sites and should thread through and surround the built environment and connect the urban area to its wider rural hinterland. Consequently it needs to be delivered at all spatial scales from sub-regional to local neighbourhood levels, accommodating both accessible natural green spaces within local communities and often much larger sites in the urban fringe and wider countryside.'

Green Infrastructures (GI) can be categorized in several systems with set of functions under each of them.

1. Parks and Gardens – urban parks, Country and Regional Parks, formal gardens
2. Amenity Green space – informal recreation spaces, housing greenspaces, domestic gardens, village greens, urban commons, other incidental space, green roofs
3. Natural and semi-natural urban green spaces – woodland and scrub, grassland (e.g. downland and meadow), heath or moor, wetlands, open and running water, wastelands and disturbed ground), bare rock habitats (e.g. cliffs and quarries)
4. Green corridors – rivers and canals including their banks, road and rail corridors, cycling routes, pedestrian paths, and rights of way
5. Other – allotments, community gardens, city farms, cemeteries and churchyards.

Policies and strategies for development and implementation of these GI are evolving with time to accommodate citizens' aspirations. Different physical elements are vehicle for GI like rail transit, urban forestry, water bodies etc. They bring benefits to urban environment and thus offer better urban experience. But there are certain issues which require redressal from various urban authorities; e.g. multiple approval authorities, affordability of users,

short-term solution provisions which invite/trigger other problems in longer time frame, maintaining standard of facilities and quality etc.

To assess need for GI can start within a block or a neighbourhood or in the entire city. Lansuse/landcover data would be extremely useful for the same. Efficient handling of data allows developing an evaluation framework or tool to plan and act accordingly to create sustainable campus environment. Balance between built spaces and green and other open area is the crux of it. Geographical Information System (GIS), Leaf Area Index (LAI), are components loosely identified which can help to develop a Greenery Evaluation Framework (GEF) for neighbourhoods. Biotope Factor (BF), Green Plot Ratio (GnPR) are some models developed in search for the need for GI.

4 Conclusion

The Greenery Evaluation Framework (GEF) for neighbourhoods would depend on micro-climate data. Once a GEF is in place, it will facilitate in identifying requirement of type, quantity and quality of green infrastructure which is area-specific and dynamic.

Bibliography

[1] Foy D., & Rogers J., *Efficiency in cities: a preliminary assessment of Potential*; Living Cities Report, 2008.

[2] Fuller, R. A. and Gaston, K. J.; *The scaling of green space coverage in European cities*; Biology Letters 5(3): 352–355, 2009.

[3] Kuchelmeister, G., *Urban Forestry: Present Situation and Prospects in the Asia and Pacific region*, FAO Working Paper No: APFSOS/WP/44, FAO, Rome; 1998.

[4] Mukherjee, M.; *Climatic Resiliency for Indian Cities*, 2nd India Disaster Management Congress, NIDM, Govt of India, Vigyan Bhawan, New Delhi, 4–6 Nov, 2009.

[5] Revi A., *Climate change risk: An adaptation and mitigation agenda for Indian cities*; Environment and Urbanization, 20(1): 207–229, 2008.

[6] Robinson, J., *Squaring the circle? Some thoughts on the idea of sustainable development,* Ecological Economics, 48, 369–384, 2004.

[7] Singh, V.S., Pandey, D. N. & Chaudhry, P., *Urban forests and open green spaces: lessons for Jaipur, Rajasthan, India*; RSPCB Occasional Paper No. 1/2010, 2010.

[8] Sukhdev, P., Foreword notes in "*Prosperity without growth: economics for a finite planet*" by Jackson, T., Earthscan, 2009.

[9] Summer, J. (Ed.), *Asian Green City Index, 2011*; Economist Intelligence Unit, Sponsored by Seimens A G.

[10] Wang, X.J., *Analysis of problems in urban green space system planning in China;* Journal of Forestry Research 20(1): 79–82, 2009.

[11] Wong, N. H. & Steve, K. J.; *An Assessment Method for Existing Greenery Conditions in a University Campus*, Architectural Science Review, 51:3, 212–222; 2008.