CHAPTER – TWO
REVIEW OF LITERATURE

2.1 Introductory Statement

An increase in population in towns and cities can be defined as the process of urbanization. The process of urbanisation involves the interactive system which had prevailed through the centuries, among handicrafts, service, commerce-based towns and primary production and between the smaller cities and larger cities in hierarchy, (Dutta, 1937, 1979). Growing urbanization along with population explosion and industrialization has created an ecological and economic imbalance which has threatened the environmental resource capacity of many developing countries of the Third World. The environmental conditions of urban areas are a source of critical concern because urban populations are particularly exposed to the combined effects of air and water pollution, lack of water supply, problems of waste disposal and congestion, sanitation etc. Inspite of the economic growth in the cities, urbanisation causes inequality and poverty in the cities along with serious sustainability and environmental problems which affects the poors inadequately, (Hildebrand et.al. 2013). Similarly, there are many studies on urbanization in India, in general and North-East India, in particular. However there are very few studies on the problem of solid waste accumulation in urban centers of India. The municipal solid wastes have attracted the concentration of many environmentalists, social scientists, engineers, planners, administrators, academicians and researchers. The study of solid waste has become now very interesting field of research as the researchers can look upon solid waste from different points of view. The entire study of literature has been classified under three broad heads. 1. Urbanisation 2. Solid Waste Accumulation and Management and 3. Bio-Medical Wastes.

2.2 Review of Literature on Urbanisation

Historically, the process of urbanisation takes place as a result of structural changes in the economy (Mitra, 1997). This change is from the subsistent agricultural based production to a surplus generating economy in which a substantial segment of the working population gets engaged in non-agricultural
pursuits. Urbanisation may not truly reveal the socio-economic transformation in any region, particularly in underdeveloped countries if it tends to be unrelated to the regional economy and is not accompanied by structural changes in the economy. Although, environmental factors have been given too little importance in the thinking of urbanization in India. It is the impact of urbanization which leads to various social, economical and environmental problems like water pollution, air pollution, soil pollution, solid wastes generation in almost all the cities in the world. It is therefore, researchers, academicians, social scientists, urban planners; administrators are interested in this field as urbanization help them to prepare the master plans for individual towns and cities; to project the urban population to indicate future needs such as housing, schooling, health, transport, environmental planning, and manpower planning; to disperse industry, new towns creation, and balanced industrial development; to understand the implications of a shift from agriculture to industry in the overall process of economic growth; understanding the implications of internal migration, and in particular, rural to urban migration and comprehensive urban and regional development plans in the context of the five year plans. The review of important literature on urbanisation by different scholars at international, national and regional level are furnished as follows:

2.2.1 Review of Literature on Urbanisation at International Level

B. F. Hoselitz (1962), in his paper entitled ‘The Role of Urbanization in Economic Development: Some International Comparisons’ distinguished between Indian and European urbanisation and concluded that urban industry in India were less developed as compared to that of Europe.

Davis Kingsley (1995), in his article ‘The Origin and Growth of Urbanisation in the World’ explained that the process of urbanisation developed in the nineteenth and twentieth centuries and since 1800, the process of urbanisation accelerates rapidly in the entire world although it has not reached at its peak level. He mentioned that the rate of urbanisation in the present era, was faster in the under developed countries rather than the old industrial countries. Finally, he accomplished that the present degree of urbanisation in developed countries are
quite new till now and we are completely unaware of the profound effects of the urbanisation of the entire world which would affect the human society.

E. Brennan (1999), in her work ‘Population, Urbanization, Environment, and Security: A Summary of the Issues’ explained some features of urban growth in world population. According to her less than 30 percent of the world population were urban in 1950 but between 1995 and 2030, the urban population of the world had been projected to rise more than the double, i.e., from 2.6 billion to 5.1 billion and around three-fifths of the total population of the world would be living in urban areas. She also mentioned a possible significant redistribution of urban population of the world between the developed and developing countries.

G. Breese, (1969), explained that there were differences in urbanization. It is because urbanization has come about during the colonization periods or exploitation by foreign countries. Besides, he has mentioned that in certain countries, urbanization might also have arisen due to the flow of refugees moving towards the large cities.

N. Harris, (1990), has found that urbanization and cities plays a significant role in the process of economic development in the developing countries. Besides, he explained the economic consequence of urbanization to better understand the demographic transition to urban societies.

G. Haughton and C. Hunter, (1994), explained the role of cities for sustainable development process. They emphasized various problems like urban environmental degradation. Further, they ascertained that the cities worldwide can play significant role for the attainment of global sustainability in the development process.

David Clark (2000), in his article ‘World Urban Development: Process and Patterns at the End of the Twentieth Century’ has explained that urban development has changed the location as well as the lifestyles of the bulk of the people of the world throughout the twentieth century. He analyzed the ways in which the urban world is changing along with urbanization, urban growth etc. which give has given rise to the global economy. He has also explained that urbanization causes a shift in the distribution of rural population to urban
population. He has mentioned that each and every year more than 70 (seventy) million people are added to the towns and cities of the world than its rural areas.

Jon Stobart (2000), in his article ‘In Search of Causality: A Regional Approach to Urban Growth in Eighteenth-Century England’ has explained that fast coal-based industrial growth has given rise to the immense urban development in Britain. Although, at local level the growth stimuli experiences extensive variety, which attempts at generalization. Besides, he explained the complexity of urban growth in its real economic and geographical context.

Prabir C. Bhattacharya (2002), in his article ‘Urbanisation in Developing Countries’ explained some issues of urbanization in the developing countries. The number of very large cities is going to increase in the developing countries due to migration from rural to urban areas, and these cities would be the home of billion additional urban residents over the next 20 years. He explained the broad trends in urbanization, emergence of large cities, urban primacy, and the contribution of rural to urban migration to urban growth. Besides he analysed the role of a free entry urban traditional in migration process and also in contributing to national output.

Eric Achankeng (1995) in his article ‘Globalisation, Urbanisation and Municipal Solid Waste Management’ found that the urban Councils were responsible for total waste management process in most of the African cities. He observed that the solid waste management problems in many African cities were not because of lack of resources but also for some other factors like corruption, poor relationships between politicians and the general public, command and control approaches, dependency of the households on the central government, urbanization and population growth, the complex nature of society, education etc.

Jorge Morello et.al (2003) in their article ‘Sustainable Development and Urban Growth in Argentine Pampas Region’ explained the ecological changes caused by urban growth in peri-urban and rural areas between 1891 and 1991. They discussed the social as well as economical changes during 1991-2001. Lastly, they concluded by discussing the lack of planning over the expansion process of urban agglomeration.
H.D. Kopardekar (1986) in his book *Social Aspects of Urban Development—A Case Study of the Pattern of Urban Development in the Developing Countries*, he explained that urban growth trends from the dawn of urbanization to the end of Mogul and Maratha periods in India, indicates some factors responsible for particular urbanization patterns followed in respective periods. Clearing of jungles and establishing settlements from the pre-historic period till the establishment of several city based kingdom and growth of different types of cities was associated with various social changes taking place in respective societies. Urban growth was mostly in the hinterland and along communication routes. Cities were mostly small and well distributed.

H. Imura et. al, (2005), in their pioneer works, ‘Urban Environmental Issues and Trends in Asia—An Overview’ found a linkage among population growth, urbanization, economic development, environmental issues etc. in most of the Asian cities and most of the cities in the region facing many environmental problems like air pollution, solid waste management, water supply and sanitation etc.

D. A. Vitor, S. Ishak and G.S. Jasaw (2013), in their research article ‘Urban Households’ Willingness to Pay for Improved Solid Waste Disposal Services in Kumasi Metropolis, Ghana’, found that the households were willing to pay more if better solid wastes management services are provided to them. By using logit regression model, they identified the level of education, length of stay in that area, housing arrangement, distance to solid waste dumping sites, gender etc. as the most significant determinants of willingness to pay which influence the likelihood of willingness to pay for better and improved solid waste management.

### 2.2.2 Review of Literature on Urbanisation in India and North East

Ashish Bose (1973), in his pioneering work *India’s Urbanisation 1901-2001*, analysed the demographic aspects of urbanisation in India using census data. He analysed the trends of urbanisation in India from 1901 onwards, giving special emphasis on the two decades, 1951-61 and 1961-71 and gave projections of urban population from 1981 to 2001. He also examined the urban growth during the twentieth century and drew attention to the stagnation of small towns.
V. Nath (1986), in his article ‘Urbanisation in India: Review and Prospects’, reviewed the trends in growth of urban population during period 1951-81 and the projections of growth to the end of the century from the content of World Development Report 1984. He discussed the strategies of dispersed industrial development and urbanisation which formed the basis of official policies since the early 1960s. Besides, he discussed the issue of resources of finance and management for urban administration along with the problems of environmental pollution in the Indian cities. Lastly, he explained the problems of increasing population in the four giant cities of Bombay, Kolkata, Madras and Delhi.

Anandhavalli Mahadevan (1991) in his paper ‘Environmental Impact Assessment in Urbanisation’ explained that due to extensive migration of people to towns and cities, during the last century, the human habitat changed significantly. As a result, the urban population is going to increase day by day in all developing countries including India. Due to the formation of high density society in metropolitan areas, results in the destruction of natural environment, and creating pollution. The uncontrolled development activities in urban areas leading to the significant impacts on the social, political, economic and ecological aspects of environment in the country. He explained that urbanization has adverse effect not only on natural landscape, but on man also. The negative impact on the environmental quality in urban system includes deterioration in air quality, water quality, solid waste dumping etc. According to him sewage and solid waste output from a city of one million populations in developing nation may be around 4x10⁷ m³/yard 25x10⁶ tons/year and may pose severe problems.

S.S. Solanki (1992) in his paper ‘Environmental Hazards – A Case Study of Delhi Villages’ explained that the traditional pattern of village boundary had almost totally broken apart. This generated the twin problems of urbanization and industrialization in the Delhi villages, which in turn led to the economic and environmental imbalances in Delhi. He also explained that the villagers were not consulted in the process of urbanization. A major part of the residents of urban villages had rented out their own residential units partially or wholly to the outsiders for establishing industries. About 70 per cent residential units have been
converted for industrial purpose which includes noxious and hazardous industries also. Due to excessive pollution, the ground water became non-potable. The growing industrialization and urbanization has created another problem of migration which ultimately had led to the population pressure in these areas. As a result, the water supply, sewage and drainage systems are under chronic stress harming the people.

A.K. Ghosh (1993), in his paper ‘Urban Development and Environment’ explained that the process of urbanization in post-independent India was rapid but unplanned. Kolkata, Bombay, Delhi and Madras had shown a remarkable growth of population in every decade from 1951-1961. These congested metropolises compelled the government to set up working groups on urban development during 1978-83. These groups suggested medium-term urban development strategies and programs, area wise and sector wise, with objective of decreasing and reversing the trends in the rapid growth of metropolitan cities and large urban conglomerations in the country. He found that Delhi first formed a Development Authority in 1957 with power to purchase, develop and auction land and for a systematic and development and to provide land for urgent resettlement.

Usha P. Raghupathi (1993), in his paper entitled by ‘Urban Environmental Issues in India’ found that social waste disposal was one of the major problems in urban sector of the country. He found that in most Indian cities, the per capita waste generated is about 350 to 400 gm per day. But this average varies from 250 gm to 300 gm in smaller cities. He also mentioned that between 20 to 40 per cent of wage remains uncollected in smaller cities and almost one-fourth of waste is left uncollected in the neighborhood and on the streets in the class I cities. The collection and also the disposal of solid waste in Indian cities is a problem. Waste is disposed by dumping and sanitary landfill in Indian cities and composting is rarely undertaken in cities. Dumping of wastes are causing many insanitary conditions, unbearable odours and spreading many diseases.

A. Kundu (1994), in his article ‘Pattern of Urbanisation with special reference to Small and Medium Towns in India’, explained that till nineties, the growth rate of the class one cities was more in the developed states as compared
to that of the small and medium class cities. But in nineties the pattern changed as the less developed states like Assam, Bihar, Himachal Pradesh, Orissa etc. have also experienced faster growth rate in their class one cities than the smaller towns.

R.B. Bhagat (2011), in his article, ‘Emerging Pattern of Urbanisation in India’ explained that during 1980s and 1990s’, explained that the trend in urban population growth rate was a declining trend. But during 2001-2011, the level of urbanisation enhanced at a faster rate as compared to the earlier period. The urban population increased from 286 million in 2001 to 377 millions in 2011, with a net increase in 91 millions and this figure was also larger than the net increment of rural population which was 90.5 millions. He claimed this substantial increase in urbanisation due to net rural – urban classification and rural to urban migration.

Amitabh Kundu and B.N.Singh (2001), in their book, Handbook of Urbanization in India, comprehensively analysed urbanisation trends in India using for the first time, the 2001 census data. They looked at definitional problems in the identification of urban settlements for comparative analysis. The realistic quantification of migration, its share of urban growth in large cities, the role of small and medium towns, and growth of large urban agglomerations were also considered. Covering 17 major states in India the study took into account regional dimensions –both at the state and district level as well as urban population growth across states. Micro-level perspectives were included by bringing in district level analysis of two developed states –Maharashtra and Punjab and two relatively backward states –Rajasthan and Bihar.

K.D. Gaur, Rachita Jawa and Munish Gaur (2004), in their paper, ‘Dynamics of Urbanisation and Development: Problems and Prospects, analyzed the trend of urbanisation’, examined the extent of urban growth in India by using mainly the secondary sources of data. They analyzed various dimensions urbanisation like water, transport, housing and education. They also analyzed the various issues like living in congested areas, rural to urban migration, lack of economic opportunities, degraded environment, psycho-social problems etc. and major causes prevailing in the social and economic structure.
Ina Mehta and Jitendra Kumar Singh (2004), in their paper ‘Urbanisation Process-Problems and Prospects in India’ found that environmental factors were given too little consideration in the thoughts on urbanisation in India. They found that the water and air pollution levels were already high in many cities of India. With the increase in population in future, these environmental problems would be intolerable. Hence, both the Central as well as the State Governments should responsible to improve the urban environment in future.

O.P. Mathur (2005), in his book entitled Globalisation and Urban Development explained the effects and implications of globalisation and liberalisation on urban system of India. He found that due to liberalisation and globalisation on India’s urban system, there was a rapid economic growth but this affected the cities in many ways, mainly the growth of Foreign Direct Investment. Besides, Globalisation has not accelerated urban growth except a few economic sectors which have been impacted. The only changes were found in the built environment and spatial structure.

Pranati Datta (2006) in her article ‘Urbanisation in India’ explained the term urbanisation as an index of transformation from the traditional rural economies to modern industrial economies. She explained that urbanisation is a long term process. India is among the countries of low level of urbanisation she termed it as over urbanisation or pseudo urbanisation and was characterised by poor quality of housing, slum, water, infrastructure, quality of life etc. And it was occurring because of rural push but not due to urban pull.

N.T.K. Naik and S. Mansoor Rahman (2007), in their book, Urbanisation of India, explained that the population inundation in developing countries like India was mainly responsible for the spurt of urban population in the world. The explosive increase in population and the sprawling urban growth have far reaching social, economic, demographic, ecological and political implications in developing countries, as it brings in the strenuous burden on the weary shoulders of the developing nations to create and provide urban infrastructure, facilities and services for the surging population. He also examined the trends and urban growth in India from 1901 to 2001.
Ashis Sarkar, (2011), in his article, ‘Urbanization and City Size Distribution of West Bengal, India, 1901-2001’ has explained that the level of urbanization is very low in India, which was only 28-30 percent and this low level of urbanization places India close to the bottom among the countries of the world. In India urbanization took place at a faster rate than in the rest of the world. But he found that metropolitan cities have a far greater number of people moving out than coming in. Due to demographic explosion and rural to urban migration, India’s urbanization was haphazard. India’s urbanization is concentrated in a million plus cities, class I cities, capital cities and six mega cities –Mumbai, Kolkata, Delhi, Chennai, Bangalore and Hyderabad having a population of 60 millions, which was 21 per cent of the total urban population. Regarding urbanization in Kolkata, he found that there were only 74 census towns with a population of 2.06 million at the beginning of the 20th century. The figure increased to 396 along with a rise of urban population to 22.43 million in 2001. The larger cities were growing at a faster rate than the small and medium towns as the small and medium towns were infrastructurally poor, lack of opportunities and functionally weak.

W. Lawther (2011), in his article ‘The Urban Plan for India: A Foundation for Economic Growth’ explained that although many officials consider urbanisation as a hindrance to economic growth yet urbanisation was one of the factors of the economic growth within industrial countries. In India, urbanisation is considered as a socio-economic process that cannot be stopped. He also mentioned that the effects of urbanisation in India should be managed properly so that it can be better prepared to reap the benefits in the upcoming decades.

Ruchira Ghosh and Arun Kansal (2014), in their article, ‘Urban challenges in India and the Mission for a Sustainable Habitat’ explained that India’s urbanisation was a skewed one, which characterized by large influx creating variation in core and peripheral area of cities. They analysed that most of the cities are characterised by growth of slums, inadequate solid waste management, sewage coverage, degrading air quality etc. The main factors behind these challenges are inadequacy in regulatory framework, resource inefficiency, resistance in adopting modern technologies, weak enforcement of laws etc.
J.B. Ganguli (1995), in his paper, 'Urbanisation in the North-East Region: Trends and Policy Implications' found that in the North-East region, the size of urban population has been expanding and new towns are being developed but also that the urban population has been shifting from smaller to bigger towns. Guwahati in Assam is the largest city in the region with a population of around 5 lakh in 1991. The city experienced the decadal growth rate of 188.25 percent during 1981-91. Further, Silchar in Assam also experienced a high rate of growth of 118.73 percent followed by Aizwal with 107.19 percent during 1981-91. The remaining 5 cities experienced growth rates between 19.25 percent (Agartala), and 57.89 percent (Jorhat). Such high rates of growth of population in the cities have been putting tremendous pressure on civic services like water supply, drainage, sanitation, power supply, health services, transport services, telecommunication services, housing and educational facilities.

A. Mitra (1997), in his book, Internal Migration and Economic Development in the Hills, analysed the trends of urbanisation in Arunachal Pradesh from 1971 to 2001. He characterised the process of urbanisation in Arunachal Pradesh as an induced one. Besides, he found that instead of population conglomerating in one or two large towns, there should be an increased number of medium and small-sized towns in different districts of Arunachal Pradesh.

M.P. Bezbaruah (1995), in his article 'Post-War Urban Growth in Third World Countries: Its Lessons for India's North-Eastern Region' explained that urban growth in the third world countries was characterized by a dualistic pattern with the emergence of a low income-yielding, overcrowded informal sector and the expansion of the sophisticated modern sector which is highly capital intensive. The modern sector absorbed only a very small portion of the increase in urban population, which resulted in the alarming growth of slums and slum populations in the third world cities.

D.K. Nayak et al. (1995), found the pattern of urbanization in the North-East Region in the piquant condition. In the hilly areas with the quasi-subsistent of tribal economies were passing through the phase of an urban explosion in the
current years. But the peasant based valley areas exhibit stagnation in their urban growth.

P.H. John, (1995), explained that urbanization was a socio-economic effect which comes from the economic development and industrial growth, in which the factors of production, manufacturing units and localities become increasingly specialized. The urban administrators were responsible for the development of the area in a systematic way and which possible through human resource factors by mobilizing and organizing the resources to produce goods and services in increasing quantities.

Manish Sharma (2008), in his article ‘Urbanisation in Arunachal Pradesh : Perspective and Prospects’ explained that after attaining statehood in 1987, the degree of urbanisation was rising in Arunachal Pradesh because of expansion of administrative set up. The degree of urbanisation was found to be 21.34 percent in 2001 which increased from 3.70 percent in 1971 and this increasing degree of urbanisation changed the social, economic, political and cultural atmosphere of the state.

T.K. Bahadur (2009), in his book, *Urbanization in North-East India*, analysed the pattern of urbanization in north-easteren region of Indian during the 20th century. He conceptualized the urbanization for the entire north-eastern states highlighting various urban indicators. Besides, he explained the trends of urbanization level, degree of urbanization along with its impact on the regional economy in the form of slum dwellers, commuters and squatters in these north-eastern states.

Priyanka Koiri (2014), in her article, ‘The Growth and Velocity of Urbanisation in North-East India’ found the decadal growth rate of population has decreased in 2001-2011 as compared to 1991-2001, in North Eastern states. She also found that the exponential growth rate of population increased only in Nagaland among all of the North-Eastern states. But the degree of urbanisation increased in all the states in the entire region in 2001 as compared to 1981 and 1991.
2.3 Review of Literature on Solid waste Accumulation and Management

Solid Waste which is also known as the third pollution after air and water pollution is composed of materials which generally arise from various human activities viz., domestic, commercial, industrial, healthcare, agriculture and normally discarded as unwanted. It may include industrial refuse, broken furniture, leather, animal manure, dinner table scrap, abandoned materials, yesterday’s newspaper etc. (Hosetti B.B., 1998). Due to rapid industrialization, urbanization and increasing population the amount of solid wastes produced in urban areas has swelled considerably. Heaps of solid wastes of various kinds littered everywhere have become a common sight in the urban day to day life. These wastes are to be disposed off to keep the environment clean and healthy to live in. Thus the solid waste management includes the process of generation, storage, collection and disposal or refuse. Unscientific management of urban waste leads to serious environmental hazards. Although, the amount and nature of the solid waste vary with the activity and with the level of technological development in a country (NSWAI, 2003).

2.3.1 Review of Literature on Solid Wastes at International Level

According to Daegu Declaration for moving towards Zero Waste through IPLA (2011), it is very urgent need to create practice oriented knowledge to help local authorities in formulating innovating projects to select technologies, to access expertise, to promote waste exchange and also financing opportunities.

B.N. Lohani and C. Popprasert, (1978), in his article, ‘Sanitary Landfill: A General Review and Problem in Asia’, explained that with involvement with urban solid wastes various diseases like skin problems, breathing problems etc. arose. It was because of the application of low level technical methods in handling the sanitary landfills. It was found that workers in the developing countries of the world suffer more with this skin contact with these wastes.

Trivedy and Gurudeepraj, (1992) stated that until 1950 solid waste disposal had not posed any problem. Although during the period 1953-1955 the spread of
viral disease to hogs had attracted the attention of several sanitary engineers and farmers. Since then the feeding of garbage to hogs was banned in USA.

B.B. Hosetti (1998), explained that scientific studies of solid wastes were started and published in Chicago by the public administration department almost for the first time. The Environmental Protection Agency of USA had submitted the fourth report to the scientific congress on resources recovery and reduction in the volume of solid waste of Washington City in 1977. The economic management and quality of solid wastes were started after 1970.

T.R. Hingco, (2000), in his article ‘Waste Disposal Problems in Metro Manila and the Response of the Urban Poor’ estimated that Manila city of Philippines generated around 5440 tonnes of solid waste per day, i.e., 0.69 kg per capita per day. He also found that the leading share of waste is generated by the residential areas.

J. Khan et. al. (2009), in their article ‘An Analysis of Willingness to Pay for Better Solid Waste Management Services in Urban Areas of District Peshawar’ explained that the government in the developing countries alone cannot rectify the problems of increasing solid waste due to scarcity of resources. Hence, there was an urgent need of community participation to menace these problems. They found 49 percent of the households were willing to pay for better solid waste management in their study area Peshawar.

M. Medina (2010), in his article, ‘Solid Wastes, Poverty and the Environment in Developing Country Cities: Challenges and Opportunities’, explained that some of the cities in Asia, Africa, and Latin America were facing acute problems to their wastes management, particularly, inappropriate collection and final disposal of wastes. In many cities, particularly in Africa and Asia, less than half of the wastes are collected and most of the wastes are generated are disposed in open dumps, thrown on the road sides, or burned by the households in backyards. The inadequate collection and disposal practices generate significant pollution problems to neighbouring environment and health hazards to human.

Aggrey Niringiye and Dougason Omortor G. (2010), in their article ‘Determinants of Willingness to Pay for Solid Waste Management in Kamala City’
analysed the willingness to pay for improved solid waste management in Kampala City by employing multi-stage sampling technique and using primary data. They found that due to the improvement in standard of living, increasing urbanization and rapid development correlated with increasing population, the quantity of solid and liquid waste generated by household activities and industrial sector has increased terrifically. Their studies showed that about 45-50 per cent of 1600 tones of solid waste generated per day in Kampala City in Uganda remains uncollected. They found that respondents level education, marital status, quantity of waste generated, household size do not influence the willingness to pay for improved solid waste management negatively. But the age of the respondents significantly affect the willingness to pay. They concluded that if solid waste collection service charges are introduced, there would be little chances of success. To improve the solid waste management, the government should focus first on awareness campaign about the outcome of waste mistreatment.

M. Banga et.al (2011) in their paper ‘Households’ Willingness to Pay for Improved Solid Waste Collection Services in Kampala City, Uganda’ found that mean willingness to pay for improved solid waste collection and management was estimated to be Ushs 2439 per month, which they calculated by applying the double-bounded contingent valuation method. The main determinants behind the willingness to pay for improved solid waste management services are income, education, age, and house ownership etc.

S. Joel et.al (2012), in his article, ‘Economic Valuation of Improved Solid Waste Management in Eldoret Municipality’, explained that Eldoret town was facing severe solid waste generation and management problems because of increasing rate of population and household disposable incomes. They explained that the solid waste management problem was being tried to solve by supply side of the waste disposal and collection but they tried to solve the problems by demand oriented valuation. They used the contingent valuation technique and multiple regression models to identify the sole factors of willingness to pay for improved quality of environment and found that the residents were willing to pay kshs 363 per months for better services.
S. Ishak et al. (2013) in their study ‘Urban Households’ Willingness to Pay for Improved Solid Waste Disposal Services in Kumasi Metropolis, Ghana’ analysed that solid waste management was a major challenge in Kumasi Metropolitan Assembly. They used a multistage sampling technique to examine households’ willingness to pay for improved solid waste management services. Besides they used logistic regression model to establish the various determinants of the willingness to pay and they also used Tobit model to evaluate the factors influencing the amount of money the respondents’ were willing for better solid waste management services. The logistic model results showed that factors like income, age, number of children, quantity of wastes generated and education have significant effects on the WTP. The majority of the respondents were willing to pay around GHC 5.00 extra for better and improved solid wastes management services.

N.U.R. Khattak and S. Amin (2013), in their article, ‘Willingness to Pay for the Treatment of Environmental Hazards: A Case Study of Peshawar’ explained that the existing situation of solid waste management in the Peshawar district was very poor. By using binomial logit model they found that income, education and family size were some of the most important determinants for maximum willingness to pay for improved solid waste management. The most crucial result found by them was that majority of the respondents, around 71 percent, had given preference to private firms for better management services.

Rahul Anjum (2013), in his article ‘Willingness to Pay for Solid Wastes Management Services: A Case Study of Islamabad’ explained that solid wastes management, being a serious problem in underdeveloped countries, consumes a lion’s share of the municipal budgets. He used the logistic regression modal and the estimation shows that 65.4 percent of the total respondents are willing to pay for better solid wastes management services. The willingness to pay is affected by various factors like age of the respondents, households’ incomes, education and environmental awareness.

Muhammad Subhan et al. (2014), in their paper ‘Urban Community Willingness to Pay for Improved Solid Waste Management in Malaysian Municipality: A Choice Modeling Approach’, explained that the problem of solid
waste management was very critical issue in most of the developing countries particularly it was more severe in Asia. They studied the people’s willingness to pay for improved solid waste management services in Seremban Municipality, one of the important municipalities in Malaysia, and found that the households were willing to pay for improved quality of services for the management of solid wastes.

2.3.2 Review of Literature on Solid Wastes in India and North East

Urbanisation, changing lifestyles, industrialization and fundamental increase in consumer’s habits in India like other developing countries, have created a rapid and steady rise in the generation of municipal solid wastes. In 1998, in a brochure entitled by ‘Launching a Clean City Campaign in the states in the 50th year of Independence’ which was published by Ministry of Urban Affairs and Employment, Government of India reported that around 30 million tons of solid waste generated per year in India.

Dileep Kumar (1995), in his dissertation paper, ‘Solid Waste Disposal with Special Reference to Thiruvananthapuram City’, tried to analysed the composition as well as the sources of municipal solid waste in Thiruvananthapuram city and found that the big 40, small legal and illegal markets, the slaughter houses, 20 government and 34 private hospitals, 1,000 hotels and 164,565 houses with 1,71,432 households are the major sources of solid wastes in the city. He calculated around 264.5 tons per day (0.32 kg per day per capita) of solid wastes are produced in the city.

Toxic Links (2002, 2004), an NGO published that around 0.1 million tons of municipal solid waste were generated in India everyday i.e., 36.5 million (approx) tons annually. It was estimated that in India, generation of solid waste may rise from 40,000 metric tonnes per annum to more than 125,000 metric tonnes by 2030.

NEERI (The National Environmental Engineering Research Institute) 1995, published a strategy paper on solid waste management in India and reported that the total solid waste generated in India was 23.86 million tons per annum.

The World Bank (2000), estimated that in the developing countries 80 percent of future economic growth in different cities would lead to change in the
consumption pattern, which would boost the quantum of solid waste along with the nature of solid waste generated. It was expected that only the organic component of municipal solid waste in India would grow substantially and the non-biodegradable content would grow marginally except paper. It was projected that the organic waste may rise from 40 percent to 60 percent, plastic from 4 percent to 6 percent, metals from 1 percent to 4 percent, glass from 2 percent to 3 percent. But paper may increase from 5 percent to 15 percent. The residual wastes like ash, sand grit may decrease from 47 percent to 12 percent.

GOI (The Government of India, 1998) estimated that urban solid waste in India generally contains 20 percent of recyclable matter and the compostable material may constitute around 40-50 percent.

A.V. Shekdar (1999) found that the generation of solid waste in India could be projected to increase at a rate of 1 to 1.33 percent per annum.

A. Kansal (2002) study showed that the waste management system in India was facing the serious problem of inadequacy in infrastructure, maintenance and upgradation. The per capita waste generation in India was low as compared to many other developing countries like Pakistan (0.6 kg/day), Sri Lanka (0.7 kg/day), Indonesia (0.55 kg/day) and developed countries like USA (1.8 kg/day), Germany (0.85 kg/day), Italy (0.69 kg/day). NEERI and some other institutes have undertaken a comprehensive survey of metropolitan cities. For example, Delhi, the third most polluted city among the 41 highly polluted cities of India; alternative methods for garbage disposal have been suggested. Sanitation in India has been treated like a dirty world for decades. Municipal corporations are facing the problems of corruption and inefficiency in different parts of the country.

Jha et. al (2003) study showed that the usual municipal solid waste collection efficiency in the cities and towns of India ranges amid 70 to 90 percent in metropolitan cities and among various small and medium sized cities this percentage was below 50 percent. Adequate waste transportation capacities were far below 70 percent.

Zafar et. al (2002) study showed that the solid wastes were scattered all over Delhi, the capital city of India. Zafar revealed that during the year 2000, the
estimated quantity of solid waste was more than 7500 tons per day in Delhi. Waste collection was adequate and small percentage of total solid wastes remains uncollected.

Kirpalani et.al. (2005) study reported that Jaipur, the capital city of Rajasthan was one of the faster growing cities of India and was facing severe problem of solid waste management. The total quantity of solid waste generated in the city was 1070 tons per day. Jaipur Municipal Corporation proposed to set up plants to generate energy and compost from the city refuse. For management of biomedical waste a private farm established a common treatment facility at the disposal site.

Dhande et al (2005), reported that like other developing countries, urbanization, industrialization, change in living conditions and fundamental increase in consumer’s habits in India created a rapid and steady rise in the generation of solid wastes. In India the total urban population of 240 million generates approximately 29 million tons of refuse annually at an average rate of 0.33 kg/capita/day.

Ramachandra and Varghese (2003) study showed Bangalore, the garden city of India was facing serious problems of solid waste management, generating 3613 tons of wastes per day.

Rajvaidya and Markandey (2005) study showed 1500 to 2000 tons of solid waste generated in Hyderabad, the fifth major city of India, every day, having a population of around 4 million.

Rahul Gupta and Sumita Gupta Gangopadhya (2006) study showed that huge quantities of solid and liquid wastes generated by major urban centres should be managed and disposed properly and effectively. In various cities of the world, the recycling process of wastes had been practiced. They mentioned that East Kolkata Wetlands reused the solid waste and liquid wastes effectively as a nutrient rich medium for agriculture and aquaculture. Using of waste water for irrigation, rice production is undertaken on a limited scale.

Barai C. Daksha (2007) explained that in Bangalore city, solid wastes were managed by both formal and community based formal and informal systems. The
formal system is looked after by the Health and Engineering departments. Community based formal system was handled by Bangalore City Corporation (BCC) along with some NGOs like 'Mythri Sarna Samithi'. This system managed the garbage including collection, disposal and recycling. In the formal system of management of wastes, households, commercial and institutional establishments arranged to sell the wastes through some agents like waste pickers, migrate purchasers, retailers, wholesalers etc. However, the active participation of private organization and households were not found in the garbage management process.

Sudha Goel (2008), in her article, 'Municipal Solid Waste Management (MSWM) in India-A Critical Review', explained that solid waste management was one of the most neglected aspects in India. Underestimations of generation rates, resource requirements, lack of technical and managerial inputs etc. were some of the major problems. Besides, India being a developing country with a rapid annual growth of 9 percent to 10 percent, consumption and generation of wastes would grow similar or higher rates of growth.

S. Das, E.Birol and R.N. Bhattacharya (2008), in their pioneer work, 'Informing Efficient and Effective Solid Waste Management to Improve Local Environmental Quality and Public Health: Application of the Choice Experiment Method in West Bengal, India' estimated the willingness to pay of the households for better solid waste management services provided in Chandernagore and South Dum Dum Municipalities areas of Kolkata in West Bengal. They found that despite of having heterogeneity and tight budget constraints, majority of households showed significant willingness to pay for better solid wastes management services.

Subhash Anand (2010), in his book, *Solid Waste Management* stated solid waste management as one of the crucial issue of urban management, which involves each and every citizen in the entire process of generation of solid waste to its final disposal. He explained that solid waste management remained neglected for the last many decades. Although the bulk of solid waste was increasing day by day as a result of increase in population, urbanization, changes in life style, development activities, socio-economic activities etc., yet the related infrastructure and collection efficiency are not increasing proportionally. Besides, an enhancing
growth of urbanization has accompanied by unhealthy and unhygienic environment. Municipal solid waste management was a very complex task requiring proper organizational capacity and cooperation among various stakeholders in both the private and public sectors. Urban local bodies would be responsible for the provision of solid waste management service, although, numerous agents like municipalities, NGOs, Community, Waste Pickers, Dealers and Wholesalers were engaged in formal and informal activities of municipal solid waste management. He concluded that the growing awareness of the people and urban ecosystem would put efficient pressure on municipal activities to find out sustainable solutions to the increasing problems of solid waste management.

Zareena Begum I (2010), in her Dissemination Paper -19 entitled by ‘Solid Waste Management’ explained that urbanization, sophisticated city life, economic development etc. are the major factors responsible for increasing quantity and complexity of solid waste generated, which led to the deterioration of urban environment and stimulates the health problems. Although the cities all over the world were facing high levels of solid waste, the developing countries were suffering worse from basic services. Municipal Corporations of these countries were unable to handle the increasing waste and this led to uncollected waste on roads and other public places. She also forced that the public sector was inadequate to render effective services and regulation of the private sector was very limited. Besides, these countries characterized by illegal dumping of domestic and industrial waste. Being given low priority to solid waste management in many countries, the government provided very limited fund to the management of solid wastes. As a result the improper solid waste management was leading negative environmental impacts and health and safety problems.

Subhashini Muthukrishnan (2010), in her book, *Economics of Environment* explained that wastes generated both by the households in the form of household waste and the waste generated in production processes by industries, in the form of by-products, without reuse value. As a result of increasing population growth along with urbanization and industrialization, the volume of waste increases dramatically in modern societies. She mentioned that solid waste whether
biodegradable or non-biodegradable created many problems like air pollution, soil pollution, water pollution, health hazards to humans etc. Besides, solid waste may fill up landfill sites which become very difficult and costly to maintain.

M. J. Abraham(2013), in his article, ‘Urban Solid Waste for Construction of Railway Platform-A Story of Sustainable Waste Management’ explained how the Indian railways along with Suchitwa Mission of Kerala Government adopted an effective solution to the crisis of solid waste management in Thiruvananthapuram city. The Southern Railway constructed the 40 metre long and 6 metre wide platform of the Murukkupuzha railway station on land filled using solid waste collected from the state capital city, which is the first of its kind on the rail network in the country where the urban solid waste was used as landfill. About 600 tonnes of non biodegradable waste were used to construct the platform. Thus the use of urban solid wastes for landfill was fully safe method of waste disposal protecting ecology and environment.

C.S. Rao (1995), explained that average paper content in the refuse of Indian cities is about 2 to 3 percent as compared to around 27 percent for typical European cities. Similarly, the density of refuse in India is much higher than that of refuse generated in the cities of western countries.

Guwahati Municipal Corporation (GMC 2007), reported that Guwahati city, the gate-way of the North-East India, generated 500 metric tons of solid waste every day. But the GMC was yet to find a scientific, well equipped and proper dumping site for the disposal of these wastes. The sources of GMC revealed that corporation spends Rs. 25 to Rs. 30 lakhs monthly on scavenging the city refuse and 47 trucks rotate through the city in two trips. The corporation did not possess any device for recycling. Moreover, the corporation did not have any segregation system and dumps the household and medical wastes together.

J. Dutta (2009), in her M. Phil dissertation entitled ‘Municipal Waste management in Guwahati City’, found that solid waste management services in the city were inadequate and people of the locality were confused about the government imposed ‘Integrated Solid Waste Management Scheme’. By applying contingent valuation method (CVM), she estimated the willingness to pay for solid
waste management and found that people were willing to pay more to the private organisation rather than to Government run services.

R. Chatterjee (2010), in his article ‘Municipal Solid Waste Management in Kohima City-India’, explained that it was the level of socio-economic development which determined the amount and composition of wastes in urban places. He explained that enhancing economic development accelerates the composition of wastes. Due to the high population density in towns and rapid urbanization in the cities, the solid waste management became a mammoth challenge. He enlightened that the management of solid waste in Kohima city was associated collection of wastes, generation, transportation, storage, processing and disposal of wastes in an environment friendly comportment.

Tongam Rina (2012), in her article ‘Green Pioneers in A Garbage City’ explained that Urban Development department dumps the wastes of the capital city Itanagar near a garbage treatment plant that was under construction for the last many years, at Holongi. The department burned the garbage destroying the vegetation in the area and leaving an unmistakable welcome stench to the neighboring area and visitors. She mentioned The Green Pioneers comprising of people of different groups including students, old people, businessmen, irrespective of sex and caste and age voluntarily cleaned up many landmarks in the city without depending on the Urban Department. She called it as a wakeup call to all concerned. Inspites of these efforts, the quantity of garbage generated in the city was growing by heaps and bounds.

Mazumdhar et.al (2013), in their article, ‘Sustainable Urban Waste Management in Silchar Municipal Area: An Application of Contingent Valuation Method in Cachar District of Assam’, explained that the willingness to pay for sustainable solid wastes management in Silchar municipal area and found that there was a chance of success if proper solid waste management scheme is introduced. For this the municipal authority should make awareness campaigns regarding the goods and bads of proper solid wastes managements and also the benefit of payment for better solid wastes management.
O. Paron, S. Kumar and A. Bharti (2014), in their article, 'Home Composting: A Sustainable Approach for Municipal Solid Waste Management in Itanagar Capital Complex' explained that Itanagar capital city was facing acute garbage or solid waste problems due to the lack of serious efforts by city authorities and planners. They found that during the year 2011, the capital city of Itanagar is producing 9690.393 tonnes of solid wastes and out of them around 7885.445 tones is organic in nature. Although, there was not any proper system of segregation of organic, inorganic and recyclable wastes at household level within the entire capital complex. Due to the rapid growth of urbanisation accompanied by population growth, these problems were becoming chronic day by day.

2.4 Review of Literature on Bio-medical Wastes

Satpal Singh,(2001), in article, ‘Mismanaging Hospital Wastes’ found that there were 27 big hospitals and 55 medium sized hospitals and about 2500 nursing homes and dispensaries in his study area, Delhi. There were a total of 40,000 hospital beds including 20,000 beds under the government sector. About 60 tones of biomedical wastes were generated per day by Delhi Hospitals. The average waste generated per day was found to be 1.5 kg per bed. The mismanagement of hospital waste in the city of Delhi which are caused by delay in waste disposal, improper segregation, lack of incinerator etc., ultimately leading to severe health problems like cancer, HIV, AIDS, tuberculosis, hepatitis infection etc. Besides, segregation of hospital wastes is not done at sources. The bags for segregation are used wrongly. Some hospitals dump their waste in municipal bins and some burn in open air. Thus, mismanagement, lack of proper supervision and lack of concentration of the Biomedical Waste Rules and ignoring the Supreme Court Order 1995, have made the present hospital waste in significant position. The civic agencies like Delhi Municipal, New Delhi Municipal Committee and Delhi Cantonment Board are responsible for the collection, disposal, and treatment of solid wastes.

Monika Jain, C.S. Goshwami and Praveen Jain (2007), in their article, 'Hospital Solid Waste and its Management in a Hospital of Bhopal, India' explained that hospitals generate different types of wastes and among these solid
wastes was an important component. Around 15-20 per cent of the hospital waste was infectious and hazardous. Hospital waste includes anatomical, pathological, infectious, non-infectious, sharps, kitchen waste and general waste. They explained that hospital waste should not be stored or duped without proper treatment. All hospitals in the country should be aware and follow Biomedical waste (Management and Handling) Rules to manage these wastes produced by them. If the hospital waste can be maintained properly, we could save ourselves from further pathogenic disaster.

S.K. Mandal and J. Dutta (2009), in their paper, ‘Integrated Bio-Medical waste Management Plan for Patna City’, explained that the concept of bio-medical waste was a new issue of major concern to hospitals, nursing homes including environmental and law enforcement agencies and the general public. Bio-Medical wastes comprise of only 1 to 2 percent of the total municipal solid wastes, but sometimes it causes potential threat to environment and human health and life. Besides they found that the average bio-medical waste generated per bed per day in Patna city is about 1.3 kg and the total quantity is approximately 3.6 metric ton per day.

B. Ramesh Babu et.al (2009), in their pioneer work ‘Biomedical Waste in India and other countries: A Review’, quoted that bio-medical wastes like hazards and toxic materials must be disposed with care. Inadequate and improper segregation and also transportation process may give rise to many problems to the society. Besides, he mentioned that there should be proper surveys of bio-medical wastes management problems along with awareness to the society and other stakeholders.

Shaheen Khurshid et.al (2013), in their paper ‘A Study of Hospital Wastes at G .B. Pant Cantonment Hospital in Srinagar (Evaluation and Management)’, explained that inadequate management of hospitals wastes affects severely the public health as well as the general environment. They found that G.B. Pant Cantonment Hospital produces a total of infectious wastes around 34.20 kg per day and non –infectious waste around 128.30 kg per day. The daily average wastes produced per day is 4.835 kg. Besides, they explained that the hospital was not
following W.H.O.s recommended standards and BMW Rules in the management of its Biomedical wastes. They also explained that there was a need of transformation in the mind sets of and it is important to develop a system and culture with the help of training, education and persistent motivation of the health staff. Besides, the medical wastes should be collected and dispose separately from municipal wastes.

S. Thirumala (2013), in his research paper ‘Study of Bio-Medical Waste Generation and Management in Various Hospitals in Davangere City of Karnataka, India’, explained that Bapuji hospital, Davangere was better as compared to the other three hospitals surveyed in managing the hospital wastes and the authority was trying to meet the recent standard and norms of the bio-medical rules. Besides, they found lack of awareness, improper waste management systems in most of the health-care establishments which are the major challenges in protecting the general health and environmental hazards. He suggested that there was an urgent need of proper management including handling, storage, transport, treatment and disposal to minimize the health-risk of the stake holders.

A. Bharti et.al (2013) in their research paper ‘Quantification and Characterisation of the Bio-medical Waste in Arunachal State Hospital (AHS), Naharlagun’, cited that ASH, Naharlagun, generates about 380.805 kg of wastes per day and the average wastes per head per day generation was found to be 0.74 kg. Above all they explained that the hospital needs more attention and improvement regarding its treatment equipments and the disposal system. The quantity of liquid wastes generated by the Hospital was not recorded properly, although the total quantities were discharged in the sewer system directly.

2.5 Concluding Statement

The literature review outlined above has highlighted various aspects of urbanisation as well as management of solid waste accumulation at international, national and regional level. It was found that solid waste accumulation in urban areas is continuously a growing problem at global, national and regional level. The growth rate of urbanisation in North East India was quite high but there were only a few studies related to urbanisation and solid waste accumulation. Hence, the present study is an attempt to fill the gap in knowledge.
References


