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The Urban World





Regional Centre for Urban & Environmental Studies (RCUES), Mumbai (Fully supported by Ministry of Housing and Urban Affairs, Government of India)

Established in 1926, the All India Institute of Local Self Government (AIILSG), India is a premier autonomous research and training institution in India. The Institute was recognized as an Educational Institution by Government of Maharashtra in the year 1971. The Institute offers several regular training courses in urban development management and municipal administration, which are recognized by the Government of India and several State Governments in India.

In the year 1968, the Ministry of Housing and Urban Affairs (MoHUA), earlier Ministry of Urban Development), Government of India (GoI) established the Regional Centre for Urban & Environmental Studies (RCUES) at AIILSG, Mumbai to undertake urban policy research, technical advisory services, and building work capabilities of municipal officials and elected members from the States of Goa, Gujarat, Maharashtra, Rajasthan and UTs of Diu, Daman, Dadra & Nagar Haveli. The Ministry of Housing and Urban Affairs (MoHUA), Government of India added States of Assam and Tripura from February, 2012 and Lakshadweep from August 2017 to the domain of RCUES of AIILSG, Mumbai. The RCUES is supported by the MoHUA, Government of India. The MoHUA, Government of India has formed National Review and Monitoring Committee for RCUES under the chairmanship of the Secretary, MoHUA, Government of India. The Principal Secretary, Urban Development Department, Government of Maharashtra is the ex-officio Chairperson of the Advisory Committee of the RCUES, Mumbai, which is constituted by MoHUA, Government of India.

The RCUES was recognized by the Ministry of Urban Development, Government of India as a National Training Institute (NTI) to undertake capacity building of project functionary, municipal officials, and municipal elected members under the earlier urban poverty alleviation programme-UBSP. The RCUES was also recognized as a Nodal Resource Centre on SJSRY (NRCS) and Nodal Resource Centre (NRC) for RAY by Ministry of Housing and Urban Poverty Alleviation, Government of India.

The AIILSG, Mumbai houses the Solid Waste Management (SWM) Cell backed by the Government of Maharashtra for capacity building of municipal bodies and provide technical advisory services to ULBs in the State. The Water Supply & Sanitation Department (WSSD), Government of Maharashtra (GoM) established Change Management Unit (CMU) in AIILSG, Mumbai from 13th January, 2010 to 30th June, 2014 and also selected AIILSG, Mumbai as a Nodal Agency in preparation of City Sanitation Plans for 19 Municipal Corporations and 15 A Class Municipal Councils in Maharashtra State, under the assistance of Ministry of Urban Development, Government of India. The WSSD, GoM also established Waste Management & Research Centre in AIILSG, Mumbai, supported by Government of Maharashtra and MMRDA.

In August, 2013 Ministry of Urban Development, Government of India empanelled the AIILSG, Mumbai as Agency for providing technical support to the Cities / Towns of States / Urban Local Bodies (ULBs) in the field of Water Supply and Sanitation, Sewerage and Drainage systems.

In July 2015, Ministry of Urban Development, Government of India empanelled the RCUES & AIILSG, Mumbai an Agency for technical support in Municipal Solid Waste Management under Swachh Bharat Mission (SBM) programmes.

In February, 2016, Ministry of Housing and Urban Poverty Alleviation, Government of India empanelled the RCUES of AIILSG, Mumbai for conducting training and capacity building programme for experts of SMMU, CMMUs, COs, Key Officials and other stakeholders of the State and Urban Local Bodies (ULB) level under Deendayal Antyodaya Yojana – National Urban Livelihoods Mission (DAY – NULM).

In December, 2017, AIILSG has been empanelled as a training entity regarding implementation of new Integrated Capacity Building Programmes (ICBP) under Urban Missions, viz. Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Swachh Bharat Mission (SBM), Smart Cities Mission (SCM), National Urban Livelihoods Mission (NULM), Housing for All (HFA), Pradhan Mantri Awas Yojana (PMAY) and Heritage City Development and Augmentation Yojana (HRIDAY) for Elected Representatives and Municipal Functionaries.

At present, RCUES and AIILSG, Mumbai is involved in providing capacity building, research and technical support to number of State Governments and ULBs for implementing various urban development missions and programmes launched by the GoI.

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Editorial

Urban Form. How much density, how much sprawl?

Which are the world's densest cities? This thought crops up in our minds often. But the answers may neither be straightforward nor easy. Cities are by definition dense settlements and by most accounts owe their economic prosperity and success to their compact structure, among other attributes.

Over the last couple of centuries, urban planners, architects and thinkers have postulated several views on the subject of urban form and suggested city designs which promote higher density or the opposite. In earlier times, high density of cities was treated at par with overcrowding and thus as an issue leading to poverty and ill-health. This was born out of the visuals of the densely populated slums of some of the world's major cities. Thus came the idea of low density settlements and the 'Garden City' concept by Ebenezer Howard in the late nineteenth century. He described the Utopian city where people lived in harmony with nature. Later, in the twentieth century, others such as Le Corbusier, the French urban planner who designed the Indian city of Chandigarh, and Jane Jacobs, the American urban activist argued for the opposite.

As stated earlier, a majority of anti-density arguments originate from the equating of high density urban form with overcrowding. Overcrowding would signify a large number of people in a small room or dwelling. This need not be the same as high-density urban form which would imply large amount of built-up space occupying a smaller plot of land. While overcrowding could be symptom of poverty and lead to poor sanitation and ill-health, high-density dwelling surely need not. In fact high-density could result in allocation of less land to buildings/dwellings and more land to open spaces parks, roads, sidewalks and public conveniences.

Several benefits of high-density settlements have led urbanists to argue in favour of the concept. Some are pretty obvious. For example, many facilities and amenities are accessible in close proximity, often just a short walk away. In fact in many high rise apartments in some Asian cities, facilities such as grocer, green-grocer, medical store, laundry and café can be found on a different floor in the same building. This obviously leads to less motoring, therefore less congestion, less pollution and greater road safety. It is a boon for senior citizens and others with infirmities. City administrations and local bodies will find it much easier and cost-effective to provide services such as water supply, sanitation, waste management, fire-fighting and public health in denser settlements. Among other benefits is security. For several reasons; one that children and elders are mostly in close vicinity of their homes, emergencies can be tackled easily. Secondly, there are bound to be larger number of people on any street at any time, including known neighbours ensuring safety of children and elders who could be vulnerable in distant parks

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and gardens - more 'eyes on the street' so to say - a phrase credited to Jane Jacobs. Among other benefits is that dense mixed-use zoning enables create facilities like parks and playgrounds, library, leisure options within a short distance from citizens' homes. At the same time, as we observed earlier, if built spaces occupy lesser amount of land, greater amounts of land can be apportioned to parks and gardens and open green spaces. Thereby one may argue that high density drives up the sustainability and safety quotient of cities.

However, it would appear naïve to argue that greater the density, better for cities. Urban planners are required to regulate density carefully keeping many factors in mind. We need to seek out and incorporate quality while deciding the best levels of density.

In this issue of Urban World, we bring you a paper on a related topic with reference to West Bengal. As in the past, we look forward to views and feedback from our esteemed readers on this issue.

Urban Planning and Role of Compactness in the Planned Townships of West Bengal, India

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Abstract

Urban planning and policies on contemporary cities favour the compact city, an idea that has not yet been clearly defined. Compactness of cities often refer to urban sustainability achieved by dense, mixed neighborhoods and high intensity, (Jenks, Burton, Williams, 1996) which make cities more livable. Land use of a city plays an important role with respect to compactness, livability and broadly to sustainability. The paper explores whether the planned towns of West Bengal are compact in nature as they are being physically planned while these towns pass more than three decades since their inception. Importance of these planned towns is enormous because these towns were developed as an alternative form of urbanization and they would be the cities of tomorrow and will play significant role in the process of future urbanization of West Bengal. So their sustainability is of prime importance. Paper highlights that almost all the planned towns fail to reshape the new form of urbanization of the state and sheds light on the failures of compactness as well as the alternative strategy of Urbanization. Towns in the study includes Kalyani, Durgapur, Bidhannagar and Haldia.

Key Words: Compact City, Livability, sustainability, Neighbourhood

1 Introduction

Urbanization in developing countries is a defining feature of the 21st century. About 90 percent of global urban growth now takes place in developing countries, and, between 2000 and 2030, the entire built-up urban area in developing countries is projected to triple¹. The process of urbanization in India characterized increasing absorption of population in large cities. It is remarkable that the rate of population growth in the Class I cities (cities which has population more than 1 lakh) has been consistently increasing over the past five decades, from 45% in 1961-71 to 62% in 1991-2001 (Chattopadhyay, Basudha 2008). Similarly there is a decrease in population growth in smaller urban centres. High population growth in the cities inevitably creates challenges for their civic infrastructure and service delivery capabilities². In the early 20th century developed countries started to experience urban sprawl and separation of land use function in planning making the cities bigger in size with low density development. The core idea of such plans was to encourage the spread of populations in satellite towns separated by greenbelts. These plans aimed to make a polycentric system of settlements all of which, because of the elongated form of the “fingers,” would remain close to nature. In Europe

¹Suzuki, H. et.al. (2010) Eco2 Cities : Ecological Cities as Economic Cities, World Bank, Report No 54432

²Sahasranaman, A (2012) Financing the Development of Small and Medium Cities, Economic and Political Weekly, vol xlvi

the greenbelts ensured the relative compactness of new settlements, in America the uncontrolled spread of suburbs produced a system closer to Wright's amorphous Broad-acre City³. In the early 1990s new concepts of urban planning emerged which included New Urbanism, Compact City, Smart Growth and Multifunctional land use planning (Vreeker et.al. 2004)⁴. These concepts were new and scholars and policy makers are trying to assess the development pattern and its effect on long run for city. Nevertheless it is widely accepted that for sustainable, balanced urbanization small cities and towns plays crucial role. Small cities and towns can absorb sizable population if there are substantial livelihood and infrastructural facilities are available. In the current scenario of small towns and cities do not have adequate infrastructural facilities and job opportunities. compactness of a city is very important irrespective of its size because of its advantages include conservation of the countryside; less need to travel by car, thus reduced fuel emissions⁵; support for public transport and walking and cycling; better access to services and facilities; more efficient utility and infrastructure provision; and revitalization and

regeneration of inner-urban areas⁶. These advantages are seen to contribute to the objective of more sustainable development in its broadest sense, embracing social and economic sustainability as well as environmental concerns. The concept of compactness is characterized by higher density development, mixed uses, and reuse of brown field land⁷.

This paper is focused on the compactness aspects of the planned townships of West Bengal and tries to find out the degree of compactness among the towns by a comparative analysis. Compactness measure is important for these planned towns due to two reasons: firstly, to explore why some of the planned town did not take off and secondly, what would be the challenges that these towns will face in near future with regards to its compactness.

1.1 Methodology & Study Area

Compactness index has been prepared based on three attributes suggested by Burton (2002) which include density, mixed land use and intensification. Based on the three parameter number of indicator have been prepared. Following Table 1 shows the list of indicators.

Table 1: Density, Mixed Used and Intensified Indicators

Parameters	Indicators
Density of Population	Persons per km.
	Permanent Employed person Density
	Households per km
Density of Built Form	Persons per sq km in residential built-up area.
	Households per sq km in residential built-up area.
Density of Housing	Percentage of total housing stock represented by small dwellings (1 -3 rooms).
	Percentage of total housing stock represented by large dwellings (7 or more rooms).
Mix Used Indicator	Number of key facilities (school, college, hospital, bank) for every 5000 residents
	Ratio of residential to nonresidential urban land.

³Fishman, R (1987) 'Bourgeois Utopias: Vision of Suburbia' from *Bourgeois Utopias: The Rise and Fall of Suburbia*, Basic Books, New Yorks

⁴Vreeker, R et.al. (2004) *Urban Multifunctional Land Use: Theoretical and Empirical Insights on Economies of Scale, size and Diversity*, Built Environment. 30(4), 289-307

⁵Jenks M, Burton E, Williams K (Eds), (1996) *The Compact City: A Sustainable Urban Form?* Spon, London

⁶Williams K, Burton E, Jenks M (Eds), (2000) *Achieving Sustainable Urban Form*, Spon, London

⁷DETR (1999) *A Better Quality of Life: A Strategy for Sustainable Development in the United Kingdom Cm 4345* (The Stationery Office, London)

Intensification Indicator	Percentage change, 2001-11, in resident population through migration and other changes, using 2001
	Number of dwellings completed, 2001-11, per sq km (residential built-up area of district).

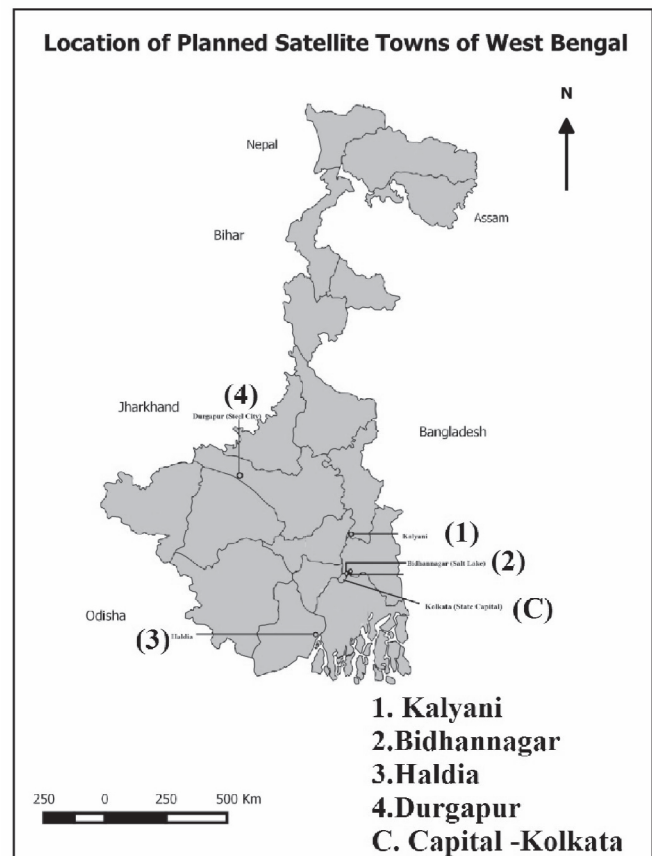
Source: Modified from Burton, 2002.

The most commonly used measures of compactness is density. The measure of density commonly used in urban research is the gross density in persons per sq km. Gross density measures reveal little about the density of the built-up parts of a city. A city with dense development within large areas of open space may appear to be low density on the basis of gross measures⁸. Therefore, it was important to include indicators of the density of the built-up area of the city. The density of the built-up area may not reflect the density at which people actually live: if much of the built-up area is given over to nonresidential land uses than the area may appear to be relatively low density even though residents are living at high densities. It is useful, therefore, to measure residential density, by omitting the area of nonresidential land from the density calculations. It is to be noted that high population density is not the sole criteria for compactness other criteria's are also important for compactness. Various basic household facilities have been included as measure of accessibility and mix land use criteria. The process of intensification concerns increases in both population and development within existing urban areas. So changing population and housing stock have been considered as primary indicator of intensification (Burton 2002). Batty (2004) uses three attributes of compactness which include density, diversity and time while Rodenburg and Nijkamp (2004) used intensification and interweaving as an indicator of compactness. Therefore density, mixed use and intensification are vital to the compactness of a city and that led to the development of sustainable city. Each aspect of

compactness was represented by a series of different indicators, so in order to produce one value for each aspect, summary measures were created by adding together the values for groups of indicators. To 'add' the scores, each indicator within a category or group was transformed into a 'z-score'. This has the effect of standardizing values across the whole range of indicators. A z-score is calculated from

$$z\text{-score} = \frac{x - \bar{x}}{\sigma}$$

Through this formula, each indicator is standardized to have a mean of 0.0 and a standard



Source: Census of India Atlas, modified by the author

⁸Sherlock H, (1991) Cities are Good for Us: The Case for High Densities, Friendly Streets, Local Shops and Public Transport, Paladin, London

deviation of 1.0. Areas with an above-average performance on the indicator have a positive score and those with below-average performance have a negative score the size of the score depends on the extent to which an area is above or below average. The use of z-scores to create composite measures is well established. To overcome the problem of measuring the same conditions repeatedly, the average rather than the sum of the z-scores was taken. Four planned towns of West Bengal have been taken into consideration: Durgapur, Kalyani, Bidhannagar and Haldia.

1.2 Concept of Compact City

The future form of cities and the role of land use planning in guiding their development are of particular concern for policy makers at different levels of government⁹. This debate on urban form has intensified since the early 1990s, particularly after the Commission of European Communities (CEC) published their "Green Paper on the Urban environment" (1990) (Morrison, 1998)¹⁰. The concept of a compact city has been proposed as a sustainable urban form by the CEC, which can save resources and energy, and revitalize an inner city, etc. While some scholar noted that interpretation of the compact city concept is based on the specific nature of argument, both Thomas and Cousins's 'virtual' city¹¹ (1996) or Green's 'social city region'¹² (1996) used the compactness concept as a perceived sense not in real sense. Their idea is based on efficient transport routes linking otherwise spatially dispersed urban units. Scoffham and Vale (1996) advocate compact city in different way characterized by self-sufficiency and independence from outside forces¹³. The interpretations of the compact city for this paper used relate to planned cities with population ranges from 1 lakh to 5 lakh. Area of these towns is ranging from 24 sq km to 150 sq km. Three major parameters have been taken into consideration which include high density city, mixed used city as product, while third aspect relates as the process of intensification¹⁴.

Relevance of compactness of the four planned towns of West Bengal is significant due to different reasons. These towns were developed as an alternative to the existing Kolkata centric urbanization pattern of West Bengal. Three decades after the formation of these towns it is relevant to find out what went wrong to these alternative steps that some towns are doing well while others fail to take off. Some towns are doing well in terms of attracting population and providing relatively better infrastructural service to the household while some are performing poor. So questions can be raised regarding the planning aspect of these towns and try to find out the different factors that become the impediment of these towns's development.

1.3 Compactness of Planned Townships of West Bengal

West Bengal has five planned towns and these towns developed in different periods of the postcolonial era. The development of Kalyani and Durgapur and Bidhannagar began within the two decades after independence. The planning of Haldia started in the late 1960s and got its present form in the late 1970s. New Town Kolkata has recently developed, so it was not included in the compactness analysis of the towns. Scholars noted that first one and half decades of independence as the Neheruvian era due to its distinct economic and political ideology. Planned towns formed within this period have deep manifestation in their physical structure especially in the land use. Almost each of the town's physical structure ignores the notion of mixed use. Land use distribution has immense impact on the towns' sustainability. Density is a crucial factor for compactness of a town. High densities are seen to be fundamental to urban vitality and creativity (Haughton and Hunter¹⁵, 1994) higher densities are seen as a 'new urbanist' antidote to the car-

⁹Jenks, A., Burton E., and Williams, K. (1996) Compact City: A Sustainable Urban Form? London, E. & F.N. Spon.

¹⁰Morrison, N. (1998) The compact city: Theory versus Practice - The Case of Cambridge Neth. J. of Housing and the Built Environment, (13), 2

¹¹Thomas L, Cousins W, (1996) The compact city: a successful, desirable and achievable urban form?', in The Compact City: A Sustainable Urban Form? Eds M Jenks, E Burton, K Williams (Spon, London) pp 53-65

¹²Green R, (1996) "Not compact cities but sustainable regions", in The Compact City: A Sustainable Urban Form? Eds M Jenks, E Burton, K Williams (Spon, London) pp 143-154

¹³Scoffham E, Vale B, (1996) How compact is sustainable? how sustainable is compact?', in The Compact City: A Sustainable Urban Form? Eds M Jenks, E Burton, K Williams (Spon, London) pp 66-73

¹⁴Burton, E., (2002) Measuring urban compactness in UK towns and cities, Environment and Planning B: Planning and Design, Vol 29, pp 219-255

¹⁵Haughton G, Hunter C, (1994) Sustainable Cities, Jessica Kingsley, London

dependent, sprawling city (Calthorpe¹⁶, 1993). It is claimed that high residential densities may reduce car travel by increasing the range of opportunities that can be accessed within convenient walking time. Another aspect of density is the density of built form it is the density of the built environment that affects the loss of open or rural land. But the question remains regarding what figures or values is appropriate density. Howard's garden city,

considered as a fairly low-density city, was intended to have a density of 45 houses per hectare. Problems in defining absolute values for the density of the compact city can be overcome in empirical research by focusing on relative values that is, by investigating the differential advantages of differing densities. Following Table 2 shows the changing population density of the planned towns of West Bengal.

Table 2: Some Aspects of Density

	Population Density/ sq km 2011	Population Density/ sq km 2001	Percentage Change	Residential Density/ sq km 2011
Durgapur	3673	3199	14.81	11032
Bidhannagar	6433	14808	-56.55	42888
Kalyani	3451	2934	17.62	10548
Haldia	1831	1556	17.67	10041

Source: Calculated by author, Based on Census Data 2011.

Some of the planned towns of the state were developed following the Garden city principle but their density was not like it was prescribed in the model. All the cities have very high population density but their decadal change is not uniform across the towns. Decadal change in population density in case of Bidhannagar is negative due to its inclusion of adjacent wetland area. In the case of Haldia and Kalyani decadal change of population density is quite similar. Durgapur has also positive but relatively lower in decadal change of population density. It seems that population density in Bidhannagar has reduced but in reality the city becomes denser. Residential density figure of Bidhannagar clearly suggest that absolute density has been increased. The inclusion of adjacent area is not an exception for Bidhannagar but it is also reality for other towns. But the other three towns included very small amount of adjacent area within this decade so it did not make any major impact of population density figure of the respective towns.

The mix of uses within a city is another key component of sustainability. It is argued that local provision of services and facilities increases the likelihood of walking trips to these services. The steady decline in the proximity of schools, services, and shops to the majority of the population (Elkin et al¹⁷, 1991) has been linked to the growth in the number and length of journeys by car. The mixing of different activities within an area should serve to strengthen social integration and civic life. Supporters of Compact city also believe that compact city may be able to secure high-caliber personnel through the attractions of the living Environment such as the range of high-quality facilities (schools, hospitals, and Banks etc) and proximity to educational and research establishments may improve economic performance through accessibility to the latest technological advances and innovations (Burton 2002). Following Table 3 shows some of the infrastructural facilities of the each town.

¹⁶Calthorpe P, (1993) The Next American Metropolis: Ecology, Community and the American Dream, Princeton Architectural Press, New York

¹⁷ Elkin T, McLaren D, Hillman M, 1991 Reviving the City: Towards Sustainable Urban Development Friends of the Earth, 16 ^ 24 Underwood Street, London N1 7JQ

Table 3: Some Infrastructural Facilities of the Planned Towns of West Bengal 2011

	No of School# per 5000 Population*	No of College per 5000 Population**	No of Banks per 5000 population	No of Health Institution per 5000 population
Durgapur	18.99	0.65	0.35	0.15
Bidhannagar	23.83	2.17	0.41	0.13
Kalyani	6.83	3.01	0.74	0.14
Haldia	29.31	0.70	0.99	0.49

Source: Census of India 2011, Data calculated by author based on Town directory of 2011

*population considered between 5-15 age group, ** Population considered between 16-24 age group

School include primary, secondary and Higher secondary. ## College include general as well as vocational

It is evident that except schools in the towns, all other facilities are not adequate for the people. It clearly indicates that these facilities are not well distributed in the towns. People have to travel long to avail those services. Bidhannagar and Kalyani have relatively better higher educational facilities but the health and banking facilities are poor across all the towns. Relatively better higher educational facilities both in Bidhannagar and Kalyani may be due to their closeness of Kolkata compare to the other towns.

Intensification is relevant in compact cities due to various reason noted by scholars which include. (1) To reduce the need to travel by car (ECOTEC¹⁸, 1993); (2) to conserve land (Burton and Matson¹⁹, 1996); and (3) to encourage regeneration of rundown city centres. It also promotes economic sustainability by reducing

service and infrastructure expenditure, which was rising as a result of urban sprawl (Newman²⁰, 1992). The process of intensification entails the use of policies of 'containment' and 'consolidation' whereby growth is restrained within the city boundaries instead of on agricultural land and beyond. So Intensification is a process of making cities more compact, and may be considered in terms of three main phenomena: an increase in population, an increase in development, and an increase in the mix of uses within the city boundary (Burton, 2002).

Planned towns of West Bengal are not uniformly intensified rather some are relatively more intensified than the others. Two indicators are taken into consideration to understand the degree of intensification among the towns.

Table 4: Some Aspect of Intensification of Planned Towns of West Bengal

	Percentage change, 2001-11, in Resident Population	Number of dwellings completed, 2001-11, per sq km
Durgapur	23.62	143.08
Bidhannagar	39.60	124.21
Kalyani	22.66	2.51
Haldia	29.66	58.00

Source: Census of India 2011, Data calculated by author.

¹⁸ECOTEC, (1993) Reducing Transport Emissions Through Planning Department of the Environment , HMSO, London

¹⁹Burton T, Matson L, 1996, "Urban footprints: making best use of urban land and resources of rural perspective", in The Compact City: A Sustainable Urban Form? Eds M Jenks, E Burton, K Williams (Spon, London) pp 298 -301

²⁰Newman P, 1992, "The compact city: an Australian perspective" Built Environment 18, 285-300

It is evident that Bidhannagar is relatively the most intensified town in terms of decadal change of population compare to the others and it is also reflected in the residential density figure. While Durgapur occupies first position in terms of decadal new dwelling construction is concerned.

Kalyani is least intensified according to both indicators. Which means future prospect of Kalyani as a growing town is not very bright. Now it is interesting to see the overall composite indicator of compactness index.

Table 5: Composite Index of Compactness of Planned towns

	Compactness Index	Density	Mixed Used	Intensification
Durgapur	-0.14	-0.19	-0.36	0.13
Bidhannagar	0.66	1.00	0.04	1.00
Kalyani	-0.29	-0.20	0.34	-1.00
Haldia	0.08	-0.60	0.99	-0.13

Source: Calculated by author.

Bidhannagar is the highest scoring town while Kalyani gets the lowest score. Both Kalyani and Durgapur have negative score which indicates the lack of compactness within these towns. Haldia is also another town which is also not highly compact like Bidhannagar. Two factors plays significant role in the highly compact nature of Bidhannagar: density and intensification. It is important to mention that the existing infrastructure is not adequate for Bidhannagar because it has very high residential density and that insufficiency in the infrastructure has been reflected in the score of mixed use. In the case of Durgapur only the intensification score is relatively high but other two scores are low while in the case of Haldia infrastructures are well planned but the town is facing lack of density and intensification. Similar situation can be seen in the case of Kalyani. Therefore it is clear Bidhannagar is the most compact town in comparison to the other three planned towns.

1.4 Challenges of the Planned Towns to be Compact

Since compactness is vital for sustainability, as noted by the several scholars so this section will

explore the challenges of these planned towns to be compact. The reason why these planned towns are important for the future is because with the unprecedented growth of mega city of Kolkata, it leads to the creation of urban sprawl in its periphery. So these planned towns could play a vital role for future urbanization of the state. Policy makers are also interested in these towns which is reflected by the participation of these towns to be selected under the Smart City Mission. Now it is evident from the above findings that only Bidhannagar is a highly compact city and other three towns are not desirably compact. To be a compact city, one of the prior condition is the economic sustainability of the town which means there should be livelihood opportunities for the people. Though, some scholars identified only Economic sustainability of the town is a narrow criteria for quality of life of its people²¹, others, notably environmental experts, link 'urban sustainability' to broader social principles of equity, and participation, especially involvement of public citizens in the land development process²². Therefore livelihood opportunities added with adequate infrastructural facilities and public participation in the development process of

²¹Ewers, H. and Nijkamp, P. (1990). Urban sustainability, In Nijkamp, P. ed, Urban Sustainability. Avebury: Gower, (8) 10.

²²FoE (1994) Planning for the planet: sustainable development policies for local and strategic plans. London: Friends of the Earth, 10.

town is important for its sustainability. These planned towns are having lack of basic facilities which include the inadequacy in the number of education and health institutions. Apart from this household basic facilities like safe water supply and latrine facilities have to be taken into account. Above all, new job opportunities have to be created either through small scale industries or technology driven IT industries. All the three towns have kept the required land in their land use development control plan for future development. If this is to be done, then probability of sprawl formation will likely to reduce as a result the inclusion of the unplanned sprawl area will also reduce. The inclusion of the unplanned sprawl area with the passage of time within the jurisdiction of planned town is a common practice. It has deep implications with respect to the town's service and other facilities as well as its nature of compactness.

Conclusion

The above analysis and discussion have pointed out the importance of the compactness concept within the purview of the new urban planning agenda for sustainability and its relevance with respect to the planned towns of West Bengal. The paper clearly identifies that Bidhannagar is the most compact city compared to other three planned towns namely Durgapur, Haldia and Kalyani. These towns are not as compact due to the various reasons which include lack of job opportunity, basic household facility and infrastructure facilities in these towns. One of crucial factor of Bidhannagar is its proximity to Kolkata and it was planned with a vision of decentralization of administrative offices from Kolkata to Bidhannagar. Since these towns represented alternative form of urbanization so their role in shaping the future pattern of urbanization in the state is crucial. Policy makers have already paid attention to these cities through various programs like the Smart City Mission. In broader sense, these towns should focus on the

compactness aspect because only then a balanced and sustainable pattern of urbanization will emerge in the state as desired by the planners and policy makers.

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Evidence Based Inputs for Gender Responsive Budget for the Financial Year 2018-19

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1. Introduction

Women and girls face various forms of vulnerability throughout their life. They may face discrimination before or after birth; violence, harassment or abuse; neglect due to dependence and lack of access to resources; social prejudice; and exploitation – whether economic, political, social or religious. They may be vulnerable to exploitation and discrimination regardless of where they are positioned on the economic and social spectrum. Additionally, their vulnerability increases significantly if they are poor, socially disadvantaged or living in a backward or remote area. Gender Responsive Budget (GRB) is a widely accepted strategy that has been employed across more than 100 countries to address these vulnerabilities. GRB is a tool for gender mainstreaming. It uses the Budget as an entry point to apply a gender lens to the entire policy process. It is concerned with gender sensitive formulation of legislation, policies, plans, programmes and schemes; allocation and collection of resources; implementation and execution; monitoring, review, audit and impact assessment of programmes and schemes; and follow-up corrective action to address gender disparities.

Gender Responsive Budget (GRB) is not just a one-time activity. It is a continuous process that must be applied to all levels and stages of the policy process. It recognizes that the Budget is a

powerful tool that can reduce the vulnerability of women and girls and transform their situation. GRB ensures that overall policy/programme planning, budgeting; implementation and auditing continuum are gender responsive. The idea behind GRB is not about literally dividing funds in a fifty-fifty ratio among men and women. GRB is about bringing a gender perspective in policy making at different levels. For example, the recent schemes like Digital India are noteworthy but lack specific focus on digital empowerment of girls and women given the gender inequality in society. At grass root level, often women with low or no literacy levels are left out in technological shifts which become important part of daily life in society. Likewise, there is scope to integrate safety of women as a major concern in flagship centrally sponsored schemes such as Jawaharlal Nehru National Urban Renewal Mission (JNNURM), PMGSY, etc. Under Smart Cities Town planners, policy makers and budget experts need to do gender budgeting to ensure women-friendly civic infrastructure- water, sanitation, health care, safe transport, public toilets, help lines, skill development for crisis management and, safe transport and safety at work place.

In brief, it needs to be recognised that women's issues do not have to be seen as the concerns of the Department of Women and Child Development (DWCD) and Social Welfare (SW) Departments alone. There is a need to recognise that women are

contributors to and recipients of services provided by different departments like Health, Education, Home, Tribal, Public Works, RDD, Housing, Social Justice, etc. and that they have different needs. Policies have to be thus designed and financed accordingly to create maximum benefits to all.

2. Institutionalisation of Gender Budgeting

The first important step towards institutionalisation of gender budgeting would be to ensure that a policy guideline or mandate is issued from the highest level of the government. Formation of a high level committee chaired by the Chief Secretary or the Additional Chief Secretary rank official will also be crucial to ensure that mechanisms are put in place to operationalise gender budgeting. All state governments need to create a gender cell, preferably within the finance and planning department to ensure that budgets are effectively reaching women and girls. Akin to environmental impact assessment, the format for approval of new programmes and schemes needs to include a section on gender to ensure that the design of the scheme is gender sensitive. All departments must include a section on gender in their annual reports and outcome budgets. Concerted efforts need to be made to ensure that sex disaggregated is collected. Wherever needed, the monitoring formats should be revised to collect the data. Women's Policy should have a clear action plan with roles and responsibilities and time line delineated for relevant ministries/departments.

3. Expectations for GRB for the Union and State Budgets of 2018-19

The Allocation for Department of Women and Child Development needs to be raised by 20% over and above that for the year 2015-16 as there was a significant cut in allocation for 2016-17 causing many schemes to suffer on ground. Budget provision should be made for setting up a nodal agency/committee for regular review and revision

of schemes. Adequate funding should be provided to Maharashtra State Commission for Women (MSCW) for effective functioning. Timely release of funds for all the schemes needs to be ensured.

3.1 Ownership of Assets

- There is a need to ensure that the GR (2003) regarding joint ownership of rural houses is properly implemented. Also figures on joint ownership need to be published in budget and performance appraisals of Government. Likewise a GR promoting inclusion of woman's name in 7/12 document needs to be issued.
- LPG connections should be registered in the name of women.

3.2 Women Friendly Public Services

i) Health

- Subsidised education and health are most beneficial to women and girls. Public Health facilities for women are grossly inadequate. There is a need to increase women's hospitals for which running cost and human resources (HR) need to be budgeted.
- There is a need to create facilities for mental healthcare of women as levels of stress and mental illness are very high among women.

ii) Nutrition

- Flagship programmes such as ICDS have faced cuts in allocations during the year 2016-17. Nutrition of pregnant mothers and children in 0-6 age group tends to suffer as a result of budget cut. The state government needs to match up its contribution to create safety net for this population.
- Allocation of Rs. 1000 per year given to Anganwadi Workers (AWWs) for organizing programmes is grossly inadequate. Honorarium for AWWs needs to be increased and released on time.

- Allocation for Supplementary Nutrition Programme (SNP) is also inadequate, and needs to be raised.
- Budget for training under SABLA Scheme needs to be increased. Also, SABLA should be implemented in all districts.

iii) Education

- Public education and counselling facilities for safety of girls and women in schools and colleges in terms of prevention of child sexual abuse should be provided.
- Colleges should be enabled to conduct safety audits.
- Separate toilets for girls and boys should be maintained in all educational Institutions.
- GRB should be included in the curriculum of all universities.
- Revise educational curriculum to remove stereotypical patriarchal roles and norms for men and women in all schools and colleges. Adopt the curriculum from Life School Education model successfully implemented in Chandrapur by UNICEF for boys and girls.
- Ensure sufficient funding for the Mid Day Meal Programme as prices of food items have increased drastically

iv) Infrastructure

- A women friendly infrastructure schemes on the lines of that initiated by Government of Kerala should be adopted.
- Create a Gender Clearance Cell for all large infrastructure projects including smart cities to ensure that they recognize the link between safety, violence and infrastructure.
- There should be proper electrification in the communities and on streets, roads to ensure women's safety.
- Integrate safety of women as a major concern in flagship centrally sponsored schemes such as PMGSY, etc.

- Under Smart Cities, Town planners, policy makers and budget experts need to do GRB to ensure women-friendly civic infrastructure-water, sanitation, health care, safe transport, public toilets, help lines, skill development for crisis management and, safety at work place. Participatory budgeting must be followed in all municipal corporations and special measures need to be taken to ensure representation of women in these participatory processes.
- Subsidized housing for single/ deserted/ divorced/ widowed women should be available.

v) Transportation

- There is an urgent need to create women friendly and SAFE public transport systems-local trains, Metro, buses as well as streets. Safety of women should be a major component in CSS like Jawaharlal Nehru National Urban Renewal Mission (JNNURM)
- The Railway Budget has promised a 33% sub-quota for women under all reserved categories. Looking at increasing attacks on women commuters, the railways need to allocate more funds for security and safety of women on the railway platforms and in the trains.
- One ticket window at railway stations to be reserved for women.
- There should be immediate implementation of the Tejaswini Bus scheme for women, especially in urban areas.

vi) Sanitation

- There is a need to build good quality toilets, as well as maintain existing ones at places of Public Transport like Railway Stations, Bus Stops, Metro Stations, Streets, etc. They should be mandatory part of budgets

vii) Safety Nets for Women

- Set up at least one night shelter home in each district, and more in urban areas to have

shelters for homeless/destitute women, children and men. Also, cheap eating facilities and public toilets need to be created in the vicinity.

- Set up Observation Homes for girls in every district
- There is a need to establish at least 10 working women's hostels in the state in urban and semi-urban areas of the state.

3.3 For Children of Women in Prostitution and Unwed Mothers

- Need to increase facilities for rehabilitation for these children. Institutions caring for such children should be included under adoption scheme.
- After care: Have an independent scheme for after care of girls released from *balgrihs* at 18 years. Counselling for this should start at 16 years. Also provide appropriate skill/vocational training to them while in *balgrihs*.

3.4 For Swadhar Homes run by NGOs for rehabilitation of Victimized Women

- There is a need to have early clearance of applications made by NGOs for funding under this scheme, increase allocation of budget for this scheme and ensure release of funds on time and in three instalments- 45:45:10 to be released in May/June: October/November: After inspection.
- There should be flexibility in the implementation of the scheme especially considering the needs for longer period of stay for women without any support, or having more than two children needing care

3.5 Manodhairya

- There is a need to set up trauma teams in all districts. Trauma teams must have trained counsellors. Address delay in release of funds

- Meetings of the teams/Committees headed by the Collector must be held once in 15 days. Responsible Officers should be held accountable, if the meetings are not regularly organized.

3.6 Violence Against Women and Survival of Girl Child

- While schemes to combat trafficking and empowering adolescent girls have received increased funds, the schemes meant for implementation of PCPNDT act, the Protection of Women from Domestic Violence Act have not received much allocation.
- There is an urgent need to Draft a comprehensive Maharashtra policy and an Action Plan to end violence against women and girls. The new laws must be supported by adequate budgetary resources and investment in infrastructure otherwise legal interventions remain ineffective.
- Ensure utilisation of funds for '*Beti Padhao, Beti Bachao*' scheme which was announced with the goal of improving efficiency in delivery services for women.

3.7 Prevention of Violence against Women

- Allocate adequate resources, both financial and human, for the prevention of violence against women and girls,
 - Conduct sustained, large scale, public education campaigns through the print and audio visual media geared towards changing mindsets of society to end gender inequalities and violence against women and girls.
 - Increasing women's awareness of rights, as well as current laws and policies.
 - Allocate adequate resources to work with men and boys to bring in the framework of women's rights by discussing structural violence, masculinities, choice, dignity, and gendered division of labour, sexuality and the bodily integrity of women / girls.

- Revise educational curriculum to remove stereotypical patriarchal roles and norms for men and women in all schools and colleges.

3.8 Stakeholders: Police & Judiciary & Health Professionals, Service Providers & Media

- To develop and Operationalise Gender Sensitive protocols
- Regular & Refresher trainings on gender, disability, sexuality, violence against women, human rights and international normative frameworks (CEDAW) police, judiciary, health professionals, service providers and other concerned state officials. Further, they should be held accountable for any breach in the performance of their duties
- Monitoring & Tracking (with civil society /community participation) : set up mechanisms for monitoring and tracking (e.g. Prevention of Domestic Violence Act) and looping back feedback from various stakeholders –identify gaps: shelters, services for survivors
- Ensure that all laws, policies, information and services are accessible to and take into account the needs of women and girls who face multiple discriminations due to class, caste, religion, disabilities, sexual orientations and other marginalisation.
- Create a Gender clearance cell for all large infrastructure project including smart cities to ensure that they recognize the link between safety, violence and infrastructure

3.9 Ensuring Women's Safety

- Implement Nirbhaya Scheme in the whole state and needs to be started in each police zone. Funds would include vehicle, spy cams, honorarium for counsellors, etc.
- Need for increase in the number of women police officers.

3.10 Women in Agriculture, Unorganised Sector, SHGs and Issues of Livelihood

- For women farmers and artisans, Government of Maharashtra should initiate Mahila Haats at block level in rural areas where they can directly sell their products to buyers. Similarly, in urban areas, setting up dedicated market spaces for women farmers, artisans and unorganised sector sellers can be very useful to build their livelihood. Funds need to be allocated for setting such markets at weekly intervals and a suitable scheme needs to be created.
- Increase the budget for Social Welfare Boards for women in the unorganized sector. Provide funding for crèches for children of women in the unorganized sector. SHGs can be encouraged to run such crèches through development of a business model.
- Carbon credits can be given to women for afforestation, their active engagement needs to be promoted in management of UNREDD+ programme.
- For recycling workers/rag pickers' occupational health and safety, allocate funds for technological upgradation in Waste Management as well as for ensuring safety standards for the workers.
- Skill building of women needs to be taken up in Aadhar Grihas for making them independent
- Ensure utilisation of funds under the scheme for setting up driving schools.
- There is a need to oversee taluka level budget in SHG budget allocation.

3.11 Legal and social Justice for Women

- There is a need for increase in the number of fast track courts, including adequate budget for running the courts as well as appointment of judges. An increase in the number of family courts also required. Also, family courts need

to take up cases related to property rights of women.

- Establish systems for the implementation of the Sexual Harassment at Workplace Act (2013). Committees have not yet been formed in many places. Provide adequate support for travel, DA, etc. for members of these committees.
- Awareness building among women regarding schemes laws, standards, rights, government policies, etc. is very essential. Budget provision needs to be created for this.
- Legal literacy on POCSO Act, 2012 and Prevention of Sexual Harassment at Workplace Act, 2013. Provision must be made to have special cells in the police department to take action against display of pornographic images, SMS messages, cybercrimes that victimize young girls at public places or in public transport- buses, local trains, rickshaws and taxis.

3.12 Social Justice

- There is a need to encourage building of assets (cattle, trees, houses) for women from Social groups like SCs, STs and for religious Minorities
- Stamp duty for housing for women from marginalized communities needs to be waived.
- Training should be provided to adivasi girls in nursery, group farming, food processing, etc.
- Providing employment opportunities for family as a unit is important, especially in tribal areas.
- Strengthening SHGs for women from marginalised social groups is important.

3.13 Revenue Generation

Several state governments have sent GR regarding allocation of 5% of total revenues for women and children, while state of Kerala has

increased it to 10%. Some amount of fine collected for causing damage to environment (introduction of Green Tax), high speed driving, wrong parking and breaking rules can also be used for welfare of women and children. Surcharge, earmarked charge for specific purpose such as Education Cess-2% of salary, has raised revenues. Further analysis is required for this, in the context of GST, which is to be introduced soon.

4 Conclusion

The Gender Budget Cells envisaged serving as focal points for coordinating gender budgeting initiatives within their Ministries and across Departments have played major role in budgetary allocations of the Union Budget. So far 56 Ministries/Department have confirmed setting up of a cell/nominating a nodal person. This could materialize because the Ministry of Women and Child Development, in collaboration with UN Women, developed a Manual and Handbook for Gender Budgeting for Gender Budget Cells for Central Ministries and Departments. This strategy of the Government on Gender Budgeting and Gender Mainstreaming during 2004 to 2014 resulted in many State Governments like Rajasthan, Gujarat, Madhya Pradesh, Karnataka, Orissa, Kerala, Assam, Bihar, Chhattisgarh, Tripura, Nagaland, Uttar Pradesh and Uttarakhand adopting Gender Budgeting.

Gender economists are aware that concerns of women cannot be addressed through the Ministry of Women and Child Development alone. It is on the work of women that success of several sectors rest. The changing demographics of agriculture, with more than 75% of all women workers, 85% of rural women workers are in agriculture; women's disproportionately large contribution to the export and services sector, in the unorganised sectors—all these need to be located in our policies. Each of these sectors needs to make concerted efforts to address women's concerns through: recognising women's contributions, addressing their gender

specific concerns and organising their voice; investing in skills of women and upgrading their work spaces and providing common work facilities; providing women access to new technologies and credit schemes; paying special attention to caste and minority derived exclusion within gender. Hence, it is important to prioritize universalisation of Gender budgeting (including gender audit) and Gender outcome assessment in all Ministries/Departments at Central and State levels. The Gender Budget Cells located in the different ministries need to be strengthened so that women's concerns can be mainstreamed across different sectors. Further, it needs to be ensured that each of such measures (as listed above) is backed with adequate resource allocation. Calling for implementation of the WCP across all ministries could ensure at least a minimum resource allocation targeted at women. The poor and even receding implementation of WCP as pointed by the Mid Term Appraisal of the Tenth Plan warrants special efforts at correction.

Considering the large numbers of women in unpaid work and women's central role to the care economy; to address women's concerns in these sectors, policies need to focus on social services to support women's care roles (old age, child care). With increasing women's role in the care economy (both paid and unpaid), adequate resource allocations need to be made to support women's care roles. In the absence of sex disaggregated data, evaluation of schemes through a gender lens or any effort at strengthening gender dimensions of existing schemes poses a big question. So, provision of such data should be prioritized. In the light of the present agrarian crisis and the changing face of agriculture being highly gendered, the vulnerability of women farmers in particular needs attention in the larger context of food security.

Considering the huge gender disparities in land ownership patterns, women's access to land needs to be strengthened immediately. This could be done by (a) improving women's claims to family land (by

enhancing legal awareness on inheritance laws, provide legal support services, etc.); (b) improving access to public land by ensuring that all land transfers for poverty alleviation, resettlement schemes, etc., recognize women's claims; etc., (c) Improving women's access to land via market through provision of subsidized credit to poor, by encouraging group formation for land purchase or lease by poor women, etc.

Women's rights organizations in India have demanded that the Government should ensure adequate gender budgeting in all ministries and departments, enact a comprehensive Food Security Bill, ensure universal PDS as a core component, allocate 6% of GDP for Health, allocate 6% of GDP for Education, Make budgetary allocation to cover special schemes for women workers, increase allocation for women farmers, enhance resource allocation for tribal, dalit, and minority women and increase budgetary support for schemes to assist women-headed households and differently abled women.

The target of 30% gender allocations under all ministries has not yet been achieved. This must be implemented immediately. There is need for gender audit and gender outcome appraisal of all ministries and departments at the central and state levels. Very often, resource allocations made under gender budgeting do not reach in time and they remain unspent. There should be proper monitoring and supervision of the allocated funds with greater transparency and accountability at all levels.

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Dust Management

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Holi is one of the most significant festivals of India. On the Holi night a pyre is set on fire. Symbolically, it signifies the eradication of all evil influences in the society. It is followed by festivities of rejoicing by putting colours on each other the next morning. This day of exultation is called Dhuli Vandan, which literally translates to saluting the dust. Historically, mankind has always acknowledged the importance of nature in his existence. On this day they recognized and reminded themselves of the great importance of soil. All our food and fibre comes from the earth, which is made up of soil.

The finer particles of soil are dust of microscopic size which remain suspended in air and are transported everywhere with air. So far the air was unpolluted, the dust did not pose hazard. The whole gamut of modern activities, industries, transport, burning of fossil-fuels, constructions, power production, etc. have resulted in different kinds of pollutions including air pollution. It was realized rather late was that the environment is required to be protected and pollutions are to be controlled with concerted efforts. As per assessment of the Government, dust contributes about 20% of pollution in big cities and about 530 billion tonnes of construction and demolition waste (C&D waste) is generated annually in India.

Particulate Matter (PM)

The simple dust particles have not remained harmless. They have turned damaging to human

health. They are made up of harmful chemical compounds of sulfates, nitrates, ammonia, sodium chloride, black carbon, mineral dust and water. They have taken the form of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. The most health-damaging particles are those with a diameter of 10 microns or less, which can penetrate and lodge deep inside the lungs. Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, as well as of lung cancer. Because of their size they are classified as under:

- **PM₁₀** : inhalable particles, with diameters that are generally 10 micrometers and smaller; and
- **PM_{2.5}** : fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.

Their microscopic size can be imagined from the fact that tip of a single hair from our head is of 70 micrometers in diameter. As particulate matter has emerged as a very damaging form of air pollutant, substantial efforts are being made at controlling them, i.e. reducing their presence in the air. The World Health Organization and the Pollution Control Boards have prescribed guidelines for assessing their permissible concentration. An extract from the WHO Fact Sheets is reproduced below:

Pollutant	Source types and major sources	Health Effects	WHO guidelines
Particulate Matter	Primary and Secondary-Anthropogenic: burning of fossil fuel, wood burning, natural sources (e.g. pollen), conversion of precursors (Nitrogen Oxide, Sulphur Oxides, VOCs). Biogenic: dust storms, forest fires, dirt roads.	Respiratory symptoms, decline in lung function, exacerbation of respiratory and cardiovascular disease (e.g. asthma), mortality.	Pm ₁₀ Annual Mean: 20 µg/m ³ 24 Hour mean: 50 µg/m ³ PM _{2.5} Annual Mean: 10 µg/m ³ 24 Hour mean: 25 µg/m ³

Control of Air Pollution:

Environment protection is a matter of high priority for the government, and a set of legislations are in place to control pollutions. Under the Air (Prevention and Control of Pollution) Act, 1981, Pollution Control Boards are set up at Central and State level, where constant monitoring is done and set of measures is taken. Under the National Ambient Air Quality Standards limits of particulate matter are prescribed. Fact is that the recorded readings are more often on the higher side. The detrimental effect of presence of particulate matter in the ambient air has resulted into serious health issues. This has led Government of India to take up many specific measures to address the problem. Two such specific measures are briefly discussed in this paper. The first specific rule for dust management is the **Construction and Demolition Waste Management Rules, 2016**. Some broad features of these rules, in brief, are as under:

(1) Duties of the Generators of Construction and Demolition Waste: Every waste generator shall segregate construction and demolition waste and deposit it at collection centre of handover to the authorized processing facilities. The generator includes builders, construction firms, individuals etc. They will have to get approval for their waste management plans, do segregation of this waste and pay relevant charges for collection, transportation, processing and disposal.

(2) The State Governments are mandated to-

- i) The Urban Development Department is required to prepare their policy with respect to management of construction and demolition waste within one year of the date of notification of the rules.
- ii) The Department of the State Government concerned with land matters shall have to provide suitable sites for setting up storage, processing and recycling facilities for C&D waste within one and a half year from the notification of these rules.
- iii) The Department dealing with Town and Country Planning shall incorporate the site in the approved land use plan so that there is no disturbance to the processing facility on long-term basis.
- iv) The Departments of the State Government shall be required to utilize 10-20% materials made from C&D waste in Government contracts.

(3) Local Authorities: Following duties are cast on the Local Authorities under the rules, namely-to place appropriate containers for collection of C&D waste, removal, transportation to appropriate for processing land disposal; to provide for safe disposal of C&D waste contaminated with industrial hazardous or toxic material or nuclear waste; to give appropriate incentives to generator for salvaging, processing and or recycling preferably in-situ.

(4) Pollution Control Boards

- i) The Central Pollution Control Board is required to prepare operational guidelines related to environmental management of C&D waste.
- ii) State Pollution Control Boards shall be responsible for granting authorization to C&D waste processing facility, monitor the implementation of the rules by the concerned local bodies and submit annual report to the CPCB and the State Government.

Environment (Protection) Amendment Rules, 2018

The increasing proportion of particulate matter in the air in cities continues to be a matter of serious concern. The Ministry of Environment, Forests and Climate Change made further rules in the form of the Environment (Protection) Amendment Rules, 2018 for dust management and notified them on 25 January, 2018. In the Environment (Protection) Rules, 1986, in Schedule-I, after serial number 105 and the entries relating thereto, the following serial numbers and entries have been inserted:

“106. Mandatory Implementation of Dust Mitigation Measures for Construction and Demolition Activities for projects requiring Environmental Clearance:

- (i) No building or infrastructure project requiring Environmental Clearance shall be implemented without approved Environmental Management Plan inclusive of dust management measures.
- (ii) Roads leading to or at construction sites must be paved and blacktopped (i.e. metallic).
- (iii) No excavation of soil shall be carried out without adequate dust mitigation measures in place.

- (iv) No loose soil or sand or Construction & Demolition Waste or any other construction material that causes dust shall be left uncovered.
- (v) Wind-breaker of appropriate height i.e. 1/3rd of the building height and maximum up to 10 meters shall be provided.
- (vi) Water sprinkling should be put in place.
- (vii) Dust mitigation measures shall be displayed prominently at the construction site for easy public viewing.

107. Mandatory Implementation of Dust Mitigation Measures for all Construction and Demolition Activities:

- (i) Grinding and cutting of building materials in the open area shall be prohibited.
- (ii) Construction material and waste should be stored only within earmarked area and road side storage of construction material and waste shall be prohibited.
- (iii) No uncovered vehicles carrying construction material and waste shall be permitted.
- (iv) Construction and Demolition Waste processing and disposal site shall be identified and required dust mitigation measures be notified at the site.

Note: The serial numbers 106 and 107 above shall apply to cities and towns where value of particulate matter 10/particulate matter 2.5 exceeds the prescribed limits in National Ambient Air Quality Standards.

[F.No. Q-16017/172/2017-CPS]
RITESH KUMAR SINGH, Jt. Secy.”



Planning for Inclusive Mobility of Urban Poor in Kolkata

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Abstract

Cities play an important role in country's economy contributing 50 to 80 percent share in the Gross National Product (GNP). However, nearly 50 percent of cities population are marginalized living in informal settlements on the outskirts of cities or in the inner city poor districts. In Kolkata among the total population an estimated 1,457,273 are slum inhabitants (32.48% of total population) (Census of India 2011). At present, there are no explicit policies for planning of mobility of urban poor in city. The present paper is an attempt to assess the mobility needs of slum dwellers in Kolkata identify their travel behaviour using travel probability fields and propose scientific based strategies of arriving at an informed transport policy intervention for urban poor. This paper is based on empirical research study carried out on understanding mobility levels of urban poor comprising about 200 slum dwellers spread in different slum pockets located in different parts of Kolkata. The analysis of primary surveys reveals that in terms of socio-economic condition of slum dwellers income tends to vary spatially by locations. Travel Probability Fields (TPF), which predicts the search areas of commute of travellers, has been applied in the present study. Based on the analysis of mobility patterns and accessibility to various opportunities and public transport various issues were identified and transport improvement strategies for case slums in particular and city level in general were recommended to enable an inclusive mobility environment for slum dwellers.

Key Words: Urban poor; Travel Probability Field, Travel behaviour

1. Introduction

Due to rapid urbanization in last few decades more than half the world's population live in urban areas and this proportion is expected to grow. Urban poor face a complex trade-off between residential location, travel distance, and travel mode, in an attempt to minimise the social exclusion associated with low earning potential. In particular, urban poor have suffered negative consequences of the growth of motorization and its impact in several ways such as increased travel times for journey to work, increasing urban transport costs in comparison to their incomes, inadequate access to public transport, and low priority to NMT infrastructure planning, biases in investment and regulatory policies etc. The Master Plans or City Development Plans have very little emphasis to address the mobility issues of urban poor specifically through more rationale location of job centres in proximity to their residential areas There are hardly any significant urban poor targeted mobility strategies reported or seen in cities in India largely owing to absence of an in -depth understanding of mobility of urbanpoor and scientifically informed approach towards evolving transport policies and strategies enabling an inclusive mobility environment for them. Travel probability field, a scientific method which can assist in understanding the mobility pattern of urban poor, has been applied towards evolving meaningful inclusive mobility strategies for the urban poor.

2. Case Study Profile

Kolkata Metropolitan Corporation area (KMC) has an area of 1875 sq. km. with a population of 4.58 million in 2011 comprising 141 wards. Slum-dwellers account for one-third of Kolkata's total population. There are approximately 7,000 notified and un-notified slums in Kolkata Metropolitan Areas and 1236 notified slums within Kolkata Metropolitan Corporation Area. The workforce participation rate of Kolkata as per Census of India, 2011 is 36.68. The transportation infrastructure consists of various modes ranging from the original ferries to metro rail via hand driven rickshaws, trams, buses and trains which currently share the same right of way. Historically, the core city of Kolkata was based on mobility by ferries, hand rickshaws and trams, complemented by the pedestrian movement.

3. Data Base

The data required for the research was mainly identified with two purposes i.e., to develop travel probability fields and to evaluate the impact of background variables (location, trip length, travel time, trip cost etc) on travel probability fields based on existing household, urban structure and transport system characteristics.

3.1 Primary Surveys

A sample of 200 slum pockets in the city were selected taking into account factors such as accessibility to transit services, geographically location, and access to work centres and local shopping areas besides other social infrastructure facilities such as health centres, schools, community halls etc. Random slum dwellers were enumerated in each case slum pocket on a survey questionnaire detailing out their household and personal socio economic characteristics besides their trip attributes for a representative day of the week. Also, bus-stop boarding alighting survey was conducted in nearest bus stop of case slum survey locations which helps in computing of public

transport accessibility index. Further about 200 stakeholders were surveyed in the case-slums to get an opinion regarding efficiency of transport facility (convenience, affordability, comfort, safety, connection to the city, transport infrastructure) and stakeholder's mark on these indicators out of three in an increasing order of marking decreasing the satisfaction level facility.

3.2 Secondary Data

Secondary information (detailed maps of Kolkata Municipal Council Area from Kolkata Development Authority and its surroundings, population details, employment density etc.) was also collected to supplement the data base.

4. Profile of Case-slums

4.1 Background

For this study within KMC area eight case slums has been selected and among which three (slum number 1 to 3) are located in inner area, namely old CBD area (Zajaria road slum, Garcha road slum and Gossain para basti), two (slum number 4 and 5) are located in middle area (Suren Sarkar street and Jojbagan basti) and three (slum number 6, 7 and 8) are in outer area (Ghol para basti, Tangra and Ayub nagar basti) which is relatively undeveloped low density outskirts area respectively. The case slum dwellers reside in three different areas and have different socio-economic characteristics and mobility pattern.

4.2 Socio-Economic Status of Slum-Dwellers

The socio economic analysis reveals that in case-slum areas 38% slum dwellers are illiterate while 46% people have primary education. Further the monthly household income ranges between Rs. 9000-5000 while per capita income ranges between Rs. 1000-1700. The income of slum dwellers tends to vary spatially by locations. While outer areas exhibit lower monthly household incomes in the range of Rs 4500 to 7000, the inner areas have relatively higher median monthly households income between Rs 7000-9500.

4.3 Mobility Characteristics of Slum Dwellers

Majority of slum dwellers predominantly walk (56%) for their travel needs followed by bus travel (26%). In terms of trip purpose the slum dwellers predominantly commute for work (65%) and followed by education purpose (27%). In terms of travel distance nearly 50% of slum dwellers commute within 0.8 km., while 75% travel within 1km. Slum dwellers limit their travel distance due to poor public transport availability or to avoid high expenditure to transport. The percentage share of income on transport expenditure tends to increase for slum dwellers residing away from city centre which exhibits that slum dwellers tend to limit their travel distance in order to optimise their travel expenditure. It has also observed that slum dwellers reside in peri-urban areas tend to spend more on per trip compare to inner area slums.

4.4 Impact of Public Transport Accessibility and Hansen's access to Employment Opportunity Index on Mobility Pattern

Public transport accessibility has been worked out using the Hansen's accessibility model as under:

$$\sqrt{(N_{ij} / A_j)} \quad \dots(1)$$

Where N_{ij} is off- peak frequency of route i passing through zone j and A_j is area of zone j .

The employment accessibility index has been calculated as under:

$$X = \sum E_{ij} / D_{ij} \quad \dots(2)$$

Where E_{ij} is No. of Jobs and D_{ij} is distance from zone i (Slum location) to Zone j (Job location)

It is observed that slum dwellers who have better accessibility by public transport tend to have lesser waiting time and journey times. Further, with improved accessibility environment the per capita income tends to increase due to better access to work opportunities. It is further observed that when both transport accessibility index and employment opportunity index is high, the income of slum

dwellers is highest (slum number 1 to 3). The average monthly savings of slum dwellers residing in slum number 5 which has good transport accessibility but moderate accessibility to employment opportunity is higher than slum dwellers residing in slum number 4 which has moderate transport accessibility but good accessibility to employment opportunity. The per capita average monthly savings of slum dwellers is more sensitive with transport accessibility than accessibility to employment opportunity highlighting the importance of transport accessibility in improving standards of living of urban poor.

5. Assessment of Travel Probability Fields

5.1 Concept

According to Zahavi (1979) travel probability fields can be defined as the spatial distribution of activity sites visited by households in a particular residential location which can be depicted by a probability density function described in location co-ordinates. According to the theory of travel probability fields people travel to increase their choice of activity sites and so increase the benefits associated with the destination. As the cost of travel (assumed here to be travel time) increases with travel distance, travel is restricted to an area where the benefits exceed the travel time which is the 'travel probability field'. Such travel fields are methodologically consistent with attempts made in urban geography to describe the spatial distribution of activity patterns.

The basic parameters of travel probability fields are as under:

- i. Centroid Distance: It is the distance from the centroid of the households to the activity site centroid.
- ii. Standard Distance: It is the spatial equivalent of standard deviation. It provides the most concise description of the spread of points around the mean center. It is a convenient

measure of dispersion in point patterns since it summarises the spread of points in just one value. It is given by:

$$d\sigma = (\sigma_x^2 + \sigma_y^2)^{1/2} = (\sigma'^2_x + \sigma'^2_y)^{1/2} \dots(3)$$

- iii. Shape Index: The most commonly measured characteristic of shape is compactness. This is effectively a measure of how far a shape deviates from the most compact possible shape, a circle. The elongation of an ellipse is given by: Elongation Index = b / a, where 'b' is the major axis of the ellipse and 'a' is the minor axis of the ellipse. It signifies the direction of an ellipse, if any.
- iv. Area: The area of the travel probability field is the area within the ellipse which signify the extent or ability of an individual to travel.

5.2 Travel Probability Fields in Case Study Area

Travel Probability Field for the poor in Kolkata was developed through development of a standard deviation ellipse. The travel probability field is calculated for eight case slum areas for all mode and all purposes, for different modes (Walk, Bus, IPT) for all purpose, then for all mode for work and education. Table 1 shows the important parameters of travel probability field including all modes and all purposes for eight slums. It is observed that the trip length calculated from travel probability field method is almost similar form observed trip length form primary surveys. The search area of outer area slums no. 7 & 8 are the highest which also relates well with the high trip lengths observed in these slums. Slum 1, an inner area slum has the least search area as well as the least trip length. In some areas due to poor public transport facility poor people limit their travel field like in Slum no. 4.

Table 1: Overall Travel Probability Fields across Slums

Slum	Centroid Distance (km.)	Standard distance (km.)	Shape Elongation Index	Observed. Trip Length (km.)	Search Area (sq.km.)	Estimated Trip length (km)
1	0.41	1.19	1.93	1.91	1.83	0.97
2	0.82	2.05	1.21	1.44	6.46	1.22
3	2.04	1.58	1.75	1.43	3.40	1.23
4	0.66	1.63	2.74	2.03	2.69	1.46
5	1.29	2.16	1.60	3.03	6.58	1.60
6	1.85	1.61	1.44	1.48	3.80	1.11
7	1.90	3.73	2.44	4.08	15.35	3.26
8	9.90	5.44	3.83	5.69	22.74	5.15

Source: Primary Survey, 2017.

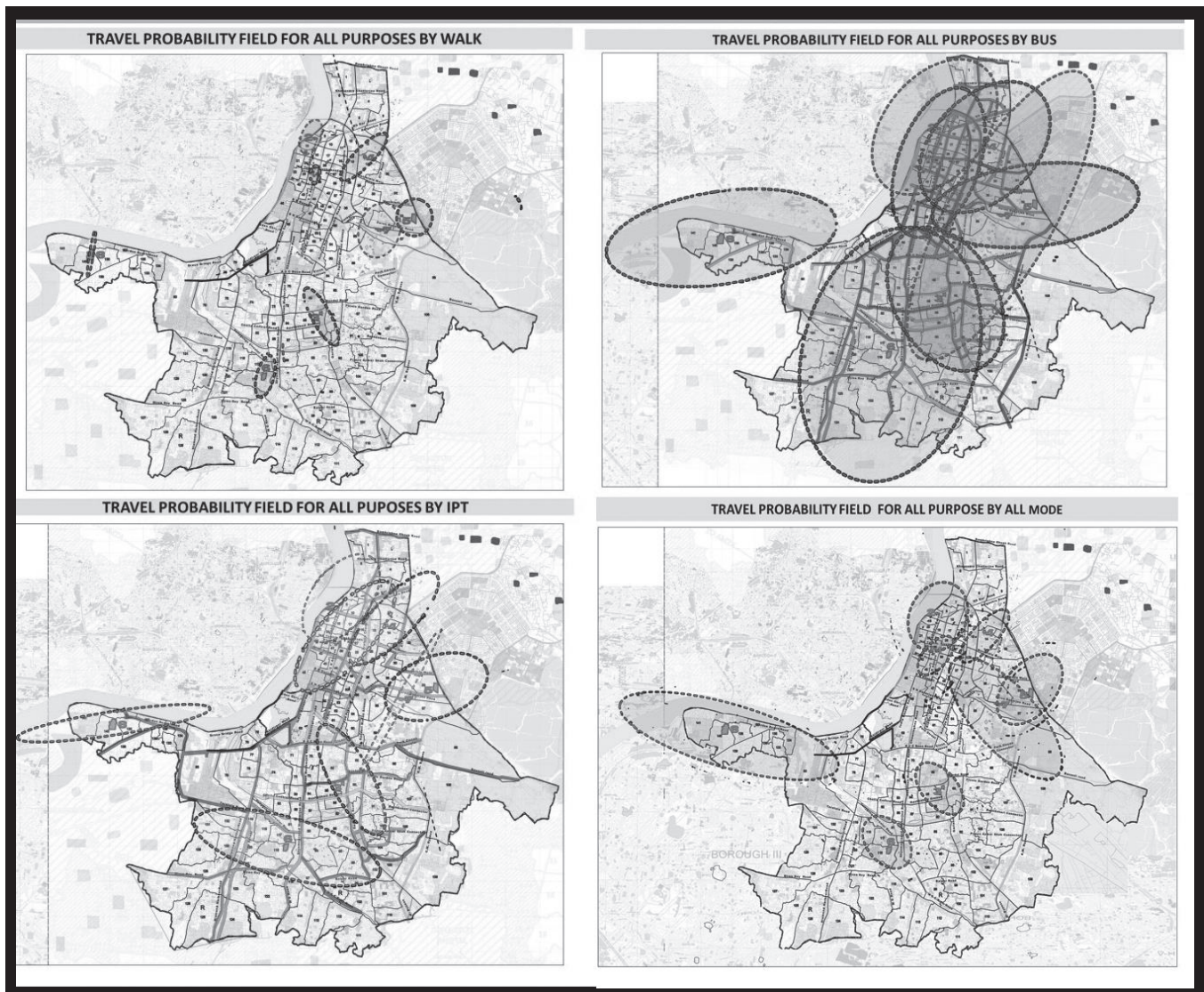
5.3 Variation in Travel Probability Fields

5.3.1 By Mode of Travel

An analysis of travel probability fields (TPFs) for all purpose by different modes reveal that travel fields for walk trips are circular in case the destination are spread all around while in some cases these are elliptical when people walk in order to access public transport. It is also observed that travel fields for bus users are elliptical as these

are along the direction of bus routes while for IPT these are more spread in nature depending on either parallel to public transport or as feeder to public transport system (Figure 1). It is also observed that on Travel Probability fields or search areas are higher for bus, moderate for IPT and less for walk trips. The search areas vary from 0.16 to 3.48 sq km for walk trips, 2.24 to 22.77 sq km for IPT and 8.7 to 84.66 sq km for bus respectively.

Figure 1: Travel Probability Fields by different modes for various purposes



5.3.2 By Purpose of Travel

Travel Probability field for work travel is highest i.e its search area ranging between 7.1 to 38.4 sq km while it varies from 0.02 to 15.17 sq km for education trips.

5.3.3 By Occupation Groups (Workers)

Travel Probability Fields for workers vary from 7.1 to 38.4 sq km. It further is lowest for walk trips (0.21 to 3.25 sq km) followed by IPT (1.13 to 13.84 sq km) and bus (14.85 to 51.78 sq km). It is observed that workers choose bus for longer distance while at outskirts

IPT is used for longer distance and walk to commute between bus-stop and slum.

5.4 Impact of Accessibility on Travel Probability Fields

Poor worker's mobility patterns depend on both accessibilities to the employment opportunity and public transport accessibility. Travel probability field for work in terms of search area increases with decrease in public transport accessibility as people. Areas where access to employment opportunity is high the search fields are low as people need not to have to travel longer distance. Also it was observed that where accessibility to employment opportunity is low but public transport accessibility is moderate to good people travel more to access better employment opportunities within acceptable travel time range. Further where both accessibility to employment opportunity and public transport accessibility are low then people either limit their search field resulting in lower income or explore higher search field resulting in higher transport cost and low savings.

6. Conclusions

This research on travel probability field was an attempt to have a better understanding of the travel behaviour of urban poor in Kolkata in order to evolve appropriate transportation planning strategies. It is concluded that travel probability

fields are a useful concept in understanding travel behaviour of households in relation to their location and the employment opportunities available. In particular, the predicted average trip length of slum dwellers using travel probability field concept almost matched with the observed trip length from household survey data. The findings from the research provides a useful insight into the relationships between travel behaviour of households and their socio-economic characteristics along with the physical attributes of area under consideration. It can be inferred that Travel Probability Fields concept can assist policy planners and decision makers to rationally plan transport services targeted towards improving mobility of slum dwellers. In order to exploit the true potential of the concept of travel probability fields there is a need to carry out more empirical studies in other cities of India to assess the relationships analysed in the present study across different geographical settings and check transferability of various parameters across space.

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Articles could be between 2000 to 4000 words. They may contain compatible tables, charts, graphs, etc. We reserve the right to edit for sense, style and space.

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ROUND & ABOUT

The Carbon Budget of the globe: Time is running out

The Fifth Assessment Report of the IPCC (2013-14) has estimated the global carbon budget- the amount of carbon dioxide that can be emitted if we are to have a likely chance of averting the most dangerous climate change impacts when global temperature will rise by 2.0 C above the pre-industrial level. The total quantum of carbon estimated by the international scientific community is of the order of 1 trillion tones of carbon (1,000PgC). By 2011 humanity has burnt 515 PgC i.e. 52% of it. Only 585 PgC (48%) is now left. At current rate of consumption, we will exceed the amount by 2045.

Mumbai gets Urban Arts Commission

In October, 2017, Shri Devendra Fadnavis, the Chief Minister of Maharashtra had announced setting up **Mumbai Urban Arts Commission** with the task of providing inputs to the government for improvements in the design and aesthetics of urban spaces and the city's skyline. Mr. Ajoy Mehta, the Municipal Commissioner had stated that "the committee members will help improve the aesthetic appeal of the public open spaces, including traffic islands and pavements." So far, only Delhi has an Urban Arts Commission set up by an Act of Parliament to advise the Government of India in the matter of preserving, developing and maintaining the aesthetic quality of urban and environmental design within Delhi and to provide advice and guidance to any local body in respect of any project of building operations or engineering operations or any development proposal which affects or is like to affect the skyline or the aesthetic quality of the surroundings or any public amenity provided therein" On 17 March, 2018, the Mumbai Municipal Corporation appointed four members on the Commission. The Commission has mainly the objective of improving the aesthetic appeal of the public open spaces, preserving architectural harmony of the areas, and will deal with the requests of art installations in the city that include paintings, murals, statues, sculptures, monuments, fountains, arches and other structures of a permanent character intended for ornament or commemoration.

Diu becomes first UT to run 100% on solar power

We have become used to reading about the pollution so often, that any news concerning amelioration of environment comes as good happening to note. The 9 March, 2018 issue of the Times of India carried news that 100% demand of electricity in the Union Territory of Diu is being met by solar energy. The Executive Engineer of Daman and Diu UT stated in a press release that Diu which was totally dependent on electricity from Gujarat has turned a surplus UT for its electricity requirement. It produces 13 MW electricity daily from solar sources, which is more than its requirement for its 56,000 residents and tourists in its flourishing hospitality industry.

Rule of law applied for non-segregation of wastes

The Solid Waste Management Rules, 2016 inter alia, makes it compulsory to segregate wet waste and dry waste at source. The Mumbai Municipal Corporation had given notices to all the bulk generators to segregate the two types of waste and to compost the wet waste in their compounds. The rules contain provision of fine for non-violation. In March, 2018, the Corporation filed 13 cases against housing societies and commercial establishments for violating the rules and not setting up wet garbage processing units on their premises. Members of the housing societies have been booked under section 53(1) of the Maharashtra Town Planning Act. They face a maximum of two years jail or Rs.5,000 fine. The Corporation also filed a police against a housing society in Juhu for converting the compost pit into car parking. It has also initiated legal proceedings against 50 societies and has given them one month's time to set up processing units before they are booked. (Times of India 4 March, 2018).

Fazalahmed B. Khan, Advisor, AILSG

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