CHAPTER –ONE
INTRODUCTION

1.1 Introductory Statement

Urbanisation is defined as an increase in the proportion of the urban population to the total population over a period of time. It is a phenomenon which is a part and parcel of economic development in general. It refers to the process of population concentration entailing an increase in population living in selected areas. It has been considered as an index of economic development. It is generally argued that urbanisation and economic development re-inforce each other. Structural changes in the economy are generally associated with urbanisation (Mitra, 1995). On the other hand, urbanisation stimulates economic changes. Some economists like Colin Clark (1940) go so far as to assert, that the acid test of development lies in the shift of population from rural to urban areas. The process of urbanization in backward stagnant societies is rather slow as the cities fail to offer employment opportunities and structural investments to the people living in the countryside. These income-earning opportunities and employments attract the rural people and are responsible for the overflow especially poor into urban areas. The sprawling growth in urban India has resulted in serious concomitants of urbanization (Mehta and Singh, 2004).

The economic history also shows that with the advancements of an economy predominance of agriculture and allied activities gradually give away to growing importance of non-agricultural activities like manufacturing and services. This is, however, not to suggest that agriculture and related sectors necessarily shrink in absolute terms in the process of economic development (Bezbaruah, 1999). On the contrary productivity and production growth of agriculture often acts to facilitate the process of development-especially in the early stages. But once the process of development is set in motion, the non-agricultural sectors start growing much faster which results in changes in the structural composition of the economy in favour of the non-agricultural sectors and against the agriculture sector (Ramachandran, 1989). As per Planning Commission (1961) “at the local level,
municipal administrations alone can undertake satisfactorily the task of providing the services needed for development in urban areas, expansion of housing and improvement in living conditions. Most municipal administrations are not strong enough to carry out these functions” (Government of India, p.693). During the 19\textsuperscript{th} and early 20\textsuperscript{th} centuries, urbanization was the aftermath of industrialization and contributed towards it, resulting the pull factor into being. That is the new job opportunities in the newly growing towns and cities motivated the mass movement of surplus population away from the rural settlements. Now a days, due to privatization, new economic policies, globalization, concentration of investments in cities attract large numbers of migrants looking for employment, thereby creating a large surplus labour force, which keeps wages low, which has become more attractive to Multinational Companies from the developed countries who produce the goods with low waged labour. Kuznets (1966) in his Nobel Prize winning work on measurement and analysis of historical growth of national income of developed countries has identified high rate structural transformation as one of the six basic characteristics of modern economic growth. “Some of the major components of his structural change include the gradual shift away from agricultural to non-agricultural activities and, more recently away from industries to services, and a corresponding shift in the spatial location and occupational status of the labour forces away from rural agricultural and related non-agricultural activities towards urban –oriented manufacturing and service pursuits’ (Tadaro, 1985, p.52). The process of urbanization states to much more than growth of population, non-agricultural employment. It also includes the economic, social and political structures of a region. In order to expand infrastructure and services to match the growth of urban population, there may be excessive pressure on different urban sectors like housing, Infrastructures, economy, environment, education, health etc. The rapid growth of cities pressurizes on the capacity to provide services such as energy, education, health care, transportation, sanitation and physical security and tends to have frequent breakdowns. Urban development is no doubt a natural outcome of economic development. But it has a number of adverse effects. For example, the rapid urbanization may lead to the rapid growth of slum settlements,
informal sectors as well as environmental problems like solid waste accumulation etc. In the present research work an attempt was made to study the extent of solid waste accumulation and its management in selected urban areas of Arunachal Pradesh.

1.2 Concept of Urban Area in India

Let us first examine what we mean by an urban area in India. A number of criteria have to be fulfilled before a place can be declared as an urban area. Certain basic amenities are to be provided in urban areas like the provision housing facilities, road, water supply, recreation centers, vehicular traffic, educational institutions, postal and banking services, residential, industrial and commercial growth. It was stated by the Superintendent of Census Operations, 1891, that for a place to “qualify for an urban area a place should first be a municipal corporation or a municipal area or under a town committee or cantonment board.” (Bhardwaj, 1974, p.7-8). On the basis of the census reports of earlier decades, Bose (1974) has indicated the extent of variation in the application of census definition of urban areas in different states. On the other hand, Premi, Gupta and Kundu (1977) have pointed out that this variation was largely due to the fact that the Superintendent of Census Operation had the discretion to determine the status of a place as a town even if it was not having local self government. They also pointed out that the 1971 census definition departs definitely from the earlier definition, i.e.1961 census. A realistic and meaningful definition of urban entity was adopted for the first time in the census of 1961 primarily to avoid the abnormalities to the earlier definition. The definition brought under its fold considerable economic characteristics in addition to the other administrative and demographic criteria. The definition adopted in 1961 was as follows:

1. A place should be either a municipal corporation, or a cantonment board, or a notified town area committee etc.
2. a) A minimum population of 5000. b) A density of at least 400 people per sq.km. c) At least 75 per cent of their male labour force in non-agricultural operations.

The urban criteria of 1971, 1981, 1991, 2001 and 2011 followed the same with minor changes of that adopted in 1961 census. Besides, the definition of urban
entities as established in 1961 in the last five decades, the Directors of Census Operations in States/Union Territories were allowed to include some places having distinct urban characteristics as urban even if such places do not satisfy strictly all the above mentioned criteria under category (2) in consultation with the concerned State Governments/ Union Territory Administration and the Census Commissioner of India. Urban areas satisfying the criterion (2) are termed as census towns and places which have come into existence by virtue of statutory notification are known as statutory towns up to 2011. All the States of North East India have both statutory and census towns. Arunachal Pradesh was the only exception to it because the State had only census towns till 2011 census. However, it may be noted that Arunachal Pradesh Municipality Act, 2007 was implemented in 2013 and it was extended to only Itanagar and Pasighat towns.

1.3 Development of Urban Centres in Arunachal Pradesh

The concept of urbanization is new in Arunachal Pradesh. It came in the map of urban centers of India only in the 1971 census, with the inclusion of its four towns (Mitra, 1997). However, the growth of urban settlements in Arunachal Pradesh appears not to be the outcome of complex interactions of internal socio-economic and demographic forces of the tribal societies of the state which is generally found elsewhere. Rather, it seems to be the direct outcome of political and administrative development of the state. If we go through the history of urbanisation of Arunachal Pradesh, we find that in the 1961 census, none of the places in Arunachal Pradesh satisfied the criteria of being declared as census town and hence the entire State was declared as rural. However, some of the districts and sub-divisional headquarters of the State were found to possess distinct urban characteristics in 1971. In consideration of their pronounced urban characteristics and the occupational pattern, it was decided that the districts and sub-divisional headquarters that recorded a population of 2,500 persons during 1961 census should be treated as towns for the purpose of 1971 census. (Barthakur, 1975) Accordingly Bomdila, Pasighat, Tezu, and Along were treated as census towns during 1971 census. Two more towns were added in the 1981 census and they were Old Itanagar, (Now Naharlagun) and New Itanagar, the temporary and permanent
capital of Arunachal Pradesh respectively. During the latest 1991 census, this number has increased from six to ten with the addition of four more census towns in the State. These are Ziro, Roing, Namsai and Khonsa. In 2001, the number of census towns rose from 10 to 17. But in 2011, the number of towns in Arunachal Pradesh jumped to 26. These are Dirang, Sagalee, Koloriang, Boleng, Yingkiong, Anini, Hawai, Miao and Longding. The level of urbanisation increased from 3.70 percent in 1971 to 20.41 percent in 2001 against the all India average of 27.78 per cent. It again rose to 22.67 percent in 2011 against 31.16 percent of all India average. Thus, in 2011 census, the number of towns in Arunachal Pradesh increased to 26 and the level of urbanisation increased from 3.70 percent in 1971 to 22.67 percent in 2011 against the all India average of 31.16 per cent.

Thus, Arunachal Pradesh had, no doubt, a late starter in urbanization process but within two decades, it had overtaken Assam, which had a long history of urbanization. The growth rate of urbanization is high (101.29 per cent) in 1991-2001 and (40.76 percent) in 2001-2011. This fairly rapid growth of urban population deserves serious attention of the development and urban planners. Besides, this fairly high growth rate of urbanization of the State has lead to various environmental problems like solid waste accumulation.

1.4 Solid Waste Accumulation and Management

Solid Waste can be defined as non liquid waste materials arising from domestic, trade, commercial, agricultural and industrial activities, and from public services. It is a combination of various heterogeneous waste materials. It is commonly known as garbage, refuse, rubbish or trash. Its main sources are residential premises, business establishments, street sweepings, hospitals etc. It is a mixture of vegetables and organic matter, inert matter like glass, metal, stones, ashes, cinders, textiles, wood, grass, etc. A waste is viewed as a discarded material, which has no consumer value to the person abandoning it. Solid Waste in urban areas, popularly known as municipal solid waste (MSW) refers to materials discarded in the urban areas which municipalities are responsible for collection, transportation and final disposal. Urban Solid Waste is defined as the material for which the primary generator or user abandoning the material within the urban area
requires no compensation upon abandonment. The Ministry of Environment and Forest, Government of India defined municipal solid wastes (MSW) as commercial and residential wastes generated in urban areas or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes (The Ministry of Environment and Forest, Government of India, 2000). Thus, the municipal solid wastes (MSW) comprises of domestic waste, commercial waste, institution waste, street sweeping, industrial/trade waste debris or construction rejects, dead animals etc. Solid waste is one of the most important sources of environmental pollution in Indian cities and towns.

1.4.1 Solid Waste Accumulation at International Level

Around 1.3 billion metric tonnes of municipal solid waste (MSW) are generated in the world at present (Kawai and Tasaki, 2016). It is anticipated that the world generation of MSW would increase to around 2.2 billion metric tonnes by 2025. But the MSW generation in Organisation for Economic Co-operation and Development (OECD) members has been decreasing (Kawai and Tasaki, 2016).

Tables 1.1 to 1.3 and Figures 1.1 to 1.3 provided a broad idea regarding the MSW generation per capita in OECD, East Asian and South Asian countries of the world.

<table>
<thead>
<tr>
<th>Table 1.1</th>
<th>Municipal Waste Generation Per Capita in Selected OECD Member Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countries</td>
<td>MSW generation per day per capita (kg)</td>
</tr>
<tr>
<td>Poland</td>
<td>0.85</td>
</tr>
<tr>
<td>Japan</td>
<td>0.90</td>
</tr>
<tr>
<td>Slovenia</td>
<td>0.98</td>
</tr>
<tr>
<td>Mexico</td>
<td>1.04</td>
</tr>
<tr>
<td>Chile</td>
<td>1.04</td>
</tr>
<tr>
<td>Spain</td>
<td>1.28</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1.34</td>
</tr>
<tr>
<td>Finland</td>
<td>1.39</td>
</tr>
<tr>
<td>Italy</td>
<td>1.42</td>
</tr>
<tr>
<td>France</td>
<td>1.45</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1.56</td>
</tr>
<tr>
<td>Germany</td>
<td>1.67</td>
</tr>
<tr>
<td>Ireland</td>
<td>1.70</td>
</tr>
<tr>
<td>Australia</td>
<td>1.75</td>
</tr>
<tr>
<td>Denmark</td>
<td>1.83</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.91</td>
</tr>
<tr>
<td>United States</td>
<td>1.99</td>
</tr>
<tr>
<td>Canada</td>
<td>2.13</td>
</tr>
</tbody>
</table>

Source: Estimated from Kawai and Tasaki, 2016, p.2.
Figure 1.1
Municipal Waste Generation Per Capita in Selected OECD Member Countries

Source: Estimated from Kawai and Tasaki, 2016, p. 2.

Table 1.1 and Figure 1.1 showed that among OECD countries Canada and Poland had the highest and the lowest per capita per day municipal solid waste generated respectively in 2015-2016.

Table 1.2
Municipal Waste Generation Per Capita in Selected Countries of East Asia

<table>
<thead>
<tr>
<th>Countries</th>
<th>MSW generation per day per capita (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mongolia</td>
<td>0.22</td>
</tr>
<tr>
<td>Myanmar</td>
<td>0.28</td>
</tr>
<tr>
<td>China</td>
<td>0.31</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.34</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.49</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.64</td>
</tr>
<tr>
<td>Malaysia</td>
<td>0.90</td>
</tr>
<tr>
<td>Singapore</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Source: Estimated from Kawai and Tasaki, 2016, p.2.
Figure 1.2
Municipal Waste Generation Per Capita in Selected Countries of East Asia

Source: Estimated from Kawai and Tasaki, 2016, p.2.

Table 1.2 and Figure 1.2 showed that among the selected countries of East Asia, Singapore had the highest per capita per day municipal waste generated. On the otherhand, Mongolia had the lowest.

Table 1.3
Municipal Waste Generation Per Capita in South Asian Countries

<table>
<thead>
<tr>
<th>Countries</th>
<th>MSW generation per day per capita(kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepal</td>
<td>0.32</td>
</tr>
<tr>
<td>India</td>
<td>0.37</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>0.41</td>
</tr>
<tr>
<td>Bhutan</td>
<td>0.53</td>
</tr>
<tr>
<td>Pakistan</td>
<td>0.65</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>0.89</td>
</tr>
<tr>
<td>Maldives</td>
<td>2.80</td>
</tr>
</tbody>
</table>

Source: Estimated from Kawai and Tasaki, 2016, p.3.
Among the South Asian countries, it was found that Maldives had the highest municipal waste generated per day per capita and Nepal had the lowest followed by India.

1.4.2 Solid Waste Accumulation in India

As it was observed that although in India per capita municipal waste generation was not very high but there was a significant increase in solid waste generation in India in the last few decades. This is largely because of rapid population growth and economic development in the country resulting in an increase in migration of population to towns and cities, changing life style and consumption pattern etc. Indian cities and towns generated, on an average, 300-400gms per capita, per day of solid wastes, translated into approximately 80,000 MT/day or 30 Million MT/ annum of urban solid wastes. Out of this, nearly 8.5 million MT/ annum came from nine major metropolitan centres alone. Only about 60-80 percent of these wastes are collected on a daily basis, and the rest was left to decay on the roads, streets and drains, etc (Singh, 2001). According to the website of TERI, the cities and towns in India had generated an estimated 6 million tons of waste products in 1947 whereas in 1997, it was about 42 million tonnes per year. Further, The Energy and Resources Institute (TERI) estimated that by 2047, waste
generation in Indian cities would be increased by five-fold to touch 260 million tonne per year, entailing that the recent solid waste generation is over 50 million tonne per year (Asnani, 2006). A study conducted by World Bank (2006) found that India’s annual generation of municipal solid waste would be somewhat lower, that is, range of 35 to 45 million tone, amounting to about 1, 00,000 to 1, 20,000 metric tonne every day. Asnani (2006) estimated the annual increase in the quantity of solid waste in India’s cities to be at the rate of 5 percent annum. But, the disposal practices at the solid waste open dumping sites are highly unsatisfactory. The poor management of solid waste has led to contamination of groundwater and surface water through leach ate and pollution of air through unregulated burning of waste. Unscientific practices in processing and disposal compound the environmental hazards by solid waste. More than 25 per cent of the municipal solid waste (MSW) was still not being collected at all and 70 per cent of the Indian cities lacked adequate capacity to transport it. The waste quantities are estimated to increase from 46 million in 2001, to 65 million in 2012 (Kumar and Gaikward, 2004).

As per the Central Pollution Control Board (2016) stated that around 141064 tonnes of solid waste is generated in India per day. Out of the total solid wastes 127531 tonnes (90 percent) were collected and only 34752 tonnes (27 percent) of wastes were treated per day. The total generation, collection, and treatment of solid wastes in some of the major Indian states was given in the Table 1.4.

Table 1.4
Generation, Collection and Treatment of Solid Wastes Per Day in Selected States of India, 2016

<table>
<thead>
<tr>
<th>Name of States</th>
<th>Generated (TPD)</th>
<th>Collected (TPD)</th>
<th>Treated (TPD)</th>
<th>Treated Wastes as Percentage of Total Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>8370(5.93)</td>
<td>8300</td>
<td>3240</td>
<td>38.71</td>
</tr>
<tr>
<td>Gujarat</td>
<td>9988(7.08)</td>
<td>9882</td>
<td>2644</td>
<td>26.47</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>22570(15.99)</td>
<td>22570</td>
<td>5927</td>
<td>26.26</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>14500(10.28)</td>
<td>14234</td>
<td>1607</td>
<td>11.09</td>
</tr>
<tr>
<td>India</td>
<td>141064</td>
<td>127531</td>
<td>34752</td>
<td>24.66</td>
</tr>
</tbody>
</table>

Note: Figures in the bracket represent the percentage of the total.
Table 1.4 shows that Maharashtra was the largest generator of solid wastes around (15.99 percent of India) followed by Tamil Nadu (10.28 percent of India) of total wastes generated. However, it was found that only 24.66 percent of wastes in India were treated. The figure was much less than in selected industrial states of India except Delhi. With this background an attempt was also made to examine the quantity of solid wastes generated, collected and treated per day in North Eastern states which was furnished in Table 1.5.

<table>
<thead>
<tr>
<th>Name of States</th>
<th>Generate d (TPD)</th>
<th>Collected (TPD)</th>
<th>Treated (TPD)</th>
<th>Percentage Contribution of Total Generated</th>
<th>Percentage of Collection of Total waste Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arunachal Pradesh</td>
<td>116</td>
<td>70.5</td>
<td>0</td>
<td>4.62</td>
<td>60.78(5)</td>
</tr>
<tr>
<td>Assam</td>
<td>650</td>
<td>350</td>
<td>0</td>
<td>25.90</td>
<td>53.85(7)</td>
</tr>
<tr>
<td>Manipur</td>
<td>176</td>
<td>125</td>
<td>0</td>
<td>7.01</td>
<td>71.02(4)</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>208</td>
<td>175</td>
<td>55</td>
<td>8.29</td>
<td>84.13(3)</td>
</tr>
<tr>
<td>Mizoram</td>
<td>552</td>
<td>276</td>
<td>0</td>
<td>21.99</td>
<td>50.00(8)</td>
</tr>
<tr>
<td>Nagaland</td>
<td>344</td>
<td>193</td>
<td>0</td>
<td>13.71</td>
<td>56.10(6)</td>
</tr>
<tr>
<td>Sikkim</td>
<td>49</td>
<td>49</td>
<td>0.3</td>
<td>1.95</td>
<td>100.00(1)</td>
</tr>
<tr>
<td>Tripura</td>
<td>415</td>
<td>368</td>
<td>250</td>
<td>16.53</td>
<td>88.67(2)</td>
</tr>
<tr>
<td>Total</td>
<td>2510</td>
<td>1606.5 (64.00)</td>
<td>305.3 (12.16)</td>
<td>100.00</td>
<td>64.00</td>
</tr>
</tbody>
</table>

Note: Figures in the brackets represent the rank of the states regarding collection.
Source: Annual Report 2014-2015, Central Pollution Control Board (CPCB), 2016.

Table 1.5 shows that Assam which has the highest number of towns contributed the largest solid waste generated (25.90 percent) among the states of North East India. It was surprising to observe that a small state (in terms of population) like Mizoram was the second highest generator of solid wastes. This may be due to the fact that in Mizoram more than fifty percent of the state populations live in urban areas. On the other hand Sikkim was the least generator of solid waste and at the same time it was the only state where 100 percent collection of solid wastes was done. That is why Gangtok, the capital of Sikkim is the only town in North East India which came one of the top cleanest cities of India (Swachh Sarvekshan, 2016). Our study area i.e., Arunachal Pradesh which has the
lowest density of population produced 116 tonnes per day of solid wastes but only 60 percent was collected. It may be noted that Itanagar has earned the infamous distinction of being the third dirtiest city in India (Swachh Sarvekshan, 2016).

The disposal of urban waste product was generally done by the Directorate of Urban and Housing Department, Government of Arunachal Pradesh in the absence of a Municipal body till 2013. It may be noted that the towns of Arunachal Pradesh did not have any municipal body till 2013. However, the Municipality came into operation in Itanagar and Pasighat in 2013 (under the Itanagar Municipality Act 2007). Hence, in the present study an attempt was made for an in-depth analysis regarding the urban development of the State as well as the extent of solid waste accumulation and the households’ willingness to pay for an improved solid waste management in selected towns of Arunachal Pradesh i.e., Itanagar and Naharlagun.

1.5 Objectives of the Study

The broad objectives of the present study are as follows:

1. To study the nature and growth of urban centers of Arunachal Pradesh.

2. To analyse the trends of urbanisation across the districts of Arunachal Pradesh and to determine the significant variables of inter district variation in urbanization.

3. To examine the extent of solid waste generation and its management system in two selected urban centers of Arunachal Pradesh, i.e. Itanagar and Naharlagun towns.

4. To estimate the maximum willingness to pay (WTP) among the surveyed households of Itanagar and Naharlagun towns for an improved solid waste management system.

5. To identify the socio-economic variables determining the maximum willingness to pay (WTP) for an improved solid waste management system.

6. To explore the extent of accumulation and management of biomedical wastes in the surveyed hospitals.
1.6 Research Questions

As the study is exploratory in nature, the following research questions were framed in lieu of hypothesis:

1. What has been the trend and pattern of urbanisation in Arunachal Pradesh?
2. What are the significant variable(s) determining the inter district variation of urbanisation?
3. What is the magnitude and composition of solid waste accumulation among the surveyed households in selected towns?
4. What is the status of solid waste management system in selected towns?
5. Are the households willing to pay for an improved solid waste management?
6. What are the socio-economic variables determining the willingness to pay for an improved solid waste management among the surveyed households?
7. How the biomedical waste is managed in surveyed hospitals?

1.7 Data Base and Methodology of the Study

The study was empirical in nature based on primary data. In fact the study used both primary and secondary data. For collection of primary data, the study used stratified sampling technique. The different stages are as follows:

Firstly, Itanagar Municipality Corporation (IMC) was the universe of the study which included both Itanagar and Naharlagun towns. It has 30 municipality wards by covering 18 wards for Itanagar and the rest 12 wards for Naharlagun town.

Secondly, IMC was divided into three different zones in order to cover different groups of people. These were I) Residential dominated area, II) Commercial dominated area and III) Mixed Residential and Commercial area. Further, the stratified zones were divided into three groups like i) Households in Government quarters ii) Households in private accommodation and iii) Households in labour colony/katcha houses.

Finally, the households were selected by using random sampling technique. Attempts were made to include at least twenty five to thirty households from each selected ward. The details were given in following Chart 1.1.
Chart 1.1
Design of Sample Survey

Note: Figures in bracket indicate the number of sampled wards and number of sampled households.

The total sample size was 414 households which consisted of around 2 percent households of Itanagar and Naharlagun towns as per 2011 census. In order to conduct survey, a questionnaire was prepared. The questionnaire so prepared was
divided into three major sections and all together 39 questions which are as follows:

a) The first section was dealt with the socio-economic profile of the households.

b) The second section dealt with the environmental attitudes and perception.

c) The third section provided the existing situation regarding waste facing by the respondents followed by willingness to pay for the improved environmental services.

The door to door sample household survey was carried out for the collection of primary data. In order to gather proper information, first the market for the product was introduced in front of the households along with a brief idea on the present situation of solid waste management and problems so that if any household was not very familiar to the solid waste management procedures, they might have an idea and inspiration about the reality and the fact. With the discussion and conversation, their responses were recorded in the required columns of the designed questionnaire. In addition to household questionnaire, a separate schedule regarding biomedical waste was prepared and canvassed among the four surveyed hospitals.

The study also took the help of secondary sources of data collected from various published and unpublished sources like the Census of India Publications, Basic Statistics of North Eastern Region published by North Eastern Council, and other published and unpublished data available with Census Authorities, the Directorate of Economics and Statistics, and the Directorate of Urban Development, Human Development Report, State Development Report of Arunachal Pradesh, Itanagar Municipal Corporation (IMC), Arunachal Pradesh State Pollution Control Board, Websites of Central Pollution Control Board(CPCB) etc.

1.8 Conceptual Frame Work

To fulfill the main objectives of this study, the Contingent Valuation Method was used. The Contingent Valuation Method (CVM) employs survey techniques to
ask people about the value they would place on hypothetical changes in some environmental recourses or non-market commodities. In this study the environmental good was solid waste. A contingent valuation (CV) method typically consists of three parts (Carson and Mitchell 1989). A CV method describes in detail the goods or services being valued and the hypothetical circumstances under which they are made available to the respondents. Here the respondents were informed about the dimension to which the solid waste management problem grew over the years and to what extent it was spread its adverse effects in the city. The respondents were informed about the Government run Solid Waste Management and the role of private service providers. Secondly, the method entails valuation questions which reflect the respondents’ willingness to pay for the good or the service being valued. These questions were asked on the presumption that without the respondents’ payment, the good or the service would not be provided. The method was thus aimed at eliciting their WTP in the form of currency. The questions can be reduced to a single question measuring maximum willingness to pay. It could also be used as a bidding game technique wherein a series of offers were made to respondents in an attempt to detect the maximum willingness to pay for the service. This means that if respondent says ‘yes’ to the initial bid, it indicates his/her WTP greater or equal to that amount.

If he/she answers ‘no’, then that sum of money was taken as an upper bound on true WTP. Depending on the design of the contingent valuation market, the final bid was the Hicksian compensation or equivalent surplus for the item being valued (Bayle and Bishop, 1998). Thirdly, the valuation method contains questions about the respondents’ characteristics, their preferences relevant to the service being valued and their use of good and service.

Many economists and survey researchers are doubtful about the validity of CV method. But validity of the technique has already been answered through the empirical findings of several research studies. A successful CV study must deal with six vital questions.

1. What will be the sample of people whose values for the solid waste services will be estimated?
2. How will the item to be valued be defined?
3. What payment vehicle will be used?
4. What are the real preferences/problems of the beneficiaries?
5. How will the CV question be posed?
6. What supplemental data will be gathered?

The present study cared of all the questions as mentioned above.

1.8.1 Contingent Valuation Formats

The prime objective of the CV researcher is to recognize the households’ maximum willingness to pay for a particular service improvement. There are four basic elicitation techniques to ask contingent valuation questions. They are as follows:

1. Bidding game technique
2. Open ended question
3. Dichotomous choice format
4. Payment card format

1.8.1.1 Bidding Game Technique

The first step, in the bidding game technique is to ask a respondent if he/she would be willing to pay a specified amount of money, which is known as the starting point. If the response is found positive, the amount is increased to higher level successively until a maximum willingness to pay bid is reached, called ‘bottom-up’ approach. Similarly, the amount is decreased for a negative response, until and unless a positive response is found and it is known as ‘top down approach’.

In the present study, as a specified amount was prescribed for better solid waste management, the bottom up approach was applied. The willingness to pay of the respondents was obtained by Double Bounded Dichotomous Choice (DBDC) technique.

Initially, an amount of Rs.50 was given to the respondents asking whether they were ready to pay the amount or not. If they replied negatively, then they were again asked whether ready to pay Rs.30 or not and then Rs.10 or not. If the
response was negative again, it was thought their WTP as 0 (zero) and it would not be possible for the any organisation to run the solid waste management service at price 0. But if the response was affirmative, the bid value increased to Rs.70 and gradually higher amount.

1.8.1.2 Open Ended Question

It is the best way to obtain the willingness to pay for a service. Here, the respondents are asked how much maximum amount of money i.e., the maximum willingness to pay for service they are ready to pay. However, the method has the strategic bias. If the respondents believe that bids would be collected soon, they may understate their WTP since the environmental goods are typically non-excludable in consumption. On the other hand, if the respondents believe that the bids are purely hypothetical, they may overstate WTP for an environmental benefit. However, the present study has tried to take care of the limitations of the method.

1.9 Analytical Framework

The present study was based on the following econometric models.

1.9.1 Model Specification for Dichotomous Choice Question

A Logit Regression Model was applied for the dichotomous choice questions to predict the probability of rejecting the offer as a function of the offer amount and other explanatory variables. By reviewing various literature of solid waste management, it was found that willingness to pay of the respondents for better solid waste management mainly depends on the factors like education of the respondents, family size, income of the household, age of the respondents, gender, civil status, years of living in a particular place, number of the income earners in the family, marital status, knowledge of the respondents about the ill effects of waste on environment etc. These factors are the primary determinants of the willingness to pay.

Hence, a WTP function for solid waste management services in the present study was formulated as follows:
WTPi = f (Yi, EDi, Fi, Li, Ai, EAi)

Where,

WTPi = Willingness to Pay for an Improved System of Solid Waste Management. (Households willing to pay are given a score of 1; others are given zero in binary model)

Yi = Income of the household

EDi = Level of educational attainment (years)

Fi = Family size

Li = Years of living in the place

Ai = Age of the respondent

E Ai = Environmental Awareness

1.9.2 Model for Open Ended CVM

As in the questionnaire an open ended question was included, the response was a continuous variable, therefore an ordinary least square (OLS) technique was used, which was given as follows:

\[ WTPi = \beta_0 + \beta_1 Yi + \beta_2 EDi + \beta_3 Fi + \beta_4 Li + \beta_5 Ai + \beta_6 E Ai + \varepsilon_i \]

Where,

WTPi= Maximum Willingness to Pay for Improved Solid Waste Management System

\( \beta_0 \) = Constant term

\( \beta_i \) = Parameters

Yi = Income of the household

EDi = Level of educational attainment (years)

Fi = Family size

Li = Years of living in the place

Ai = Age of the respondent

E Ai = Environmental Awareness

\( \varepsilon_i \) = Error term

1.10 Organisation of Chapters

The present study was organized into six successive chapters which are follows:-
Chapter-One: The first chapter consisted of introduction, background of the study followed by the objectives of the study, research questions, methodology of study, conceptual frame work etc.

Chapter-Two: The second chapter elaborately reviewed the available literatures relating to the urban development and problems of solid waste accumulation in towns and cities. For convenience, it was divided into three subsections. The first section dealt with the pioneer studies of urbanisation at international, national and regional level. The second section concentrated on the solid waste accumulation and management at international level, in India and North East India including the local level. Finally, the fourth section highlighted the studies on bio-medical wastes.

Chapter-Three: In the third chapter an attempt was made to examine trends, patterns and growth of urbanisation in India, North-East India and Arunachal Pradesh from 1971-2011.

Chapter-Four: In fourth chapter an attempt was made to provide a brief profile of the study area and socio-economic characteristics of surveyed households.

Chapter-Five: The fifth chapter dealt with the household’s maximum willingness to pay for an improved solid waste management in Itanagar and Naharlagun towns of Arunachal Pradesh. It also dealt with the analysis of various socio-economic factors determining household’s maximum willingness to pay (WTP).

Chapter-Six: The sixth chapter discussed the present status and management of biomedical wastes in the surveyed hospitals.

Chapter-Seven: Finally, the seventh chapter consisted of conclusions and policy implications of the study.
References


Clark, Colin (1940): The Conditions of Economic Progress, St. Martin’s Street, London.

Government of India (1966): Indian Planning Commission, Third Five Year Plan, New Delhi, pp.693


