URBAN PARKS AND SUSTAINABLE DEVELOPMENT: A STUDY OF AMRUT CITIES IN UTTAR PRADESH

A. K. Gupta*, A. K. Singh** and Zia Ul Haque***

Abstract: Urban green spaces and parks are integral components of urban ecosystems, contributing to enhanced environmental quality and sustainable development and provide significant ecosystem services. Role of parks and gardens has enhanced in view of growing population of cities and increasing pollution. Tangible and intangible benefits provided by green spaces and parks are often taken for granted by the public and municipal authorities. In order to squarely address the challenges of urbanisation, the Government of India has launched a number of new initiatives. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) for 500 cities target the provision of drinking water, sewerage, storm water drainage, development of green spaces and parks, and creation on infrastructure for non-motorized transportation at least the established benchmark levels. Present paper purports to review the status of green spaces and management of parks in AMRUT cities of Uttar Pradesh.

In recent decades, India has seen unprecedented population growth and urbanization. In the period between 2001 and 2011, the total population increased by 17.64 percent, along with an annual economic growth rate of approximately 6 percent. From having 5,161 classified towns and 384 urban agglomerations in 2001, India's urban centres grew to 7,935 classified towns and 475 urban agglomerations in 2011, making India the second largest urban system in the world. The urban population of Uttar Pradesh stood at 19.01 million in 1981, increasing to 34.50 million in 2001 and, further to 44.47 million in 2011. Urban population has been increasing at a steady rate of

* Additional Director, Regional Centre for Urban and Environmental Studies, Lucknow
** Assistant Director, Regional Centre for Urban & Environmental Studies, Lucknow.
*** Urban Planner, Regional Centre for Urban & Environmental Studies, Lucknow.

around 3.07 percent per annum in the past three decades, which is much higher than the growth rate of 2.38 percent per annum in the total population of the State. In 2011, 22.28 percent of total population of State lives in urban areas which accounts 11.79 percent of total urban population of country and on the basis of provisional census data of 2011, out of 4041 statutory towns of country, 648 towns exist in UP which is 16 percent of total number of towns. Uttar Pradesh has 634 Urban Local Bodies. There are 14 Nagar Nigam, 196 Nagar Palika Parishads and 424 Nagar Panchayats. They account for almost 16 percent of the total Urban Local Bodies in the country. In the state of Uttar Pradesh, 61 cities/ towns have been selected under AMRUT.

Distribution of AMRUT cities by population range is shown in Table 1. About 3/4th cities had population of less than 5 lakh. About 20 per cent cities were in the range of 5 lakh to 15 lakh population. Most of the Nagar Palika Parishads have population of less than 5 lakh. It is to be noted that AMRUT has been implemented in Class I cities i.e. having population of more than one lakh. 7 Municipal Corporations have population of more than 10 lakh.

Table 1
Type of ULBs-wise Population of AMRUT Cities

Type of City	Less Than 500000	500000-1000000	1000000-1500000	1500000+	Total
Municipal Corporation	0	7	4	3	14
	0.0%	50.0%	28.6%	21.4%	100.0%
Nagar Palika Parishad	45	2	0	0	47
	95.74%	4.25%	0.0%	0.0%	100.0%
Total	45	9	4	3	61
	73.77%	14.75%	6.55%	4.91%	100.0%

Source: SLIP Data, RCUES, Lucknow

In order to squarely address the challenges of urbanisation, the Government of India has launched a number of new initiatives. The Swacch Bharat Mission aims to make India litter free and open-defecation-free by 2019. The Atal Mission for Rejuvenation and

Urban Transformation (AMRUT) for 500 cities target the provision of drinking water, sewerage, waste management and other infrastructure to at least the established benchmark levels. The reforms under AMRUT emphasise the increasing green spaces by 15 percent by 2019-20. As per approved SAAP of AMRUT, Rs. 127.47 crores , constituting 2.5 percent were allocated on development of green spaces and parks for the period of 2015-16 to 2019-20. Overall, 86 projects with worth of Rs.70.45 crores, constituting 2.14 percent were approved for 2015-16. The 'Housing for All' scheme promises that every Indian will have an adequately serviced shelter by 2022. The HRIDAY (Heritage Rejuvenation and Development) Scheme will revitalize heritage cities. The programme for Smart Cities targets the transformation of 100 mid-sized cities and satellite towns through effective planning, financial management, mobility and widespread use of information & communication technologies (ICT). The ambition and scale of the urban transformation in India will only be sustainable if the path chosen to achieve targeted objectives is essentially a 'green' path. The nature and extent of the environmental pressures and damages being caused by India's cities are yet to be fully measured; however, there is sufficient evidence in the levels of air and water pollution alone that these cities are producing externalities that are likely to severely impede the productivity of the indigent populations and are contributing to global phenomena like climate change to unprecedented levels. In this scenario, the developmental impetus needs to be steered towards greener solutions and a new approach to the economy of cities.

Urban forestry is an important contributory factor in the cities for environmental enhancement, control of air and noise pollution, microclimatic modification and recreational purposes of the urban population. Before the city expands further a proper plan for greening in the city especially with respect to land availability in the form of parks and gardens, forest patches and road side plantation should be in place. In addition to avoid illegal diversion of green cover of the city for taking up developmental works or otherwise a legal framework should be in place. And therefore plan for urban forestry should be integrated into overall planning of the

urban areas in advance otherwise greening of the urbanised area becomes more difficult once the settlement takes place especially in identifying the land for the same and in greening the same.

The term "urban green spaces" is used as a comprehensive term, comprising all urban parks, forests and related vegetation that add value to the inhabitants in an urban area. The term "urban trees" includes trees growing both within the built environment as well as road-side avenues and public places in urban systems. The issue of required open green spaces per capita in urban systems has remained controversial. In 20th century, experts in Germany, Japan and other countries proposed a standard of 40 square meters (m²) urban green space in high quality or 140 m² suburb forest area per capita for reaching a balance between carbon dioxide and oxygen, to meet the ecological balance of human well-being. Currently, developed countries have tended to adopt a general standard of green space of 20 m² park area per capita (Sukopp et al. 1995, Wang, 2009). International minimum standard suggested by World Health Organization (WHO) and adopted by the publications of United Nations Food and Agriculture Organization (FAO) is a minimum availability of 9 m² green open space per city dweller (Kuchelmeister 1998). There is yet another yardstick, which refers to London but has relevance to any city. In terms of structural diversity, green spaces in urban systems should essentially be developed as networks (Cook, 2002, Thompson, 2002). Three main components of urban forest and green spaces are: Patch (urban domestic gardens, public and private parks, gardens, urban forest patches etc.), Corridor (roadside avenues, walkways and urban greenways etc.), and Network structure (layout of all the patches and the corridors connecting the patches). In India, except for a few cities, urban forests are not well-studied. There are, however, some studies on Bangalore (Sudha and Ravindranath, 2000, Nagendra and Gopal, 2010), Chandigarh (Chaudhry, 2006; Chaudhry and Tewari, 2010; FSI, 2009) and Delhi (FSI, 2009). Some issue - specific studies such as biodiversity and carbon storage are also available for Bhopal (Dwivedi *et al.,* 2009), Delhi (Khera, 2009), Jaipur (Verma, 1985, Dubey and Pandey, 1993), Mumbai (Zeìrah, 2007) and Pune (Patwardhan *et al.,* 2001). A few studies are also available for specific

locations within the urban ecosystems, such as NEERI Campus, Nagpur (Gupta *et al.*, 2008) and Indian Institute of Science Campus, Bangalore (Mhatre, 2008). The most robust studies on urban forests using satellite imageries have been for Delhi and Chandigarh. The estimates suggest that Chandigarh and Delhi have 35.70 and 20.20 per cent urban forests, respectively (Action Plan, 2009-10 and FSI 2009). Chandigarh, one of the planned and modern cities of India, has more than 35 percent of its geographical area under forest and tree cover, making it one of the greenest cities of India (FSI, 2009). Two economic valuation methods, i.e., Contingent valuation method and Travel cost method were applied for the estimation of recreational use value of its public parks, gardens and Sukhna wild life sanctuary from the point of view of residents and tourists. In Jaipur city, as per the existing land use analysis the area under park, open space is around 5.43 Km^2 in Jaipur city for a population of 3.30 million. Accordingly, per capita open space works out to be 1.60 m^2 per person. The areas of reserved forests and protected forests in surrounding hills that amount to approximately 75 km^2 are excluded in the above calculations. According to the proposed Master Development Plan 2025, it is proposed to enhance the per capita of open space to 8.80 m^2.

In addition to urban forests, private gardens are significant habitats that improve connectivity by functioning as corridors and patches, and thus enhance the overall network size of urban green spaces. Trees in urban systems provide a variety of ecosystems services including biodiversity conservation, removal of atmospheric pollutants, oxygen generation, noise reduction, mitigation of urban heat island effects, microclimate regulation, stabilization of soil, ground water recharge, prevention of soil erosion, and carbon sequestration (Bolund and Hunhammar, 1999).

First and foremost aspect of SLIP under AMRUT is to assess the existing situation and service levels gaps for organised Green Space and Parks based on standards prescribed in URDPFI Guidelines and National Building Codes. In order to assess the service level gap the city shall have to review all policies, plans; scheme documents etc., hold discussions with concerned officials and citizens, as per the requirement and conduct physical assessment

of city parks to understand the current status. The city should undertake overall assessment of Parks and Open/ Green Space in terms of (a) available general services and facilities, (b) Physical Activities resources, (c) family facilities including child friendly play equipment's, and, (d) aesthetics and other (e) safety; (g) accessibility . While discussing about the existing status of the organized green space in your city make a sincere effort to analyze the proportion of area under the categorization of parks as per URDPFI Guidelines viz. Housing Area Park, Neighbourhood Park, Community Park, District Park , and Sub-City Park . Also focus on qualitative aspects of existing parks like geographical distribution across the city, encroachments, child and elderly friendly features; staffing, maintenance & equipment issues; and maintenance by RWAs/ Corporate under their CSR Activities etc should be given.

Urban parks are an important part of the complex urban ecosystem network and provide significant ecosystem services. It benefits urban communities environmentally, aesthetically, recreationally, psychologically and economically (Burgess *et al.*, 1988; Conway, 2000; Gehl and Gemzoe, 2001; Grahm, 1985). The urban park movement (Conway, 1969; Pregill and Volkman, 1999) had objective to increase the city life quality of the industrial revolution era (Paredal, 2006). The planning of parks was closely related to urban and garden design (Eckbo *et al.*, 1993). The movement started in England (Andersen, 1969; Deane, 1979), creating public city parks like the Victoria Park which is considered the first urban park of history (Pardal, 2006) while according to some authors the Birkenhead Park was the first urban park constructed exclusively with public money (Tate, 2004). Public parks supported by municipal governments date from the 1840s in Britain and the 1850s in the United States and Canada. Initially urban parks were not public, once they were used only by a privileged part of the population (Cranz and Boland, 2004; Jellicoe *et al.*, 2001). Urban parks, open space and related human health issues are a critical component of any state, regional and local infrastructure plan. Urban parks promote the core values at stake in building public infrastructure: providing children the simple joys of playing in the park; improving health and recreation; equal access to public

resources; democratic participation in deciding the future of the community; economic vitality for all with increased property values, local jobs, small business contracts, and affordable housing; spiritual values in protecting people and the earth; the environmental benefits of clean air, water, and ground; and sustainable regional planning. The planning and management of urban parks is meaningful to urban sustainable development (Teal *et al.*, 1998). Urban Parks have significant ecological, social and economic functions, thus, the future social implications of new lifestyles, values, attitudes to nature and sustainability will lead to higher demands for urban parks (Thompson, 2002). Parks and other open spaces should not be considered a luxury in the city. Parks are democratic "commons" that bring diverse people together, fomenting a sense of community and social vitality that has been progressively lost in the last decades, by promoting human heath, environment and economic strength. Green space offer significant ecosystem services, which are defined as "the benefits human population derives, directly or indirectly, from ecosystem functions" (Costanza *et al.*, 1997). It can sequester carbon dioxide emissions and produce oxygen (Jo, 2002), purify air and water, regulate micro-climate, reduce noise (Bolumd, 1999), protect soil and water (Konijnendijk *et al.*, 2005), maintain biodiversity (Sandstorm *et al.*, 2006), and have recreational, cultural and social values (Vos and Klinj, 2002). Additionally, public parks and green spaces can have a statistically significant effect on the sale price of houses in close proximity to those resources (Bolitzer and Netusil, 2000; Luttik, 2000). According to Canz and Boland (2004) urban green space contributes to ecological sustainability. A functional network of green space is important for the maintenance of the ecological aspect of a sustainable urban landscape. Landscape connectivity should be promoted with the development of greenways and use of autochthonous species, adapted to local condition, with low maintenance cost, self-sufficient and sustainable.

Distribution of Parks by type of ULBs is shown in Table 2. In 59 AMRUT cities, 7945 total parks were reported. The distribution of parks demonstrates that larger number of parks is located in Municipal Corporations while about 89 per cent Nagar Palika Parishad own less than 50 parks. About 71 per cent Municipal

Corporations own 100-500 parks while 4 Municipal Corporations have more than 500 parks in each ULB.

Table 2
Distribution of Parks by Type of ULBs

Type of City	Less Than 50	50-100	100-500	500 Above	Total
Municipal Corporation	0	0	10	4	14
	0.0%	0.0%	71.4%	28.6%	100.0%
Nagar Palika Parishad	40	4	1	0	45
	88.9%	8.9%	2.2%	0.0%	100.0%
Total	40	4	11	4	59
	67.8%	6.8%	18.6%	6.8%	100.0%

Source: SLIP Data, RCUES, Lucknow

Distribution of Parks in ULBs of Uttar Pradesh is shown in Table 3. About 87 per cent parks were found located in Municipal Corporations. Out of total parks, about 83 per cent parks were under the ownership of ULBs while about 11 per cent parks were managed by Development Authorities. Most of the parks were found located in housing areas. About 5 per cent parks are being managed by private sector/corporate sector under public private partnership.

Table 3
Distribution of Parks in ULBs of Uttar Pradesh

Particulars	Municipal Corporations	Nagar Palika Parishads	Total
Total Parks	6933 (100.00)	1012 (100.00)	7945 (100.00)
ULB Parks	5608 (80.89)	1001 (98.91)	6609 (83.18)
Development Authority Parks	961 (13.86)	1(.01)	962 (10.84)
Parks Managed by PPP	358(5.16)	10(0.98)	368 (4.63)
Horticulture	6 (0.09)	0	6 (0.07)
Housing Area Parks	6572 (94.79)	922 (91.11)	7494 (94.32)
Neighborhood Parks	246 (3.55)	53 (5.24)	299 (3.76)
Community Parks	94 (1.36)	30 (2.96)	124 (1.51)
District Parks	21(.30)	7(.069)	28 (0.35)

Source: SLIP Data, RCUES, Lucknow

Category-wise distribution of parks in Municipal Corporations in Uttar Pradesh is shown in Table 4. The ownership of parks by Development Authorities was found significantly high in Aligarh followed by Allahabad, Agra and Gorakhpur while in other Municipal Corporations; most of the parks are being managed by ULBs.

Table 4
Category wise Distribution of Parks in Municipal Corporations in Uttar Pradesh

Municipal Corporation	Total Parks	ULB Parks	Development Authority Parks	Parks Managed by PPP	Horticulture Parks
Varanasi	164	164	0	0	0
		100%	0.0%	0.0%	0.0%
Meerut	394	394	0	0	0
		100%	0.0%	0.0%	0.0%
Lucknow	1999	1657	342	0	0
		82.81	17.11	0.0%	0.0%
Kanpur	844	826	18	0	0
		97.87	2.14	0.0%	0.0%
Jhansi	330	89	39	202	0
		26.97	11.82	61.22	0.0%
Allahabad	333	181	152	0	0
		54.36	45.65	0.0%	0 . 0 %
Saharanpur	129	129	0	0	0
		100%	0.0%	0.0%	0.0%
Aligarh	153	76	74	3	0
		49.68	48.37	1.97	0.0%
Agra	583	336	207	34	6
		57.64	35.51	5.84	1.02
Bareilly	254	120	28	106	0
		47.25	11.02	41.74	0.0%
Firozabad	101	94	4	3	0
		93.06	3.97	2.98	0.0%
Ghaziabad	1212	1212	0	0	0
		100%	0.0%	0.0%	0.0%
Gorakhpur	265	200	65	0	0
		75.48	24.53	0.0%	0.0%
Moradabad	172	130	32	10	0
		75.59	18.61	5.82	0.0%
Total	6933	5608	961	358	6
		80.89	13.87	5.17	0.08

Source: SLIP Data, RCUES, Lucknow

Hierarchy-wise distribution of parks in Municipal Corporations in Uttar Pradesh is shown in Table 5. Most of the parks are located in housing area in Municipal Corporation. However, a significant proportion of parks were classified as Neighbourhood parks in Kanpur, Ghaziabad, Jhansi, Lucknow and Agra. The proportion of community parks was also recorded significant in Jhansi, Kanpur, Ghaziabad, Varanasi, Moradabad, Gorakhpur and Saharanpur.

Table 5
Hierarchy-wise Distribution of Parks in Municipal Corporations in Uttar Pradesh

Municipal Corporation	Total Parks	Housing Area	%	Neighbo- urhood Parks	%	Commu- nity Parks	%	Distt. Parks	%
Varanasi	164	159	96.95	2	1.21	3	1.83		0
Meerut	394	384	97.46	5	1.26	4	1.02	1	0.25
Lucknow	1999	1916	95.85	74	3.70	7	0.36	2	0.10
Kanpur	844	754	89.34	57	6.75	23	2.73	10	1.18
Jhansi	330	297	90	18	5.45	15	4.54		0
Allahabad	333	331	99.40		0	2	0.60		0
Saharanpur	129	125	96.89	1	0.77	2	1.55	1	0.77
Aligarh	153	149	97.38	2	1.31	1	0.65	1	0.65
Agra	583	564	96.74	15	2.57	3	0.51	1	0.17
Bareilly	254	248	97.64	4	1.57	2	0.78		0
Firozabad	101	100	99.00	1	0.99		0		0
Ghaziabad	1212	1120	92.41	63	5.19	27	2.23	2	0.16
Gorakhpur	265	259	97.73	2	0.75	3	1.13	1	0.37
Moradabad	172	166	96.51	2	1.16	2	1.17	2	1.168
Total	6933	6572	94.79	246	3.54	94	1.35	21	0.30

Source: SLIP Data, RCUES, Lucknow

Population-wise area of parks in AMRUT cities is shown in Table 6. The parks located in Municipal Corporations had larger area and population while Nagar Palika Parishad had less area in parks. ULBs with larger population have large area of parks while ULBs having less population have less area in parks.

Table 6
Population wise Area of Parks in AMRUT Cities

ULB Population	Less Than 50000	50000-100000	100000-500000	500000-1500000	1500000 +	Total
Less Than 500000	30	6	8	0	0	44
	68.2%	13.6%	18.2%	0.0%	0.0%	100.0%
500000-1000000	0	0	5	3	0	8
	0.0%	0.0%	62.5%	37.5%	0.0%	100.0%
1000000-1500000	0	0	1	2	0	3
	0.0%	0.0%	33.3%	66.7%	0.0%	100.0%
1500000+	0	0	0	0	4	4
	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Total	30	6	14	5	4	59
	50.8%	10.2%	23.7%	8.5%	6.8%	100.0%

Source: SLIP Data, RCUES, Lucknow

Per capita availability of Green Spaces in ULBs in Uttar Pradesh is shown in Table 7. Availability of green space per capita should be 3 sq.mt. as per norms, however, availability of green space has been reported to be low in Municipal Corporations and slightly higher in Nagar Palika Parishad.

Table 7
Per Capita Availability of Green Spaces in ULBs in Uttar Pradesh

Type of ULB	Total Population	Total Area of Parks (Sqr Mtr.)	Total No of Parks	Per capita Availability of Green Spaces (Sqr. Mtr.)	Budget Allocation under AMRUT for 2015-20 (Rs. Crore)
Municipal Corporation	17579784	20614321	6933	1.17	56.64
Nagar Palika Parishad	8214181	3267896	1012	3.98	70.83
Total	8390165	23882217	7945	2.85	127.47

Source: SAAP Data, RCUES, Lucknow

Per capita availability of green spaces in Municipal Corporations in Uttar Pradesh is shown in Table 8. Per capita availability of green space was recorded low against the norms in all the Municipal Corporations. However, it was recorded comparatively higher in Agra followed by Lucknow, Jhansi and Ghaziabad. As per approved budget of AMRUT cities for 2015-20, Rs. 56.64 crores was allocated for development of parks. A higher amount of budgetary allocation was recorded in Jhansi followed by Meerut, Gorakhpur, Kanpur, Allahabad and Ghaziabad.

Green spaces and parks are critical component of urban and peri-urban environment, which moderate microclimate, enable ground water recharge, provide shade and conserve local biodiversity, improve quality of life for city dwellers by pro viding recreational avenues. Urban centres need public space for better social cohesion, significant health benefits, aesthetics as well as mitigating climate change. Presently the responsibility for development, protection and management of green spaces and parks in urban areas lies with number of agencies like local bodies, Development Authorities and Forest Departments etc. From a legal perspective also, green space is covered under various Acts and Rules like the Municipal Acts, Indian Forests Act, Master Plans and Bye Laws etc. In addition there are Country and Town Planning guidelines governing allocation of space for green areas while laying out of town plans. Most of these green areas are Neighborhood Parks, District and Regional Parks, and other green areas. The extent of areas that are to be set out as greens under these town planning rules and guide lines have mostly followed however, empirical guidelines are not based on scientific findings and requirements. As a result these guidelines have most often fallen short in demarcating adequate land cover under greens resulting in sub-optimal benefits to environmental, health and other related issues. The regulatory authorities entrusted with protection of trees do not have a proactive role to play in planning of green areas in urban landscapes. Multiplicity of agency has proved to be more of an obstruction than help in protecting and conserving tree cover and urban greens. The absence of long term planning resulting in frequent changes in land use. Land covered with trees is viewed as

Table 8
Per Capita Availability of Green Spaces in Municipal Corporations in Uttar Pradesh

Municipal Corporation	Total Population	Total Area of Parks (Sqr. Mtr.)	Total No of Parks	Per capita Availability of Green Space (Sqr. Mtr.)	Budget Allocation under AMRUT for 2015-20 (Rs. Crore)
Varanasi	1201815	213607	164	0.18	1.97
Meerut	1309023	676301	394	0.52	6.46
Lucknow	2815601	5995103	1999	2.13	1.68
Kanpur	2767031	2601419	844	0.94	5.80
Jhansi	507293	777083	330	1.53	11.10
Allahabad	1117094	1038676	333	0.93	4.36
Saharanpur	703345	622427	129	0.88	1.05
Aligarh	872575	320868	153	0.37	1.34
Agra	1574542	3832555	583	2.43	3.11
Bareilly	898167	446319	254	0.50	3.90
Firozabad	603797	129570	101	0.21	1.03
Ghaziabad	1648643	2802586	1212	1.70	4.03
Gorakhpur	671048	359307	265	0.53	5.91
Moradabad	889810	798500	172	0.90	4.91
Total	17579784	20614321	6933	1.17	56.64

Source: SLIP Data, RCUES, Lucknow

loss of opportunity cost when compared to the land put to commercial and infrastructural uses. There is tremendous pressure on green areas/ trees for competing land uses especially for expanding infrastructure. Thus, there is need for uniform policy framework for integration of existing green spaces and parks in the Master Plans of cities. Green spaces resource assessment should be undertaken in urban and peri-urban areas by the concerned landowning agencies in coordination with respective Departments. There is an urgent need to have common guidelines for maintaining and enhancing tree cover based on sound scientific principles.

Necessary facilities should be developed for training and capacity building, transfer of technical knowhow, awareness raising and information dissemination among citizens for promoting tree growth in urban areas. Urban greening is different from normal plantation/ afforestation activity, requiring appropriate cost norms for plantation & maintenance. Maintaining green spaces and parks is important which require regular care and maintenance. There is a need for dedicated funding for improving green cover in urban areas from Central, State Governments and Municipal Bodies which can be augmented with fees, cess or other such sources by the respective authorities. It is essential to explore funding from all possible sources to support urban greening.

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