Sustainable Development of Guwahati: Is Satellite Township a Viable Solution?

Jiban Chandra Phukan*
Professor Srinath Baruah^
Dr. Chandrama Goswami#

Abstract

Guwahati, the heart of Assam has grown at brisk pace on its journey towards urbanisation in the last 30 years. However, the social and capital infrastructure development has not kept pace with the population growth and growing economic activities. As such, per capita availability of infrastructure is far below the national benchmarks. There has been acute shortage and deficit of service delivery and infrastructure viz. water supply, solid waste management, sewerage, urban network, streetlight and storm water drainage in the city. Our primary research revealed that all was not well with the infrastructure availability in Guwahati. The water logging, non-availability of streetlights, water scarcity and lack of maintenance of roads are identified as major problems. Further, the study in one of the main commercial hubs at Fancy Bazaar revealed that lack of parking space coupled with congestion of traffic are the biggest detriments to seamless economic activity in this bustling market. One of the ways to enable sustainable development in an over grown city is to facilitate satellite townships that can relieve the load of population pressure on the main city. People's willingness to shift to new townships with enabling amenities on the outskirt of Guwahati was explored and found that over 60 percent of the households surveyed agreed to shift to a new place. Therefore, the development of satellite townships is an idea that could be an option for the sustainable development of the Guwahati city.

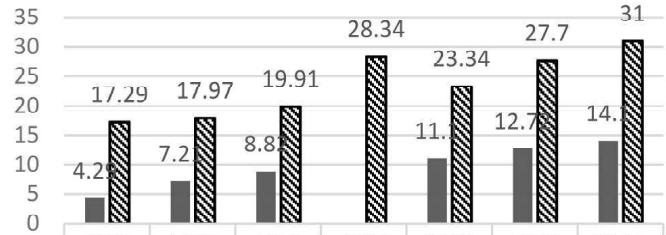
Key words: Guwahati Municipal Corporation, Government of India, High Powered Empower Committee (HPEC), Ministry of Urban Development, Solid Waste Management.

* Research Scholar, Krishna Kanta Handiqui State Open University, Guwahati, Assam.
^ Former Professor of Economics, Gauhati University, Guwahati, Assam
# Associate Professor, Krishna Kanta Handiqui State Open University, Guwahati, Assam.

1.0 Introduction

Development of resilient cities to meet the ever-growing challenges of provision of infrastructure and service delivery emanating from the increased urban population has become a global affair. India, like most of the other developing counties is also experiencing rapid growth of urban population. The number of metropolitan cities with population of 1 million and above has increased from 35 in 2001 to 50 in 2011 and projected to increase to 87 by 2031(National Institute of Urban Affairs, New Delhi). The challenge of urbanisation in India is to provide enabling infrastructure with ensured service delivery at the minimum standards. An investment of Rs. 39.2 lakh crore at 2009-10 price estimated to be required by 2031(HPEC-2011). The urban population of Assam has increased from 77,074 in 1901 to 43, 98,542 in 2011. Similarly, the urbanisation level increased from 4.29 percent in 1951 to 14.1 percent in 2011 in Assam against the national increase from 17.29 percent to 31 percent respectively.

Figure 1 Urbanisation Trend of Assam vs India



	1951	1961	1971	1981	1991	2001	2011
% of urban population in Assam	4.29	7.21	8.82		11.1	12.72	14.1
% of urban population in India	17.29	17.97	19.91	28.34	23.34	27.7	31

Source: Based on Authors' Analysis of data of Census of India.

Note: In 1981, there was no census operation in Assam.

Even though the rate of urbanisation is modest in Assam, the distribution of population is skewed towards class-I cities. As per census of India, the city with more than 1, 00,000 population is classified as Class I city; 50,000 to 99,999 as Class II town; 20,000 to 49,999 as Class III town; 10,000 to 19,999 as Class IV

town; 5,000 to 9,999 as Class V and less than 5,000 as Class VI towns. The 42 percent of total urban population of Assam is living in the four class-I cities and out of which, 57 percent is living in Guwahati. It is also found that the percentage of urban population living in Class I towns is in increasing trend whereas it shows decreasing trend in class– II, III, IV & V towns except few towns like Jorhat over the years.

1.1 Objective of Study

The objective of the study is to examine the opinion of the city dwellers regarding willingness for shifting to Satellite Townships around Guwahati.

1.2 Study Area

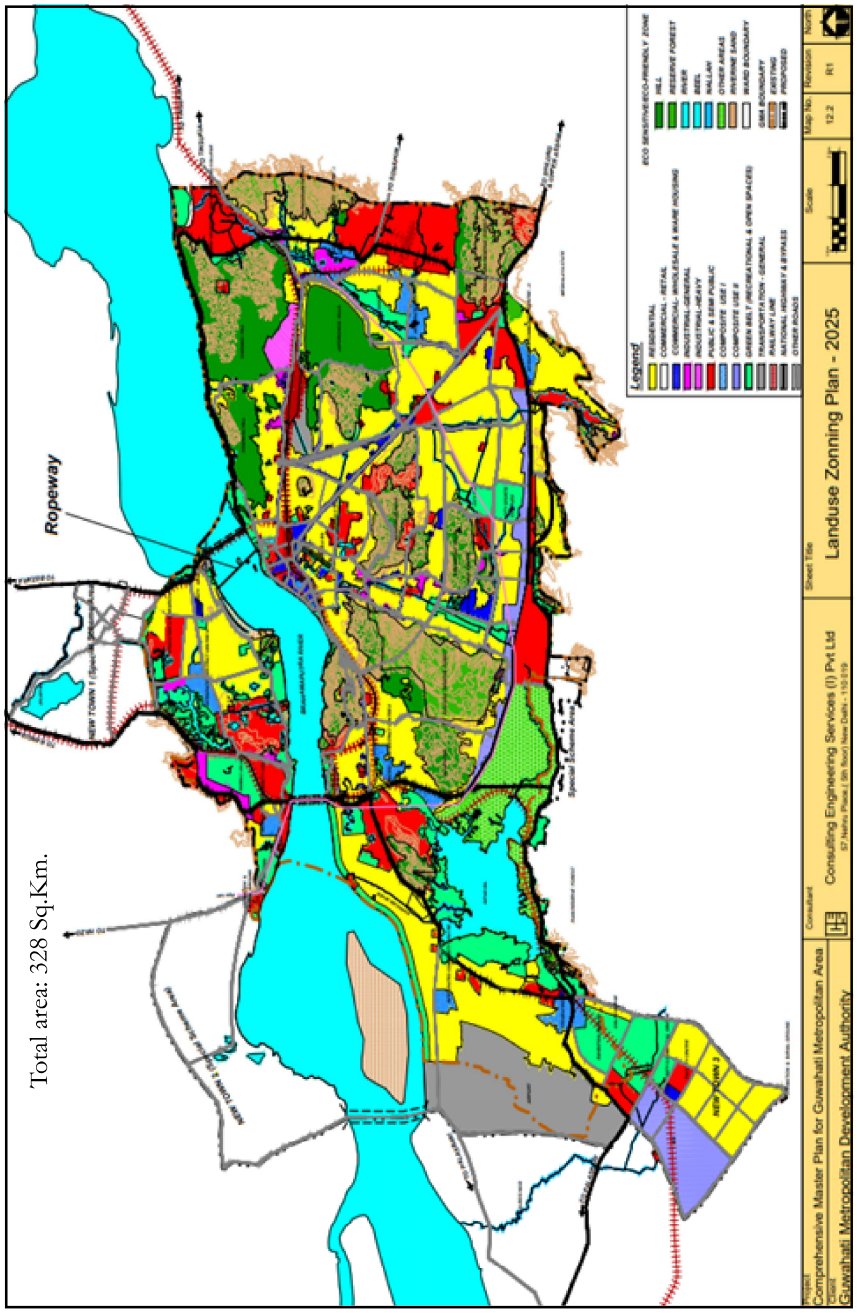
Guwahati Metropolitan Area (GMA) located in the Kamrup Metropolitan district of Assam has been taken as Study Area for the purpose of this research. GMA cover an area of 328 sq. km coinciding with the boundary of Guwahati Metropolitan Development Authority (GMDA) area. The Guwahati Municipal Corporation (GMC) area is falling within the boundary of GMA. The map of Study Area (GMDA) has been shown in Figure 2.

1.3 Methodology

The research utilises data from both primary and secondary sources to facilitate the study. Data pertaining to demographic, physical, socio-economic, urban infrastructure and land use etc. relating to the study was collected from secondary sources. The secondary data is based on census report, GMC, GMDA, ASDMA, ASTEC, various published, unpublished Government and other agencies reports. The analysis of secondary data relating to the physical features, demographic features, socio economic scenario and urban infrastructure eventually facilitates the understanding of the current scenario of these parameters. The comparison of the existing scenario with the national benchmarks gives a comparative idea about the prevailing status of the concerned parameter.

The research undertakes an attempt to study the existing conditions, functionality of the urban infrastructure facilities and feedback from city dwellers on willingness to shift to new location. Towards this end, the residential household's survey of city dwellers was conducted in Guwahati. The primary survey was carried out with the objective of getting a glimpse of the availability and perception of citizens towards current infrastructure and service delivery and preference to move out of the city for the sake of better quality of urban living. The primary

Figure 2 The Study Area Map of GMA



Source: Master Plan for GMA-2025, GMDA

data was collected through a sample household's residential survey on urban infrastructure and related issues in Guwahati city. The sample size for the primary survey estimated based on random sample survey technique and household survey was conducted using questionnaire. The findings of the analysis of secondary data was corroborated with the opinion of the stakeholders analysed from the primary survey data. The final inferences were drawn based on the findings of secondary and primary research.

2.0 Effect of Population Surge in Guwahati Metropolitan

Guwahati Metropolitan Area (GMA), which is coterminous with the boundary of Guwahati Master Plan 2025 in the Kamrup Metropolitan district of Assam, has been taken as study area. The city has well developed road, rail, and air connectivity with almost all places of the country. All cities and towns of Assam and other Northeastern states of India have direct connectivity with Guwahati and it has developed as the largest populous, commercial, industrial and educational center of the North East Region. The locational advantage along with good connectivity and availability of amenities has brought the city in eminence position and has emerged as gateway of North East Region of India. The city has grown from 13.61 sq.km in 1961 to 83.80 sq. km in 1967-68 and to 206.26 sq.km in 1990-91. Subsequently, the city area was extended to 328 sq.km under Comprehensive Master Plan-2025. The Guwahati Municipal Corporation with an area of 216 sq. km is within this Master Plan area. The major part of the city is in the southern part of the river Brahmaputra.

The population in the city (GMA) has increased from 6.59 lakh in 1991 to 10.60 lakh in 2011. At the same period, the urban decadal growth rate of Guwahati has been reduced from 36.98 percent in 1991-2001 to 20.42 percent in 2001-2011 as indicated in the table 1. Against this, the urbanisation level has been increasing and reached at 95.75 percent in 2011. It is also observed that the GMA share of total of Assam urban population remained about 25 percent.

There has been net addition of population of 2,27,515 during 1991-2001 and 1,72,066 during 2001-11 to the city. The GMA is experiencing rapid growth of economic activities with marked improvement in transportation network and other communication facilities in the past two decades. During this period, rapid

Table 1 Trend of Population Growth in the Guwahati Metropolitan Area 1991-2011.

Year	1991	2001	2011
Total Population	658713	899687	1059908
Decadal Growth Rate (percent)	51.33	36.58	17.81
Rural Population	43465	56924	45079
Urban Population	615248	842763	1014829
Urban Decadal Growth Rate (percent)		36.98	20.42
Urbanisation Level (percent)	93.40	93.67	95.75
Share to Assam Urban Population (percent)	26.48	26.16	24.15

Source: Interim Report on Delineation of New Guwahati Metropolitan Region, GMDA, February 2013 and analysis based on data of Census of India.

growth of urban centres around GMA has been observed especially in the areas situated along the transportation corridors. The analysis of phenomena of growth of urban centre around Guwahati city from the census data of 1991, 2001 and 2011 has depicted a trend of clustering of urban centres. Nineteen villages developed as urban centres in the region between Census years 2001 to 2011 along the NH 37 corridor. The development of urban centres in and around Guwahati metropolitan area in 1991, 2001 and 2011 has been given in Table 2.

A part of the reduction in the in-migration of 55,449 persons during last decade might have been absorbed in the newly emerged urban centres in the vicinity of GMA. However, in spite of this development, the pressure on urban infrastructure continues to increase as these small urban areas are devoid of basic urban services to support the additional population. The people in these urban centres are mostly depending on Guwahati for employment, services and other facilities. The visible reduction of inflow of population and abnormal increase of census towns around GMA has open new opportunity for the policy planners for distribution of excess population of GMA to nearby towns. This assumption proposed to examine details through a primary research by conducting residential household survey.

3.0 Infrastructure Gap in Serving the Population

The social and capital infrastructure development is not keeping pace with the population growth and growing economic activities in the city. Although, efforts have been made to develop infrastructure in recent years, the availability

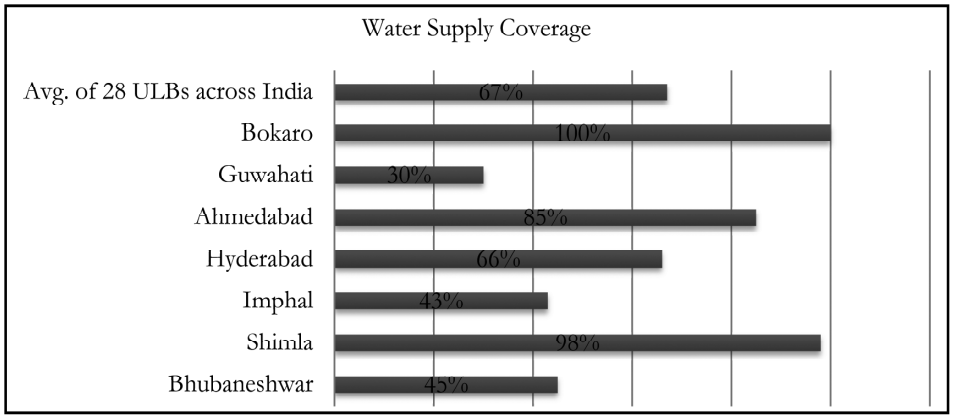
Table2 Evolution of urban centres in and around GMA 1991-2011

Name of Settlement	Status of Settlement in			Name of Settlement	Status of Settlement in		
	1991	2001	2011		1991	2001	2011
Digaru gaon	Village	Village	CT	Upar Hali	Village	Village	CT
Nakhula grant	Village	Village	CT	Koch Para	Village	CT	CT
Garal	Village	Village	CT	Palashbari	MB	MB	MB
Sanpara	Village	Village	CT	Bamun Sualkuchi	Village	CT	CT
Majarkuri	Village	Village	CT	Dharapur	Village	Village	CT
Majir	Village	Village	CT	Dahali	Village	Village	CT
Narengi	-	OG	OG	Azara	Village	Village	CT
Chandrapur	Village	CT	CT	Amin gaon	CT	Village	CT
BaghichaChangsari	Village	Village	CT	Kahikuchi	Village	Village	CT
Baruabari	Village	Village	CT	North Guwahati	TC	TC	TC
Tegheria	Village	Village	CT	Nahira	Village	Village	CT
Sonpurgaon	Village	Village	CT	Sualkuchi	CT	CT	CT
Parli part	Village	Village	CT	Niz-Hajo	CT	Village	CT
Jalah	Village	Village	CT	Jagiroad	CT	CT	CT
Sarpara	Village	Village	CT	GMC	M Corp	M Corp	M Corp

Source: Report on Delineation of New Guwahati Metropolitan Region, GMDA, February 2013; Authors' Analysis based on data of Census of India.

level per capita infrastructural facilities is not up to the mark or non-existent for some core facility like water supply, sewerage disposal, etc. (P&D Department, 2014). The shortage and deficit of services of urban infrastructure measures comparing with the availability of infrastructural services with the benchmark in the particular service. Benchmarking is an important mechanism to measure and monitor service provider performance for providing better services to the people. The Ministry of Urban Development, Government of India has brought out service level benchmarking covering water, sanitation, solid waste management and storm water drainage, which seeks to identify minimum set of standard performance parameters for the country (HPEC, 2011). The status of water supply coverage in comparison to average of 28 cities in India has been presented in Figure 3.

Figure 3 Comparison of Water Supply Coverage across similar ULBs in India



Source: GMC, Service Level Benchmarking Handbook, MoUD, HPEC-2011

On an average, 67 percent of the areas has been covered under water supply schemes in Indian cities. Against this, only 30 percent of the total area of Guwahati was covered under water supply schemes with inadequate supply of water. The national benchmark is fixed at 100 percent pipe water supply connections to the city households. The average per capita water supply in the city is 80 Litre Per Capita per Day (LPCD) against the national standard of 135 LPCD (City Development Plan, 2006). Similarly, Guwahati has the average water supply of 2 hours per day against the benchmark of 24 hours per day. The extent of metering of water connection is only 5 percent resulting into the poor recovery

of operation and maintenance cost. GMDA has initiated four water supply projects as externally aided project at a cost of Rs 2713 crores. The projects with the estimated supply of 425 MLD was to complete by 2016.

Even though work is in progress, due to various reasons as land issues none of the projects commissioned so far. The municipal solid waste management (**S**WM) in Guwahati is unorganized with indiscriminate dumping of waste and huge gap in collection and treatment of solid waste (Department, 2014). There is no organised pipe sewerage network and treatment facility available in the city for normal residents and most of the people using septic tanks, which has increased the possibility of contamination of ground water (Registrar General of Census Operations, 2011). The urban services with current gap (2016) and estimated demand in 2031 for provision of the capital urban infrastructure of the city is estimated based on the current availability and the demand for the infrastructural services as per benchmark in the respective sector is summarised in Table 3.

Further, large number of roadside storm drains are not connected to the final outfall in natural drains. The encroachment of drains, low-lying areas, beels, natural channels & hills hampers the free flow of water. As per estimated demand for the urban infrastructure viz. water supply, solid waste management, sewerage, streetlight, storm water drainage etc. there are substantial gap in provision of infrastructure to meet even the current demand in the city.

4.0 City Dwellers' Opinions

Primary data using questionnaire was collected through sample household survey at the residential area of Guwahati in May 2016. The survey undertakes an attempt to work out the existing conditions, functionality of the urban infrastructure facilities and feedback from city dwellers on willingness to shift to new location. The ward-wise distribution of the sample households in GMC has been shown in Table 4.

The sample survey is based on 196 households selected based on random sample survey method. The sample size was determined with an assumed margin of error of 5 percent and confidence level of 95 percent for a universe of 1,44,655 households in Guwahati city spreading across 31 municipal wards as per the Guwahati Municipal Corporation (GMC) data. The required sample of 196 households has been selected at random by lottery method based on the municipal

Table 3 Estimated Demand for Urban Services in the GMA - 2031[1]

Sector	Benchmark	Existing Supply (2016)	Demand as per benchmark	Current Gap (2016)	Estimated Demand in 2031	Target of Provision by 2031
Water supply	135 lpcd	70 MLD	170 MLD	100 MLD	272 MLD	135 lpcd of water supply to all urban population 24*7
Solid Waste Management	0.38 kg/ person	440 TPD	535 TPD	95 TPD	857 TPD	100 percent collection of solid waste generated
Sewerage	113 lpcd	0	142 MLD	142 MLD	228 MLD	100 percent collection &treatment of sewerage generated
Urban roads	12.25km/ sqkm	1509	3209[2]	1500	4018[3]	City with area of 262 sq.km in 2016 excluding new towns and 328 sq.km in 2031 including new towns.
Street light	Spacing 40mt/pole	16100 poles	67500	51400	100450	100 percent satisfaction of demand.
Storm Water Drainage	100 percent drains on both sides of roads	420 km	6418 km	2278 km	8036 km	100 percent drainage coverage

Source: Report of GMDA, 2013, HPEC Report-2011, GMC, PIDP, Assam and Authors' Analysis

[1] Total population of 10,59,908 for 2011 (Census figure), Projected population of 12,58,908 in 2016 and projected population of 20,18,500 for ~~2031(Interim report of GMDA, 20~~13)

[2] Area of GMA as 262.5 Sq.Km. excluding new towns.

[3] Area of GMA as 328 Sq.Km. including new towns.

Table 4 GMC Municipal ward wise sample households selected for survey

Sl. No.	GMC Ward No.	Sample HH selected		Sl. No.	GMC Ward No.	Sample HH selected
1	6	10		9	24	4
2	8	5		10	25	19
3	13	12		11	26	48
4	14	5		12	28	14
5	18	21		13	29	6
6	19	11		14	30	8
7	20	11		15	31	15
8	21	7		Total		196

Source: GMC (2005); Authors' Analysis of survey data

property tax records. After the selection, it could be seen that selected 196 households spread across 15 wards (i.e. half of the total no. of wards).

The data collected from the residential household was analysed to correlate the relationship with the findings of the survey in the locality with the overall infrastructure gap estimated from the secondary data of the city. The analysis of survey data revealed that majority of the people (63 percent) shifted to the city in search of employment followed by business (11 percent), educational purpose (10 percent). About 2 percent of the people had to shift because of their family and 11 percent for other reasons. The employment is the major pulling factor of the city. The reasons for shifting to Guwahati from their original places is summarised in Table 5.

Table 5 Reasons of Shifting to Guwahati from their Original Places of Residence

Reasons for shifting to Guwahati	Percent of Sample h/h
Business	11
Education	10
Employment	63
Family	5
Other	11
Total	100

Source: Authors' Analysis of survey data

From the study, it has been found that 76 percent of the people surveyed had their own house and 24 percent living in rented houses in Guwahati. Further, the study reveals that no regular maintenance of residential roads was undertaken. The authority does not maintain 35 percent of the residential roads. Similarly, the authority never maintains 45 percent of the residential drains. The frequency of maintenance of roads and drains has been shown in Table 6.

Table 6 Frequency of maintenance of roads and drains in Guwahati

Maintenance of Drains & Roads	Frequency of Maintenance of Roads (percent)	Frequency of Maintenance of Drains (percent)	Remarks
Regularly	0	24	Regularly: maintenance in monthly & quarterly.
Sometimes	65	31	Sometimes: maintenance in yearly basis
Never	35	45	
Total	100	100	

Source: Authors' Analysis of survey data

The analysis of the opinion collected from the residential households revealed that 67 percent of the people were dissatisfied with the existing condition of roads and its utilities and suggest for improvements, development and maintenance of the existing roads. It is found that about 80 percent of the respondents are deprived of supply of drinking water by the public authority. These people are compelled to make own arrangement for drinking water supply facilities by construction of ring wells, bore wells etc. Only 20 percent of the people surveyed are using pipe water connections from public authorities. The duration, flow force and quality of pipe water supply has been shown table 7.

It has been found that about quarter of the total beneficiaries of the pipe water supply schemes received water only for half an hour in a day. It is also evident from the survey that about 27 percent of the beneficiaries do not receive adequate flow of water. From the opinion survey for household water source, it has also been found that 63 percent of the pipe water supply consumers are not happy with the present state of affairs of the water supply. As the public authority is yet to provide the required water supply to the residents, the water supply remained to be an issue in the city over the years.

Table 7 Duration, Flow Force and Quality of Pipe Water Supply in Guwahati 2016

Pipe Water Supply Duration		Flow Force of Pipe Water		Quality of Water Supplied	
Supply Hour	percent of h/h	Force Quality	percent of h/h	Water Quality	percent of h/h
Up to 30 min	23	Good	46	Clean	83
½ to 2 hrs	27	Adequate	27	Poor Quality	13
2 to 3 hrs	50	Poor	27	Muddy Water	4
Total	100		100		100

Source: Authors' Analysis of survey data

The analysis of data revealed that only 39 percent of the total household municipal solid waste (MSW) is disposed through the GMC garbage collection mechanism. Remaining more than 60 percent of the MSW is disposed through private arrangement or by the households.

The frequency of collection of household MSW by the GMC was analysed to understand the effectiveness of the system in operation. It has been found that daily collection of garbage is happening only in 53 percent of the total households. The frequency of collection for rest of the households are irregular and taking place on weekly basis. This has been summarised in Table 8.

Table 8 Interval of Collection of Household (h/h) Garbage by GMC 2016

Interval of Collection of h/h Garbage by GMC	Frequency of Collection (percent)
Daily	53
Weekly	37
Fortnightly	7
Monthly	3
Total	100

Source: Authors' Analysis of survey data

The distance of educational institutes and mode of travel to these institutes are important indicators to understand the availability of services and preference of mode of travel. Accordingly, data on distance to primary and secondary schools from the residence, mode of transport used to travel to schools and level of satisfaction of the services were analysed from the household survey. The analysis

of data revealed that 17 percent of the residential households are located within a distance of 1 kilometre from a primary school. As per right to education act, access to a primary school is to be provided within a distance of 1 kilometre from the residence. The analysis of availability of secondary school revealed that 18 percent of the secondary school is located within 2 kilometres from residences.

Table 9 Availability of Primary and Secondary Schools near to Residence 2016.

Distance of School from Residence	Availability of Primary School (percent)	Availability of Secondary School (percent)
Within 1 kilometre	17	8
1 to 2 kilometres	64	10
2 to 5 kilometres	18	81
More than 5 kilometres	1	1
Grand Total	100	100

Source: Authors' Analysis of survey data

The analysis of household data revealed that 65 percent of the office goers' travels by private mode of transport to offices. Against this, only 27 percent of the people travel by public transport to work place. It has also been found that 41 percent of the students used to take school buses and 14 percent use public transport buses for going to schools. Again, about 40 percent of the students use private vehicle for travelling to schools. This has been summarised in Table 10.

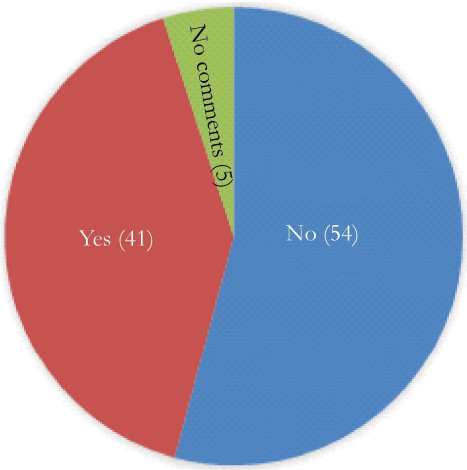
Table 10 Mode of use of Transport to Work Place and Schools in Guwahati 2016

Mode of Transport to Work place	percent use of Mode of Transport to Work Place	percent Use of Mode of Transport to Schools
Private Vehicle	65	38
Public Transport	27	14
School Bus	–	41
Auto Rickshaw	5	7
Cycle	4	
Grand Total	100	100

Source: Authors' Analysis of survey data

The opinion of households in terms of satisfaction in services and related issues on social infrastructure and amenities on availability of services in terms of distance of travel to the educational facilities, markets, banks, post offices, health facilities and work places was analysed from the data collected and shown in Figure 4.

Figure 4 Opinion of Households on Social Infrastructure and Amenities in Guwahati (in percent)



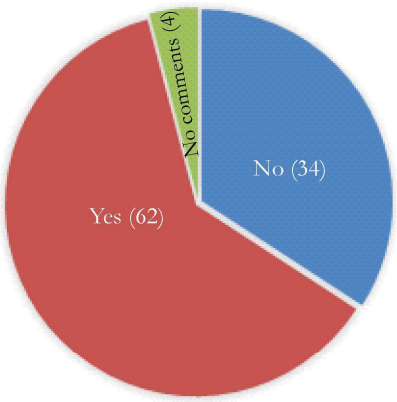
Source: Authors' Analysis of survey data

It has been found that 54 percent of the population are satisfied with the social infrastructure and amenities as highlighted above and 5 percent remained non-committal. Considering the availability of most of services at close proximity of majority of the households, the level of satisfaction on these services would expect to be on higher side. However, the expression of dissatisfaction on the services by almost half of the households indicates some other factors are playing on the ability of the residents to avail the seamless services.

As a part of the survey, the households were asked to give their opinion on the willingness to shift to a new location/towns with all required infrastructure and other services for leading a quality living. The analysis of the opinions received from the households interviewed revealed that 62 percent of the respondents are willing to shift to satellite town around Guwahati city. Out of the total samples surveyed, 34 percent expressed their desire not to relocate the residence and want to continue in the parent city as highlighted in the Figure 5.

In this respect, the analysis of secondary data on infrastructure had revealed a huge gap in provision of infrastructure facility to meet the requirement of city dwellers in Guwahati. The existing city dwellers of GMA are deprived of the basic urban amenities to lead a quality life as per benchmarks fixed for the Indian cities. The gap is huge and large investment will be required to make provision for the amenities as per minimum benchmarks. The on-going water supply, storm

Figure 5 Opinion of the Households on the Willingness to shift to Satellite Townships (in percent)



Source: Based on analysis of primary survey data 2016.

water drainage, sewerage etc. projects are nowhere to the milestone of completion. Under these conditions, the city dwellers are looking for alternative options for a quality life. Therefore, given the option, majority of people opined to shift to satellite townships around Guwahati.

The findings of the primary survey of sample residential households in Guwahati was "tested for significance" at 5 percent and the estimated value of Z score (3.46) is found to be greater than critical value of z at 5 percent level (-1.645). The estimated proportion of 0.62, that has been worked out from the primary survey of residential households is "significantly" greater than 0.50. Therefore, from the study it can now be concluded, "Study finds that most of the people are willing to shift to satellite towns, so developing satellite towns can be a viable and preferred policy option for sustainable development of Guwahati city".

5.0 Conclusion

The city dwellers of GMA are mostly deprived of the basic urban amenities required to lead a quality life as per benchmarks fixed for the Indian cities. The infrastructure available is grossly inadequate even to serve the existing population of the city. The gap is huge and large investment will be required to make provision for the amenities as per minimum benchmarks. The ongoing water supply projects are nowhere near to the milestone of completion. Under these conditions, the city dwellers are looking for alternative options for leading a quality life. As a result, given the option, majority of people opined to shift to satellite townships

around Guwahati. Therefore, developing satellite towns can be a viable and preferred policy option for sustainable development of Guwahati city. The authorities concerned have the options to further examine in this direction towards sustainable development of Guwahati in the days to come.

Abbreviations and Definitions:

Benchmark	:	Standard or point of reference against which things may be compared, Specification
Class I cities	:	Urban centre with more than 1 lakh population
CT	:	Census Town
Development	:	Evolution, growth, expansion, spread
GMC	:	Guwahati Municipal Corporation
GMDA	:	Guwahati Metropolitan Development Authority
GMA	:	Guwahati Metropolitan Area
HPEC	:	High Powered Empower Committee
Infrastructure	:	Basic physical structures and facilities e.g. roads, water supply
Lpcd	:	Litre per capita per day
MB	:	Municipal Board
M.Corp	:	Municipal Corporation
MLD	:	Million Litres per Day
MoUD	:	Ministry of Urban Development, Government of India.
MSW	:	Municipal solid waste, garbage, a waste type consisting of everyday items that are discarded by public
Per capita	:	for each person
Public Transport	:	Buses, trains and other forms of transport that are available to public, charges set fares and run on fixed routes
Satellite town	:	A smaller town(s) located near to larger city.
SWM	:	Solid Waste Management
SWD	:	Strom Water Drainage
Urban	:	Town, City, non-rural

References

Directorate of Census Operations. (2011). *Primary Census Abstract*, New Delhi: Government of India.

Federation of Indian Chambers of Commerce & Industry Urban Infrastructure Committee Report. (2011). *Urban Infrastructure in India,* New Delhi: Federation of Indian Chambers of Commerce & Industry.

Guwahati Metropolitan Development Authority. (2009). *Comprehensive Master Plan for Guwahati Metropolitan Area, 2025,* Guwahati: Government of Assam.

Guwahati Metropolitan Development Authority. (2013). *Draft Report on Delineation of New Guwahati Metropolitan Region and Review & revision of Master Plan,* Guwahati: Government of Assam.

Guwahati Municipal Corporation. (2005). *City Development Plan for Guwahati,* Guwahati.

High Powered Expert Committee Report. (2011). *Estimating the Investment Requirements for Urban Infrastructure and Services,* New Delhi: Ministry of Urban Development, Government of India.

Ministry of Urban Development. (2011). *Improving Urban Services Through Service Level Benchmarking,* New Delhi: Government of India.

Mohan, R. & Dasgupta, S. (2004). *Urban Development in India in the 21st Century: Policies for Accelerating Urban Growth,* Working paper 231, Stanford: Stanford University.

Planning and Development Department. (2014). *Perspective Infrastructure Development Plan, Assam*, Guwahati: Government of Assam.