

# **Transformations of Urban Green Spaces (UGS) in Sub-Cities: A Case of New Town of Kolkata and Gurgaon of Delhi**

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## **Abstract**

Sub-cities offer affordable houses and often better living quality when compared to a mother city. One of the major causes of such better living quality is a greater share of land earmarked as urban green spaces in the prevailing master plan. The mega cities in India like Delhi, Kolkata, Mumbai and their sub-cities accommodate a larger share of the total urban population compared to the other million population cities and fewer than million cities. For example, under national capital region (NCR) planning, Delhi, several such sub-cities are planned around the city of Delhi, such as Gurgaon, Noida, Dwarka, Rohini & Greater Noida. On the other hand, the Perspective Plan of Kolkata (KMDA) proposed several sub-cities, such as New Town (elsewhere also termed as Rajarhat), Bidhan Nagar (also termed as Salt Lake City), Kalyani, West Howrah etc. Among all those sub-cities, Gurgaon (population about 40 lakh) of Delhi and New Town (population 10 lakh) of Kolkata are the largest. These two sub-cities have also been developed with major investment from developers, with minimal financial involvement of city authorities. It is found that Urban Green Spaces (UGS) has been vulnerable to contraction, distortion and depletion, during the whole life cycle of sub-cities due to many reasons. The paper takes up the case of two contemporary sub cities developed around two major megacities (Delhi and Kolkata) in India to understand the nature and causes of such vulnerability. First, it gives an overview of such transformations from the literature. Second, it presents a narrative on the nature of transformation at spatial and temporal levels. It identifies the inherent causes of such transformations at various levels. Lastly, it discusses various issues and possible solutions at the planning and management level, community involvement and for use of technologies. The subject of the paper will open the discourses of management of green spaces in a better way, if predicted and foreseen at the time of planning and policy making.

## **Introduction**

Sub-cities are a common practice in planning to decentralise megacities. Such sub-cities offer affordable houses and often better living quality when compared to the larger mother city. One of the major causes of such better living quality is a greater share of land as earmarked as urban green spaces in the prevailing master plan. This could happen since the land value in the prospective locations of sub-cities in the peripheral areas is lower than the mother city. Those developments traditionally have been carried out by classical city development authorities. However, gradually, the tougher land acquisition has changed due to economic trends like the open economy and foreign investments, the market forces have become a significant player in the development, especially post-2000. With that context in mind, cities are exploring alternatives in developing sub-cities and urban extensions with less involvement of public finance and avoiding hassles of land acquisition. In many cases, a market-based approach involving private players in the investment of land and infrastructure has become popular and India is no exception.

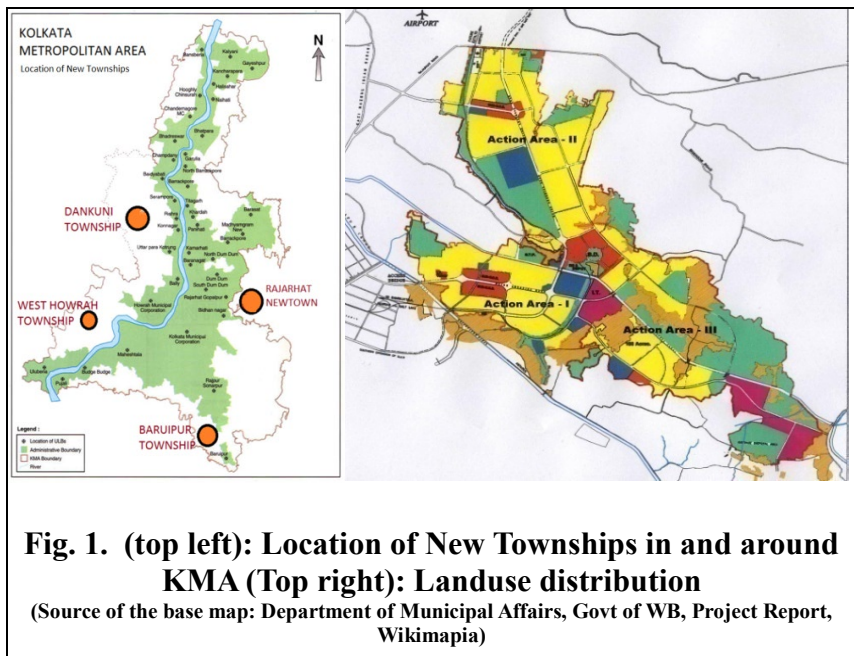
India represents one of the largest urban systems in the world. The mega cities like Delhi, Kolkata, Mumbai and their sub-cities accommodate a larger share of the total urban population compared to the other urban subsystems. From the 1970s, city authorities from mega cities have been attempting alternatives to these huge urban concentrations. A system of sub-cities, which are adjacent and nearby, but built on a comparatively low-value land was largely adopted. For example, under National Capital Region (NCR) planning several such sub-cities are planned around the city of Delhi such as Gurgaon, Noida, Dwarka, Rohini, and Greater Noida. Similarly a Perspective Plan of Kolkata proposed several sub-cities, such as New Town (elsewhere also termed as Rajarhat), Bidhan Nagar (also termed as Salt Lake City), Kalyani, West Howrah etc. Among all those sub-cities, Gurgaon (population around 40 lakh) of Delhi and New Town (population 10 lakh) of Kolkata is largest. These two sub-cities have also been developed with the major investment of developers with minimal financial involvement of a city authority. As a result, both the sub-cities have been developed in a faster mode compared to earlier examples. However, it is very interesting to see the changes and transformations which took place from the conceptualization, planning, development, operation and maintenance of infrastructure and land resources being largely done by private players. It is found that such transformations are most evident for blue and green infrastructure. Particularly Urban Green Spaces (UGS) become vulnerable to contraction, distortion and depletion during the whole life cycle of a sub-cities due to many reasons.

The paper takes up two contemporary sub-cities developed around two major megacities (Delhi and Kolkata) in India to understand and analyze the underlying causes of such vulnerability. First, the author gives an overview of such transformations from the literature. Second, I present a narrative on the nature of transformation at spatial and temporal levels. I identify the inherent causes of such transformations at various levels. Lastly, I discuss various issues and possible solutions at the planning and management level, community involvement and for use of technologies.

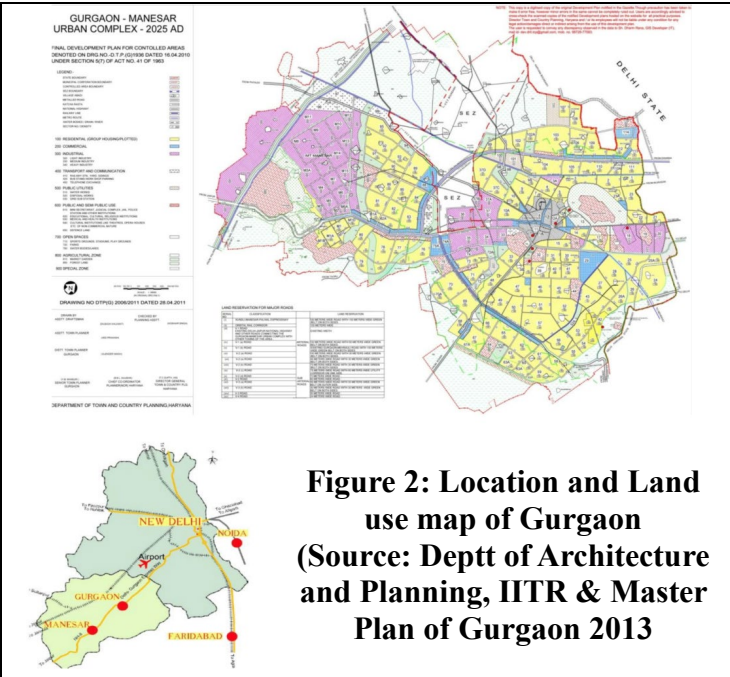
## **Background and Literature Review**

This section has two sub-sections. A detailed background of the concept, strategy and planning provisions of two sub-cities under review are presented followed by few references from the literature showing similar work and learnings around the world in the last few decades.

Kolkata, the second most populous city in India and one of the ten most populous cities in the world (2001, 2011) has been facing tremendous population pressure regionally and nationally. As a solution, a number of sub-cities were envisaged in its perspective plan. To decentralize the increasing economic activities from Kolkata and to address the future housing need in the Metropolitan area, several sub-cities in the form of New Townships have been proposed in and around KMA in the Perspective Plan (Vision) for Kolkata 2025. Until now there are two such sub-cities, which are planned and developed and now represent contiguous and integrated urban development within the present Metropolitan Area. Those sub-cities, namely, Kalyani and Bidhan Nagar (Salt Lake City) were built during the 60s to 90s. After that, New Town (Rajarhat), which is bigger (Ten lakh population), were conceptualized. Besides, there are the West Howrah Township (already partly developed) and Dankuni Township (proposed, not developed due to land issues), which are also planned and envisaged during the last three decades. Major proposed New Townships and sub-cities around KMA are shown in the Figure 1 below:



The planning and conceptualization of new Town were done by the planning authority, HIDCO (Housing and Infrastructure Development Corporation Ltd). It started in the 1990s. The land was acquired by HIDCO and distributed to private developers, Housing Cooperative, Individuals and other industry players in a transparent and phased manner to pay back the expenditure on land acquisition and development cost. The housing neighbourhoods were developed both by developers, joint venture companies (private-public partnership) and also small to large housing cooperatives (8 to 128 members) and individual landowners who are allotted detached plots for house constructions.



Gurugram (or popularly known as Gurgaon), is a city in the Indian state of Haryana and is located near the National Capital Region of India. It is southwest of New Delhi and is situated on prime location on National Highway 8, only at a distance of 4 km from the Indira Gandhi International Airport (Figure 2). The Haryana Urban Development Authority and the licenced colonizers (private developers who developed the sectors) collectively have developed about 8000 hectares land for residential, commercial, institutional and industrial purposes to meet the increasing demand of the public. The areas of Gurgaon-Manesar Urban Complex, which have so far, has been developed in public and private sector including existing town and village areas would accommodate 2.2 million population. In order to cater to the future demand of Gurgaon-Manesar Urban Complex, an additional area of 22,957 hectares has been added in the form of a developable area for the said complex to accommodate 2.05 million additional population. Thus, the total developable area of Gurgaon- Manesar Urban Complex would accommodate 4.25 million population by 2031 and will supplement the population pressure of Delhi largely by offering a better lifestyle and destination of global jobs.

The causes of transforming and changing urban green spaces are multifaceted. The drivers of space-time compression due to enormous population pressure and accelerating property prices tend to remove public green space from urban landscapes, while agricultural areas near cities are transformed and used for other purposes (Lee and Webster, 2006; Ernstson, 2013; Colding and Barthel, 2013). This is also common in many global south countries including India. It is felt that UGS has been most vulnerable and susceptible due to socio-economic and market forces. UGS as a source of food and biodiversity spaces in cities needs a vigilant eye as resilience lens' is driven by community movement (Barthel et al, 2012). In China, the causes of such contraction and depletions have been cited as ignorance of characteristics of the urban natural system, the limiting factors of the special planning system and quantitative issues (Xiao-Jan 2009).

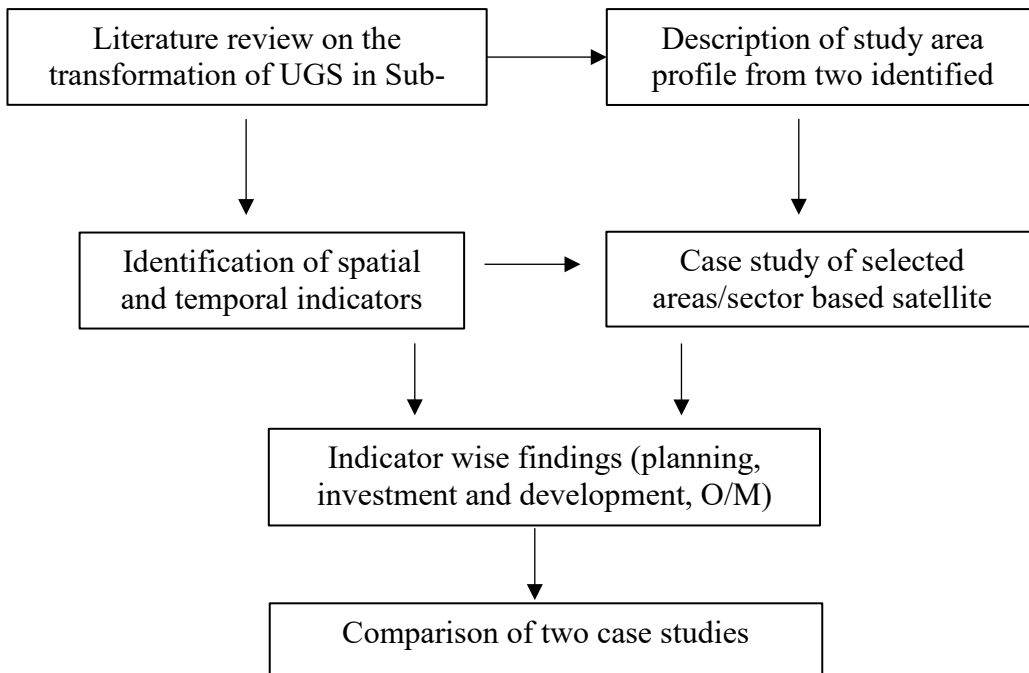
However, transformation and management of UGS is not a new subject of study. Significant cases are reported and scholarly discourses on strategies to address the problems are available. Subdivision exactions have been cited as one of the used regulatory approaches to protecting open space (Porter, 1997). An approach in cluster zoning or clustered development is also popular in the US and elsewhere. Cluster zoning ordinances allow or require houses to be concentrated together on small lots on a particular part of a parcel of land, leaving the remainder in open space (American Farmland Trust, 1997). An innovative incentive-based policy instrument was cited by Leopold (1991) whereas market-driven TDR (Transferable Development Right) as a tool is a more efficient alternative (Thorsnes and Simons, 1999). However, the literature on classifying the nature of transformations at spatial and temporal levels is limited. The paper presents a broad framework for that.

## **Goals, Objectives and Methods**

The intent of the paper is to observe the nature of transformations in market-driven Sub-cities developed around major Mega Cities of the Global South. For doing this it has considered two objectives. Those are given below:

1. To present the nature transformations of UGS in sub-cities as compared with the initial plan and the current situations.
2. To analyse the elements of planning and designing urban green spaces at various spatial and temporal levels indicating predominance, causes and possible interventions.

The paper adopts an inferential study from the literature and study area profiles. Indicators are identified on three temporal levels: 1) Planning and conceptualization, 2) Investment and development, 3) operation and maintenance. These three indicators are studied in three spatial hierarchical levels, namely, 1) city level, 2) sector level & 3) local or neighborhood level. Therefore, the study encompasses the findings of transformations of UGS in sub-cities in temporal levels and spatial levels. Case study method, broadly based on secondary data and satellite image, is applied to illustrate the changes and transformations. It collects secondary and selected primary data to represent and document the nature of transformations. It compares the major findings with other similar contexts in the end. Refer to Figure 3 for the detailed methodology chart. The scope of the paper is limited to the UGS at city and community levels in sub-cities. Thus, the green spaces at the plot level is not included in this study.

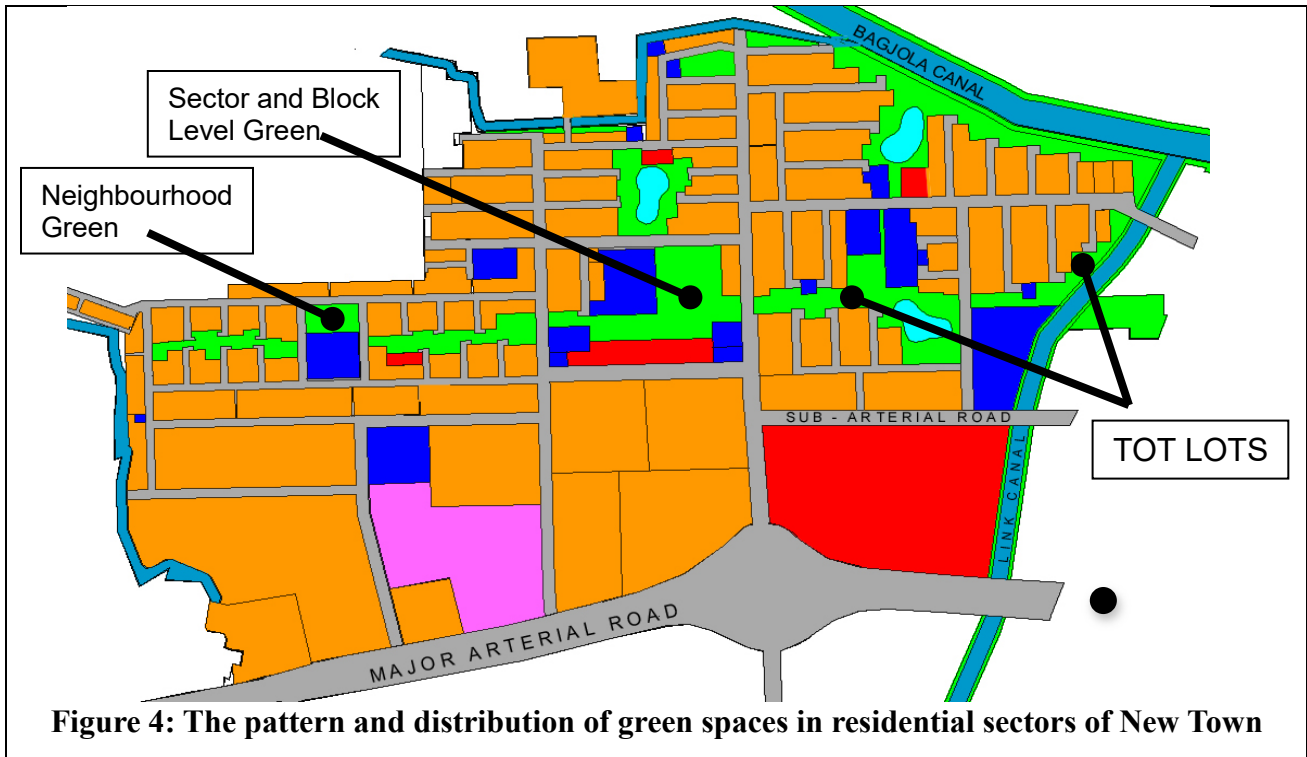


**Figure 3: Methodology Flow Chart**

## Results and Findings

### New Town of Kolkata:

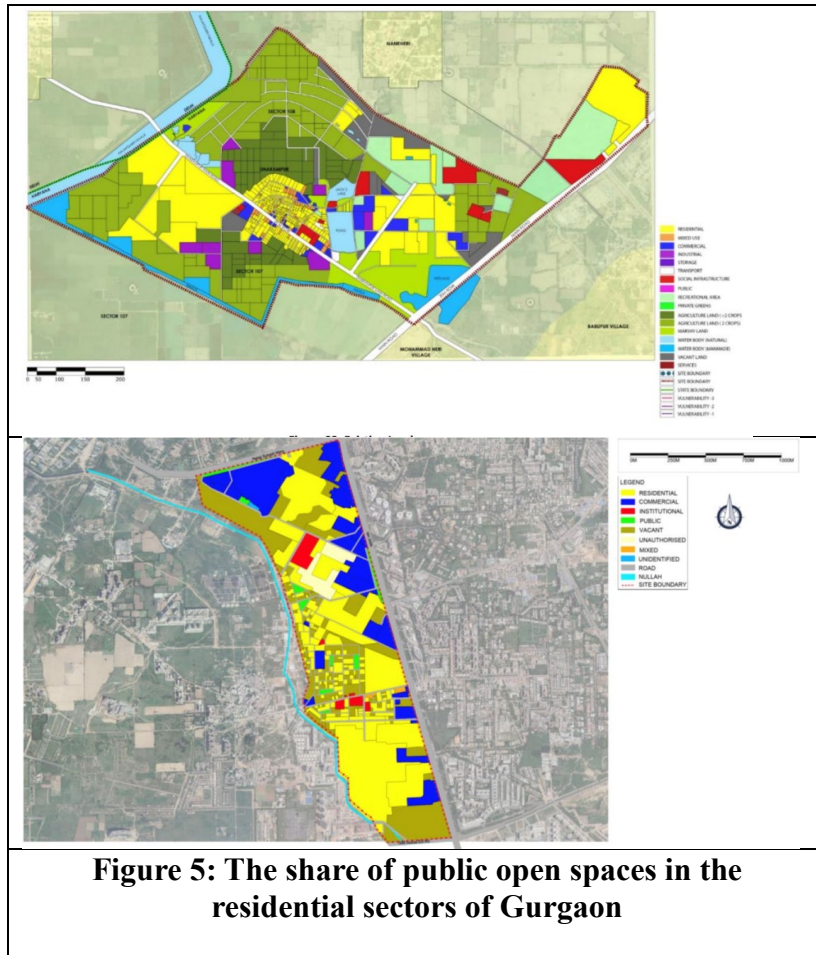
The fundamental concepts for planning of UGS in New Town, Kolkata consists of 1) the connectedness of greens at neighbourhoods and sector level, 2) locate local and convenient shops and community facilities adjacent to such connected greens, 3) use walkability as an integrating feature between greens, facilities and citizens, and 4) creating small ponds in almost every neighbourhoods to address urban heat island effect and to create more community interactions (Figure 4). On the other side, the city level green spaces were designed in large chunks to create a large water body for two purposes. First, to generate a substantial amount of earth to bring the planned areas above sea level and second to use such large green and blue spaces as ecologically maintained zones to use for regional recreation (Figure 4).



**Figure 4: The pattern and distribution of green spaces in residential sectors of New Town**

Transformation of Green spaces in new towns are multifarious and shown below:

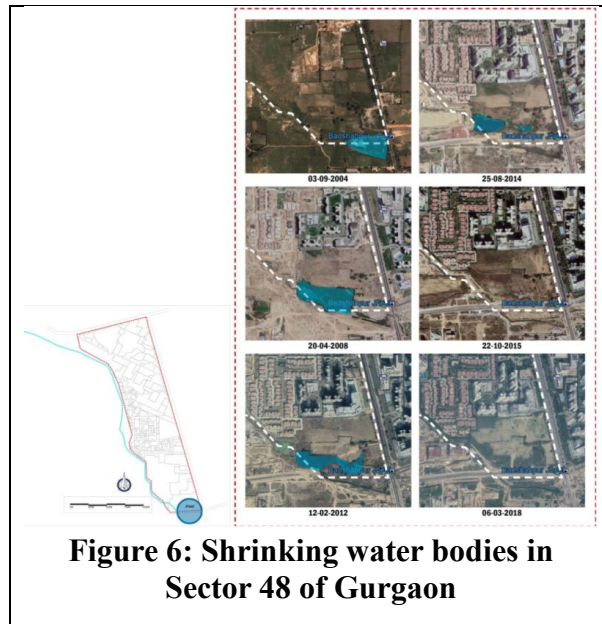
1. The city level open space (about 200 hectares including the 45-hectare water body) has been converted as an eco-park. The eco-park consists multiple public recreational activities which generates the revenue required for maintenance of the green areas.
2. Gated recreational spaces in the connected green: Some of the earmarked green areas with adequate sizes around a football ground has been converted in to a park with access control. As a result, the continuity of connected green is disobeyed. The walkability proposed along the connected greens touching the community facilities are now disjointed. The causes for such undesired changes could be the absence of local development controls pertaining to green spaces.
3. Depletion of surface quality due to construction activity has happened in many cases. Such depletion affected the quality of green areas reducing the effective useable areas and reducing the quality. In a few cases, the service utilities like the sewerage network also has been laid along the green areas and has been the cause for destruction of green areas.
4. Maintenance of the green specially the sharp corners along the connected greens has been the issue. The main reason for such low maintenance could be the non-formation of the resident's association in every sector. In other part of the city the resident's associations take a significant role in protecting and maintaining the green areas.
5. Green along roads are not earmarked and destroyed due to the multiple excavation of the road flank for maintenance and installation of pubic utilities.



**Figure 5: The share of public open spaces in the residential sectors of Gurgaon**

Gurgaon of Delhi:

Unlike New Town of Kolkata, Gurgaon of Delhi was conceptualized and developed differently. Based on the overall network of major roads, which is developed by public authority, other sectors are developed fully by private developers (known as colonizers) on the land purchased directly from landowners. Therefore, the cases of land acquisition were minimal. As a result, the developers kept on assembling land from the market and developing residential and commercial buildings. The process was faster. However, it lacked significant local facilities, where UGS is one of them. Thus the development of Gurgaon has manifested few significant general learnings and observations which are given below:



The sector level green space is missing due to the market-based land development policy, where an inadequate provision in the master plan to preserve the sector level green which could cater to large fields and parks. As a result, the number and quantity of green in the residential sectors vary less. Refer to the example of sector 48 and sector 108 (Figure 5) with meagre amount of green spaces (less than 5%) leads to inferior quality of the air and environment.


Second, few natural water bodies have been shrinking due to continuous construction activity and encroachments. Such needs immediate attention. One such example is Badshapur Jheel (Local name of Pond or water body). The Figure 6 shows how Badshapur Jheel is becoming reduced and encroached over the course of time. In addition, the Badshapur Nallah (i.e. canal) is also shrinking and contributing pollution. A few other observations in this area are:

1. Flooding during rain due to high urbanization and unavailability of the proper stormwater drainage system;
2. Dumping of construction waste in the Badshapur Jheel site causing it to shrink in size;
3. Dumping of waste and debris in the Badshapur Nallah causing a reduction in its width and length. Drying up of the nallah during summers; and
4. Depletion of groundwater level to as high as 1 m per year. High level of air pollution due to unavailability of carbon-absorbing patches.



At the outset the transformations are compiled in a spatial and temporal levels with the causes and predominant natures as indicated below in Table 1:

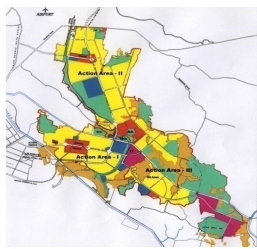
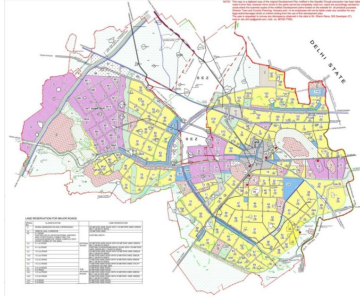
**Table 1: Nature of transformations of Urban Green spaces at Spatial & temporal level**

| Temporal levels<br> | City level  | Sector level   | Local/ neighborhood level  |
|--|---|--|--|
|  | City park   | Play ground  | Play areas, Tot lots, Greenways, Swimming pools  |
| A. Planning and conceptualization  | <ul style="list-style-type: none"> <li>Available in Master plans but later converted to revenue earning greens</li> <li>Broad strategy for natural and created greens required</li> </ul> | <ul style="list-style-type: none"> <li>Inadequate due to developer driven development</li> <li>Conversion of play ground into gated greens</li> <li>Pollution</li> </ul> | <ul style="list-style-type: none"> <li>Shrinking due to construction and encroachment</li> <li>Depletion due to pressing demand of parking etc</li> </ul>                                      |
| B. Investment & Development  | <ul style="list-style-type: none"> <li>Developers are interested to invest only when revenue is given</li> </ul>  | <ul style="list-style-type: none"> <li>Developers are not interested to build</li> </ul>   | <ul style="list-style-type: none"> <li>Gated residential communities having limited green areas</li> <li>Greenways are disturbed due to continuous road improvement and maintenance</li> </ul> |
| C. Operation and management  | <ul style="list-style-type: none"> <li>Event of mischief, littering found</li> <li>City authorities are now desirous to operate in a sustainable manner</li> </ul>                        | <ul style="list-style-type: none"> <li>Residents association made need to work with city authority</li> </ul>  | <ul style="list-style-type: none"> <li>Within gated community a system of shared O &amp; M is present</li> <li>Better sense of ownership in gated community, rest uncertain</li> </ul>         |
| <b>Predominant nature of transformation</b>  | <i>Conversion</i>   | <i>Contraction and shrinking</i>   | <i>Depletion of quality</i>  |
| <b>Causes</b>  | <i>Policy and planning inadequacies<br/>Economic causes for the conversion of public greens</i>   | <i>Policy planning inadequacies<br/>Socio-political influences<br/>Social awareness or it's absence</i>  | <i>Enforcement of controls<br/>Absence of dedicated tract of Green in roads and pathways<br/>Socio-cultural and economic dynamics of residents association has been effective</i>              |

It is found from the table that the transformations in the city level is predominantly due to conversion. While the transformation in sector level and local level is due to shrinking and depletion. It will be interesting to make a comparative analysis of type of transformations in both the sub cities under study. The New Town Kolkata being a fully publicly planned new town represents quite different scenario than

the Gurgaon which is planned by a state level authority and developed by developers through a infill mechanism. A comparative chart in Table 2 below shows the nature of such differential transformations.

**Table 2: A comparison of Nature of transformations in Case Study areas**

| <b>Temporal levels</b>          | <p style="text-align: center;"><b>New town of Kolkata</b></p>    | <p style="text-align: center;"><b>Gurgaon of Delhi</b></p>   |
|---------------------------------|---|--|
|                                 | City level, Sector level, Local/ neighborhood level   | City level, Sector level, Local/ neighborhood level  |
| Planning and conceptualization  | <ul style="list-style-type: none"> <li>• By public planning authority</li> <li>• Strict zoning controls</li> <li>• Dedicated planning authority created (WBHIDCO)</li> <li>• Changes during planning</li> </ul> | <ul style="list-style-type: none"> <li>• Planning by state level Public authority (TCPO) at city level only,</li> <li>• Remaining areas done by the colonizer (developers)</li> <li>• dedicated planning authority created in retrospective</li> </ul> |
| Investment & Development        | <ul style="list-style-type: none"> <li>• Partially by public agency, joint venture companies and also private developers</li> </ul>   | <ul style="list-style-type: none"> <li>• Fully by private developers except few pockets</li> </ul>   |
| Operation and management        | <ul style="list-style-type: none"> <li>• Fully by public civic authority (New Town Kolkata Development Authority, NKDA) at all level</li> </ul>   | <ul style="list-style-type: none"> <li>• By civic authority (Gurgaon Municipal Corporation, GMC) up to sector level.</li> <li>• Local operations are with developers and resident organizations</li> </ul>   |
| <b>Nature of transformation</b> | <ul style="list-style-type: none"> <li>• Conversion,</li> <li>• low maintenance,</li> <li>• reduction of quality due to space conflict with utility</li> </ul>  | <ul style="list-style-type: none"> <li>• Depletion, shrinking</li> <li>• Absence at local/neighborhood level</li> </ul>  |

### Discussion and Conclusions

The need, sense of need, sensitivity, planning, policy and action for UGS are diverse and evolve in a city in a gradual manner. It may not be predicted at the beginning of conceptualization of a sub-city and new town development. It is found that the possible transformations in UGS due to social, political, cultural, economic reasons are largely unforeseen. It is only due to the adverse result and public or media reaction which forces public authorities to act reactively for UGS in many cases. There are various underlying causes like socio-cultural, political, economic and policy-planning related (Table 1). This paper has attempted to focus light to the nature of transformations of UGS, which take place in sub-cities and new towns around major existing megacities especially in global south (like Indian cities). However, it is felt that an empirical study on a larger data set, is required to enumerate the relative causes, concerns and their

relevant coping strategies. To facilitate such future discourses, within limited scope of the paper, few areas of future study and directions are discussed below.

A comparative study of the transformations in UGS in every level (spatial and temporal) for the mother city and sub-city would be a very interesting areas of study. A mother city which originates from long time can have a robust and developed community to protect and support UGS. While in a sub-city, a new community is made by design and it takes time to consolidate the land use and community. Therefore, the community aspect in owning the green and blue spaces could be interesting to study further.

In the prevailing cases, we find large city level greens and greenways are often converted to land bank or space of future infrastructure development due to land crunch. They are often used as buffer areas as well. Thus greenways and corridors, if any, have to be seen as an integral part of city planning (Ahern, 1995). The integration/coherence of the proposed green-open-blue spaces with all other components is an essential planning consideration. Space management especially allocating a dedicated track and spaces for green is needed. It is worth mentioning that Gurgaon authority (GMDA) has envisaged the concept of Right of Way (ROW) Management for public infrastructures within the right way. A concept of ROW management is quite innovative and distinct from the traditional Land use & Development Controls. However, it needs further elaboration and in-depth prescriptions. Spatial patterns of the green-open-blue spaces like uniform distribution, interconnectivity, etc., need to be predicted at the time of planning. Besides, the natural phenomenon and ecosystem services like corridors for movement of birds and other micro-fauna, pollination, the supply of fresh vegetables/crops, microclimate and seed dispersal (Bolund and Hunhammar, 1999; Miller, 2005; Ernstson et al., 2010a) etc, need to be maintained and recreated using relevant expertise.

Feasibility and extent of utilizing efficient technology (e.g. solar/wind energy) for running the machines used for maintaining the greenery and water quality in green-open-blue spaces could be studied in detail. The urban space crunches are increasingly leading to multilevel land usage like sub-ways, underpasses, flyovers, foot-over-bridges, skywalks, overhead metro railways etc. Developing simple technologies is required for creation of earth sheltered blue-green structures, sub-way greenery, greenery at road intersections, pathways, apartment level greenery and vertical gardens which need less maintenance.

Management of UGS is great concern for all. In the current practice we find that the community-based mechanism at the neighborhood level and local level has been successful when a sense of ownership is there. In Oregon, US, citizen advisory committees exist at the state, regional, county, and city level (Nelson and Duncan, 1995) for management of urban greens. For management of larger greens and agricultural tracts in urban setting, Community engagement in allotment gardens also was cited as one of the prevailing practices (Wenger, 1998; McKenna et al., 2008) along with using locally adapted organisms and landscape features (Barthel, Folke and Colding, 2010), which enhances public participation and better management of UGS. Studies in cities of India suggest willingness of visitors to pay the entry fees provided these green spaces, gardens, urban forests and protected areas are managed sustainably (Hadker et al. 1997). Therefore, a city green is the essential property of citizen. The sooner it is understood, the better its management.

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