

# SOLID WASTE MANAGEMENT IN THIRUVANANTHAPURAM CITY : A CASE STUDY

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*Dissertation submitted in partial fulfilment of the requirements  
for the award of the degree of  
Master of Public Health*

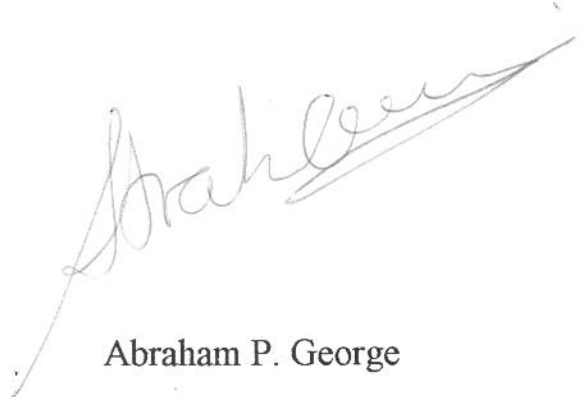


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May 2000

## DECLARATION

I hereby certify that the work embodied in this dissertation entitled 'Solid Waste Management in Thiruvananthapuram City: A case study ' is the result of original research and has not been submitted for any degree in any other University or Institution.



Thiruvananthapuram  
May, 2000

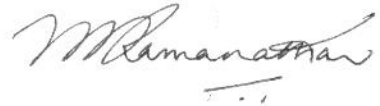
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## CERTIFICATE

Certified that this dissertation entitled 'Solid Waste Management in Thiruvananthapuram City: a case study ' is a record of bonafide original research work undertaken by Dr. Abraham P. George in partial fulfilment of the requirements for the Degree of Master of Public Health, under our guidance and supervision.

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**Dr. Abraham P. George,**  
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# CONTENTS

	PAGES
CHAPTER 1: INTRODUCTION	
1.1 Background	1
1.2 The problem in India	1
1.3 Solid waste and solid waste management	2
1.4 Urban Solid Waste Management in India	3
1.5 USWM in Thiruvananthapuram City, Kerala	5
1.6 Need for study	6
1.7 Objectives	7
CHAPTER 2: REVIEW OF LITERATURE	
2.1 International perspective	10
2.2 National perspective	15
2.3 Regional perspective	17
2.4 Local perspective	18
CHAPTER 3: METHODOLOGY	
3.1 Focus of study	21
3.2 Study design	21
3.3 Brief description of study area	21
3.4 Data collection techniques	22
3.5 Study sample	23
3.6 Plan for data collection	24
3.7 Plan for data processing and analysis	24
3.8 Problems with data collection	25
3.9 Limitations of the study	25

CHAPTER 4: PROCESS OF MUNICIPAL WASTE MANAGEMENT IN THIRUVANANTHAPURAM CITY	
4.1	Development of urban local self governments in India 27
4.2	List of important milestones related to water and sanitation. 29
4.3	Structure of local governance in Kerala State 29
4.4	Legislation and legal mechanism 30
4.5	People's plan campaign and its relevance 30
4.6	Management within the Corporation 32
4.7	Process of Management 36
4.8	Problems of waste management 40
4.9	Discussion 51
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS 55	
REFERENCES 59	
APPENDIX I	QUESTIONNAIRE I
APPENDIX II	TECHNOLOGY OPTIONS FOR GARBAGE DISPOSAL III
APPENDIX III	AMOUNT OF WASTE GENERATED IN DIFFERENT DISTRICTS IN KERALA STATE IV
APPENDIX IV	ANALYSIS OF STAFFING AND LOGISTICS OF THE HEALTH CIRCLES OF THE CORPORATION V
APPENDIX V	ECONOMIC ANALYSIS OF CORPORATION BUDGET FOR THE YEAR 1999-2000 VIII
APPENDIX VI	DEVELOPMENT OF THIRUVANANTHAPURAM MUNICIPALITY AND CORPORATION XIII
APPENDIX VII	MAPS OF KERALA STATE, THIRUVANANTHAPURAM DISTRICT, CITY AND WARDS XIV

## LIST OF TABLES AND FIGURES

PAGE

<b>TABLE 1: PERCENTAGE OF TOTAL POPULATION IN URBAN AREAS BY SIZE OF TOWNS (ALL INDIA, EXCEPT ASSAM AND J&amp;K STATES)</b>	<b>8</b>
<b>TABLE 2: TOTAL PLAN OUTLAY VIS-A-VIS PLAN OUTLAY UNDER OVERALL WATER SUPPLY AND SANITATION SECTORS AS WELL AS FOR URBAN AREAS. (RS IN CRORES)</b>	<b>9</b>
<b>TABLE 3: SURVEY ON ENVIRONMENTAL ISSUES OF CONCERN</b>	<b>13</b>
<b>TABLE 4: LIST OF HEALTH CIRCLES IN THIRUVANANTHAPURAM</b>	<b>22</b>
<b>TABLE 5: RELEVANT LEGISLATURE PERTAINING TO SWM</b>	<b>31</b>
<b>TABLE 6: ANNUAL GRANT-IN-AID CONTRIBUTIONS THROUGH PEOPLE'S PLAN CAMPAIGN</b>	<b>31</b>
<b>FIGURE 1: COMPARISON OF URBAN POPULATION WITH TOTAL QUANTITY OF WASTE GENERATED</b>	<b>2</b>
<b>FIGURE 2: PRIORITY LADDER FOR WASTE MANAGEMENT</b>	<b>11</b>
<b>FIGURE 3: MUNICIPAL SOLID WASTE GENERATED IN EUROPEAN COUNTRIES IN 1990</b>	<b>14</b>
<b>FIGURE 4: DIAGRAM SHOWING HIERARCHY OF COMMAND WITHIN THIRUVANANTHAPURAM CORPORATION</b>	<b>26</b>
<b>FIGURE 5: STRUCTURE OF LOCAL GOVERNANCE IN KERALA STATE</b>	<b>30</b>
<b>FIGURE 6: DIAGRAM REPRESENTATING THE NUMBER AND TYPE OF VEHICLES AVAILABLE IN CORPORATION GARAGE</b>	<b>39</b>

## ABSTRACT

**OBJECTIVE:** To study the various facets of Urban Solid Waste Management (USWM) as well as the factors influencing it. USWM is one of the most important obligatory but neglected functions of the Urban Local Bodies in India. A significant proportion municipal solid waste generated in Thiruvananthapuram is neither collected nor disposed off properly.

**DESIGN:** Explorative, descriptive study using the following anthropological approaches: indepth interviews, focus group discussions and non-participant observations.

**SETTING:** Thiruvananthapuram city, Kerala.

**PARTICIPANTS:** 8 city residents, 5 waste material traders, 42 municipal staff at different levels and 5 leading experts were asked about relevant experiences and opinions using anthropological methods like in-depth interviews, focus group discussions and non-participant observations.

**INTERVENTIONS:** Nil

**MAIN OUTCOME MEASURE:** The problems of USWM identified by the above methods.

**RESULTS:** The main problems are increasing quantity of waste generated, the absence of a proper waste processing plant and acute shortage of land, inadequate and vague legislation on solid waste disposal, budget constraints, shortage of staff and functioning waste disposal equipment and vehicles, inadequate work supervision, poor health status and work attitudes of municipal workers, and lack of community participation by residents.

**CONCLUSION:** Apart from the established need to set up a processing plant and the acquisition for more land for waste disposal, the other issues, like community involvement in segregating and reducing solid waste generated 'at source' also need to be addressed.

# 1. INTRODUCTION

## 1.1 BACKGROUND

The control of communicable diseases and the reduction of health risks from environmental pollution and its hazards form the major components of both primary environmental care and primary health care, signifying the synergistic relationship between the two. This strong relationship has been an issue for discussion at international forums such as the Earth summit in Rio, Brazil in 1992 (Planning Commission, 1995).

However, due to a series of fiscal as well as other reasons, many developing countries have not been able to invest in basic health promoting factors like provision for safe water, sanitation and housing. These were the very factors that fueled the public health revolution in many of the developed countries in the post industrial revolution period. Ignoring these aspects of public health in the developing countries has resulted in overcrowding, poor hygiene conditions caused by lack of infrastructural facilities and sanitation and a deterioration of living conditions especially in urban areas.

## 1.2 THE PROBLEM IN INDIA

India's population expanded from 342 million in 1947, to 846 million in 1991 (see Table 1). Of this, 220 million people (or approximately about one quarter of India's population) lived in 4000 urban agglomerations. Close to two thirds of this population was concentrated around 300 Class I (having a population of more than 100,000 people) towns or cities, resulting in very high population densities. Such overcrowding without a concurrent increase in infrastructure would put pressure on existing facilities. This has led to the degeneration of urban services like collection of household and trade wastes, environmental sanitation and hygiene.

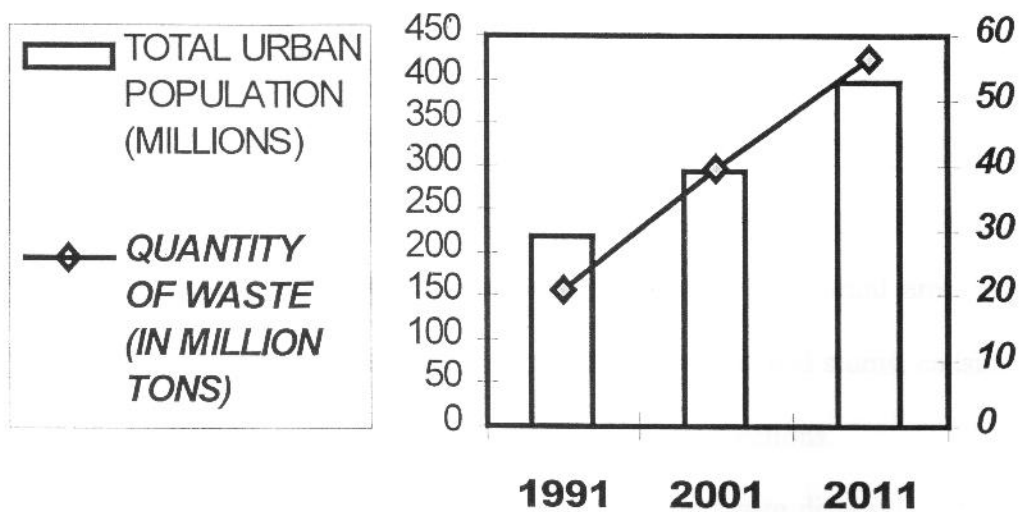
An estimated 30 million tonnes of solid waste are generated every year in India. Statistics show that while urban population in 2011 may be twice that of 1991, the quantity of waste generated may triple (see Figure 1). To maintain urban ecology and provide for the well being of urban dwellers it becomes extremely important to evolve programmes for solid waste management.

The pollution of the land surfaces, which has been called by some, the “third pollution”, consists mainly of that which is termed **solid waste** ( Joseph, 1999).

### 1.3 SOLID WASTE AND SOLID WASTE MANAGEMENT

SOLID WASTE is defined as unwanted or discarded materials that arise from human activity and are not free-flowing (WHO Expert Committee 1971). Solid wastes can be biodegradable

**Figure 1: COMPARISON OF URBAN POPULATION WITH TOTAL QUANTITY OF WASTE GENERATED.**



or non-biodegradable in nature. Waste collected from cities will be different from that of rural areas and that collected in summer season will be different from rainy season.

Urban

solid wastes broadly consist of municipal, hospital and industrial wastes in any composition. Of this, municipal solid wastes are mainly of domestic and commercial nature. This is distinct from hospital and industrial waste, which is usually disposed off by private means using specialised methods.

SOLID WASTE MANAGEMENT is defined as the process associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is agreeable to public attitudes, environmentally compatible and should adopt principles of economy, aesthetics, energy and conservation. This includes all administrative, financial, legal, planning and engineering functions (Ahmed and Jamwal, 2000).

A brief description of the options for disposal are listed in the Appendix II.

#### 1.4 URBAN MUNICIPAL SOLID WASTE MANAGEMENT (SWM) IN INDIA

Urban Solid Waste Management is one of the most important obligatory but neglected functions of Urban Local Bodies (ULBs) (which consists of a total of 73 municipal corporations and 1770 municipalities in India). It is estimated that less than half of the solid waste generated in most towns and cities is actually collected and transported regularly. Even then, the collected waste is just dumped openly and indiscriminately in vacant plots of land, sometimes adjacent to residential areas. As a result, poor sanitary conditions prevail, especially in densely populated slums, causing an increase in morbidity especially due to microbial and parasitic infections.

There are several reasons for the lack of effective solid waste disposal systems in urban India. The first of those is poor inter-sector co-ordination. A health officer from the medical discipline is usually in charge of waste management whereas the vehicles and staff required for transportation of waste would be under the jurisdiction of the engineer.

Should these groups not co-operate, proper disposal of solid waste becomes difficult (Ahmed and Jamwal, 2000).

The second problem is of accountability. Out of 46000 urban SWM workers in the Municipal Corporation of Delhi (MCD) only 33,000 are actually available (Ahmed and Jamwal, 2000). Absenteeism is quite high and includes about a quarter of the employees. There is a case for accountability because after these employees draw a salary and are expected to perform their duties from which they absent themselves (Ahmed and Jamwal, 2000).

Other problems are those of supervision, monitoring and lack of expertise. Shortage of funds also hampers proper management and some experts have pointed out that the market price for per tonne of waste to be disposed is inflated to include corruption (Ahmed and Jamwal, 2000).

Given the potential threat of epidemics like that which took place in Surat in 1994, public interest litigations were filed in the Supreme Court of India, seeking directions to the Government of India and the State Governments for improving Urban SWM in the country.

The Supreme Court deemed it necessary to set up a Committee comprising of senior representatives of relevant ministries and government bodies. It was instructed to investigate the existing practices of Urban SWM in Class 1 cities and identify the deficiencies (Supreme Court Committee Report, 1999).

## **1.5 URBAN SWM IN THIRUVANANTHAPURAM CITY, KERALA: DETERIORATING CONDITIONS**

Kerala's relative high levels of literacy and public awareness had given it a unique status with respect to civic cleanliness in the past. Thiruvananthapuram, the capital city of the state had been labelled of the cleanest cities in India. In the last two years, the city has been suffering from severe shortcomings with regards to urban SWM. The unhygienic

conditions of various parts of the city has attracted almost daily media coverage. These areas form potential breeding sites for many disease vectors like flies and mosquitoes, etc. This deterioration of urban living conditions could not have been better demonstrated than the recent outbreaks of malaria in the Jagathy ward of Thiruvananthapuram Corporation (The Hindu, 28<sup>th</sup> February 2000).

In addition, increasing consumption has resulted in increasing production of wastes in both rural and urban areas. The same public awareness and fear of pollution has prevented the allocation of sites for solid waste disposal. Consequently, local authorities in most of the cities and towns of Kerala face the problem of lack of space for disposal of solid waste in a manner that is proper and agreeable to the public. At present, most of it is dumped on municipal or private lands or gets used as land fills (Ambat et al, 1999).

Thiruvananthapuram city has lost some of its shine as being one of the most clean cities in India. This is a consequence of rising population (the city's population was 524006 in 1991) and limited land availability. In recent times, reclamation of paddy fields in low lying areas for residential areas has resulted in flooding. This does affect SWM as garbage lying uncollected on the sides of the street tend to block the open drains, compounding these problems further.

## 1.6 NEED FOR STUDY

Unwarranted dumping and accumulation of solid waste can have the following serious implications.

A large part of the storm and sewerage drain and canal system (mostly open) becomes blocked and inoperable, especially during monsoon (Nair, 1999).

Dumping on road pavements particularly, in commercial areas obstructs pedestrian and road traffic.

If not checked, this can be a major environmental determinant of zoonotic infectious diseases. Man-made disrupted landscapes can have considerable effect on the normal behavioural relationships of the vectors (mosquitoes, fleas, etc.) and reservoir hosts (usually rodents, dogs, cats, birds, etc.). Humans inadvertently become infected by close contact, unleashing diseases like Echinococcus, Rabies, Toxoplasmosis, etc. (Speilman and Kimsey, 1991).

With the advent of consumerist culture, the composition of waste has changed over time and will continue to do so. Plastics, which contributed to a relatively small percentage about 20 to 30 years ago, has now increased considerably in terms of proportion (about 15 tonnes per day), making safe waste disposal more difficult to achieve (The Hindu, 6<sup>th</sup> September 1999).

The re-emergence of certain infectious diseases like Dengue fever has been proved to be a result of poor solid waste management in some Latin American countries. In this case, the vector, *Aedes aegypti* mosquito, was found to breed in discarded artificial or plastic containers that can hold rain water (Leontsini, 1995; Rigau-Perez et al, 1998).

Thiruvananthapuram Corporation, which has the chief responsibility for handling SWM for the city, has been receiving public angst for its poor management of solid wastes. An informal discussion with relevant officials in the city's Corporation indicated that a major impediment in their efforts to implement an effective urban SWM programme was the lack of an appropriate site for disposal and they also highlighted the need to set up a processing plant for this purpose. Another point of view that emerged is that to some extent the problem of USWM can be mitigated by involving communities in segregating and disposing of solid waste (Ambat et al, 1999). As of now, some residential associations have taken the initiative of cleaning and maintaining their neighbourhoods (Ambat, 1999a).

## 1.7 OBJECTIVES

This study aims to describe the process of SWM in Thiruvananthapuram city at various levels and to document the attitudes, practices, opinions of selected Thiruvananthapuram Corporation employees and officials, residents as well as other leading experts, in this context.

**Table 1: % OF TOTAL POPULATION IN URBAN AREAS BY SIZE OF TOWNS (ALL INDIA, EXCEPT ASSAM AND J&K STATES)**

<b>SOURCE: REGISTRAR GENERAL OF INDIA, DECENTENIAL CENSUS REPORTS</b>		1951	1961	1971	1981	1991
<b>CLASS &amp; SIZE OF TOWN IN TERMS OF POPULATION</b>						
Class I	100,000 or more	7.62	9.08	11.17	13.83	16.40
Class II	50,000 to 99,999	1.70	1.98	2.13	2.66	2.75
Class III	20,000 to 49,999	2.68	2.99	3.12	3.28	3.32
Class IV	10,000 to 19,000	2.33	2.25	2.14	2.18	1.95
Class V	5,000 to 9,999	2.21	1.21	0.86	0.82	0.65
Class VI	Less than 5,000	0.53	0.14	0.09	0.12	0.07
<b>% of URBAN POPULATION OUT OF TOTAL POPULATION</b>		<b>17.29</b>	<b>17.97</b>	<b>19.91</b>	<b>23.34</b>	<b>25.72</b>
<b>TOTAL POP'N (MILLIONS)</b>		<b>361.09</b>	<b>439.24</b>	<b>548.16</b>	<b>683.33</b>	<b>846.30</b>

**Table 2 TOTAL PLAN OUTLAY VIS-À-VIS PLAN OUTLAY UNDER OVERALL WATER SUPPLY AND SANITATION SECTORS AS WELL AS FOR URBAN AREAS. (Rs in Crores)**

PLAN PERIOD	TOTAL PUBLIC SECTOR PLAN OUTLAYS	TOTAL PLAN OUTLAY UNDER WATER SUPPLY AND SANITATION SECTORS		PLAN OUTLAYS UNDER URBAN WATER SUPPLY AND SANITATION SECTOR	
		AMOUNT	% OF PUBLIC SECTOR OUTLAYS	AMOUNT	% OF PUBLIC SECTORS OUTLAYS
1. First Plan (1951-56)	3360.00	49.00	1.46	43.00	1.28
2. Second Plan (1956-61)	6750.00	72.00	1.07	44.00	0.65
3. Third Plan (1961-66)	8573.00	105.70	1.23	89.37	1.04
4. Annual Plans (1966-69)	6664.97	106.42	1.58	NA	NA
5. Fourth Plan (1969-74)	15902.00	437.00	2.75	282.00	1.77
6. Fifth Plan (1974- 79)	39303.49	1030.68	2.62	549.44	1.40
7. Annual Plan (1979-80)	12549.63	430.22	3.43	197.93	1.57
8. Sixth Plan (1980-85)	97500.00	4047.00	4.15	1766.68	1.82
9. Seventh Plan (1985-90)	180000.00	6522.47	3.62	2965.85	1.65
10. Eighth Plan (1992-97)	4344100.00	16711.00	3.85	5981.00	1.38

## 2.REVIEW OF LITERATURE

In this section, different aspects and problems related to waste management in selected countries across the world are discussed. This is followed by a description of the situation with respect to India, Kerala and specifically Thiruvananthapuram city.

### 2.1 INTERNATIONAL PERSPECTIVE

#### JAPAN

With a population of around 124 million, but only 10% of the land suitable for residential purposes, there is considerable limitation of available land for landfill sites. This is essentially the driving force behind Japan's waste management policy.

The average person in Japan today produces about 1.1 kg of general waste each day – about 50 million tonnes of general waste annually. Another 400 million tonnes of commercial and industrial waste is also generated. Changing consumption patterns and the diversification of needs has led to the diversification of garbage. Businesses produce large amounts of waste by encouraging consumers to discard goods after a short period of time.

Industrial waste disposal is mainly handled by the 47 Prefectures in the country, which is considered as the first 'tier' of local government. General waste is mainly managed by the second 'tier' of government, the 3245 municipalities (Williams,1998).

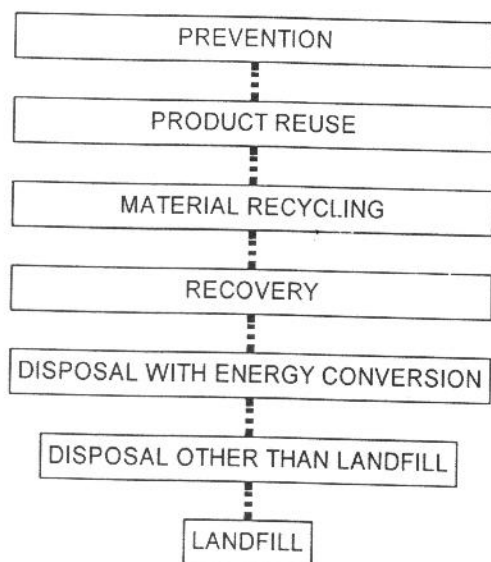
A staff member of a major refuse incinerator plant in Tokyo says that it is important to have as many people as possible to see for themselves how waste is treated. Most people cease to have any interest in waste once they leave it on the conveyor belt of the convenient collection and treatment system (Ota, 1999).

## NETHERLANDS

The amount of waste in the Netherlands had almost tripled between 1960 and 1990, and this coincides with growth in national income. It was estimated that 51 million tonnes of waste were being generated every year. This does not include dredging sludge, animal manure, contaminated soil and radioactive waste. In 1996 an average inhabitant produced 475 kg of municipal waste per annum. These increases had caused serious contamination of soil and ground (drinking) water. Even some residential areas built on former landfills had to be demolished because of danger to public health. The authorities in the Netherlands outlined an order of priority for waste disposal, entailing seven elements (See

Figure 2). **Figure 2:**

PRIORITY LADDER FOR WASTE MANAGEMENT



The implementation of waste policy is largely decentralised. The Ministry of Environment has prime responsibility for the development of environmental policy as laid down in the National Environmental Policy Plan, while other local governmental bodies, such as municipal and provincial authorities are responsible for implementation of the different environmental acts.

A major principle of the environmental management is the 'polluter pay principle' – every one who causes pollution has to pay their part in total cost of handling. A comprehensive levy system is introduced, for collection, handling and disposal of solid waste (Sprenger, 1999).

## GERMANY

Germany being a highly industrialised country with relatively little land for land fills, environmentalists advocated reducing the amount of waste generated, by requiring manufacturers of goods to use recyclable packaging. Towards the end of the 1980s, German policy makers started looking into recycling of waste materials as a major part of the solution to their increasing waste management problems.

The Toepfer decree, named after the then environmental minister in 1994, called for imposition of a 'take back' requirement on those who introduce packaging into the market. That is, retailers had to take back packaging from the consumers, manufacturers to retrieve packaging from retailers, and packaging companies to retrieve used packaging from manufacturers. This applied to beverages, cleaning products and emulsion paints (Verpackungsverordnung, 1991).

In response to the Toepfer decree, the German industry, abiding by these rules, called on third parties to fulfil these obligations. Thus was born 'Duales System Deutschland' (DSD), made up of over six hundred companies, which were authorised to work with local governments to collect recyclable materials. This entity was given a free hand to solve the problem with a few conditions imposed by the government i.e., the program should offer national coverage, locate collection bins close to consumers, establish routine collection schedules and integrate the collection plan with state and local systems (Verpackungsverordnung, 1991).

## ENGLAND

A survey was done recently in England to assess public attitudes towards environmental issues placed waste disposal high on the list of issues of concern (See Table 3). Placed alongside this concern is a general public acceptance that waste requires effective treatment and disposal in a responsible and environmentally acceptable manner. However, the establishment of waste treatment and disposal facilities has in many cases generated intense opposition in recent years, and recognition of what has become known as the NIMBY (not in my backyard) syndrome. This opposition to local siting of such facilities has implications for the implementation of waste management strategies which encompass the proximity principle, whereby waste generated in a local area is the responsibility of that area (Williams, 1998).

**TABLE 3: SURVEY ON ENVIRONMENTAL ISSUES**

ENVIRONMENTAL ISSUES	'PERCENTAGE VERY WORRIED'
Chemicals put into rivers and sea	63
Toxic waste disposal and import	63
Radioactive waste	60
Sewage on beaches/bathing water	56
Oil spills at sea and oil on beaches	52
Litter and rubbish	29
Household waste disposal	22
Not enough recycling	19

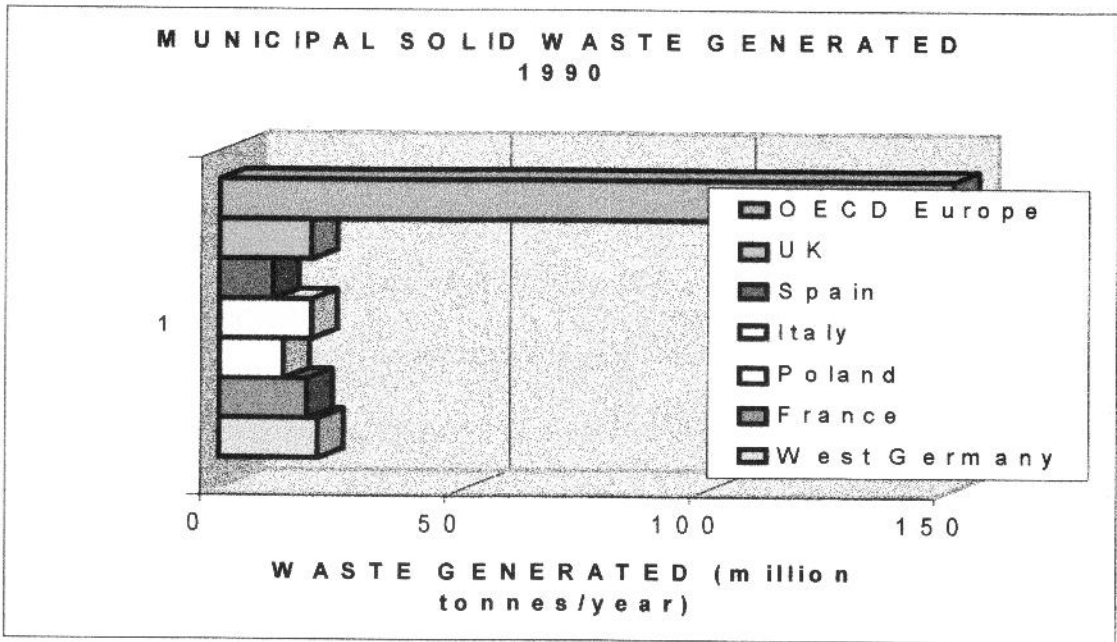
Sources: 1. West Yorkshire Waste Management Plan, West Yorkshire Waste Management Authority, The Environment Agency, March 1996; 2. Survey of Public Attitudes to the Environment, 1993, Department of the Environment, HMSO, London, 1994.

The National Waste Strategy is a requirement of the European Community Waste Framework Directive had been incorporated into the 1995 Environment Act of England, Scotland and Wales. The objectives of this strategy include:

1. ensuring that waste is recovered or disposed off without endangering human health and without using processes or methods which could harm the environment;
2. establishing an integrated and adequate network of waste disposal installations, taking account of the best available technology not involving excessive costs;

3. ensuring self-sufficiency in waste disposal;
4. encouraging the prevention or reduction of waste production and its harmfulness;
5. encouraging the recovery of waste by means of recycling, re-use or reclamation and the use of waste as a source of energy (Williams,1998).

**Figure 3:**



## USA

The quantity of municipal solid waste generated in the USA was estimated to be 210 million tonnes per year, and industrial waste generated was 400 million tonnes per year. This figure, which is steadily rising is disposed off using the following methods: 63% of the municipal solid waste by land filling, 17% by recycling and 16% by incineration. The key to the origins of solid waste legislation lie at the Federal or Central government. Administration of this legislation is by the Environmental Protection Agency (EPA). This does not include materials recovery facilities, recycling systems, compost plants or transfer stations. Regulation of such facilities occurs at the state level and there

are over 500 different legislative bills concerning them throughout the U.S. (Williams, 1998).

## 2.2 NATIONAL PERSPECTIVE

The four metros of India top the list in terms of maximum quantity of municipal solid waste generated, Mumbai being the highest (about 5355 tonnes per day). However, Chennai tops the list in terms of per capita waste generation (657 grams per person per day). 0 According to studies by Central Pollution Control Board and National Environmental Engineering Research Institute, the waste content of garbage is highly organic – about 40-50% (Ahmed and Jamwal, 2000).

The difference in quantity and quality of waste is due to a number of factors such as average income, source, population, social behaviour, climate, industrial production and market for waste materials. With economic development, the amount of waste has increased in weight and volume and a major proportion of it contains ‘luxury’ wastes like paper, cardboard, plastics, etc. In addition it has served to reduce the clean and easily manageable biodegradable elements from garbage.

### CITY EXPERIENCES

The plague epidemic scare in Surat was attributed to the breakdown of public health infrastructure. As a consequence of this and its political and economic fallout, India lost a total of US\$ 1.5 billion in foreign exchange especially from the tourism industry (Shah, 1997; Mavalankar, 1995). Following this, the city of Surat has become, over the last four years, one of the cleanest in India. Out of a total 1008 tonnes of solid waste generated daily, around 960 tonnes are properly handled.

Its success was attributed to the changes brought about by the commissioner of Surat Municipal Corporation (SMC) in 1995. The story of this success involved dividing the Corporation into six zones, decentralisation or delegating financial and administrative

powers to the lower officials, provision of basic facilities to all employees to carry out their job efficiently and effectively and the use of modern communication equipment like cellular phones and wireless such that any complaints or situation can be taken care of immediately and co-ordinated effectively (Ahmed and Jamwal, 2000).

Apart from these changes, SMC itself is financially well off. Its total budget is Rs. 599 crore, which is very high compared to other municipalities of similar population size and land area (eg. Indore – 96 crore). However, its budget for SWM is also quite high, around 30 crore, compared to Indore which is only 3 crore (Ahmed and Jamwal, 2000).

#### EFFORTS BY THE PUBLIC AND NON GOVERNMENTAL ORGANISATIONS

In Delhi, an NGO called Vatavaran is performing solid waste management efficiently in 27 different parts of the city. They basically respond to calls by residents of various colonies as and when required. Their team of field workers then conduct situational analyses of the areas concerned i.e. quantity and type of garbage generated and how much financially the residents would have to contribute, selecting vacant areas for composting, segregation, contacting rag pickers, etc. It consists of a three-tier operation system, garbage collectors at the lowest level, deputy supervisor at the next level and supervisor at the top. Each of these posts has clearly demarcated duties.

In Chennai, Civic Exnoras (community based organisations) formed under the umbrella organisation Exnora International, have initiated several schemes, SWM being the biggest. Their initial objective was to collect as much as waste and deposit it in transfer centres / municipality collection centres. However, due to the increasing difficulties in handling such a large amount of waste, Exnora decided to adopt effective methods maximum recovery of waste, through segregation at source, door-to-door collection, decentralised composting of organic waste, recycling and re-segregation of inorganic waste and land-filling of non-recoverable waste.

Pune is now termed by many as the composting capital of the country. From the early 1980s up till now, it is estimated that around more than 10000 families are engaged in terrace gardening, the common method of in-house SWM, using earthworms.

In Mumbai, the Municipal Corporation of Mumbai and an NGO called Save Bombay Campaign have worked together to form Advanced Locality Management (ALM) groups. These groups bring the municipality and people of different localities together and teach them various methods of SWM. At present, there are 300 ALMs out of 425 housing societies in Mumbai (Ahmed et Jamwal , 2000).

### RAGPICKERS

The role of rag pickers with respect to SWM has been largely underestimated and neglected by others who are engaged in SWM. It is said that up to 12 – 15 % of the total waste produced in major urban areas is collected by rag pickers. The MCD spends about Rs 620 per day on collection and disposal of one ton of waste. Since the city generates approximately 5000 tonnes of waste per day, the ragpickers save the MCD Rs 372000 to Rs 450000 per day.

Items such as paper, plastics, metal, glass and rags are collected and sold to traders at a very low cost. These traders in turn sell them to the industry at a very high price. Efforts to mobilise them have been difficult as the main traders work against their interest.

### 2.3 REGIONAL PERSPECTIVE

The quantity of waste generated in municipalities of other districts in Kerala is relatively much lower than that of Thiruvananthapuram (See APPENDIX III). However, they have also suffered recent setbacks in their public health records.

For example, there was a typhoid epidemic in Kochi in September 1999. The breakdown of the drainage system in particular areas was said to be responsible for it.

However, lack of inter-sector co-operation between the water authorities and the city Corporation resulted in attempts at blaming each other(The Hindu, 17<sup>th</sup> September 1999).

The health department's solution in the form of vaccination programs, was carried out for residents in surrounding areas, to prevent the typhoid epidemic from spreading further. Such solutions cause an excessive drain in government financial resources (the vaccines were imported from abroad), as well divert attention from the relevant issues i.e. proper management and strict maintenance of the urban environment.

Other examples of 'temporary solutions' like this include the recruitment of 10000 paramedical personnel, chlorinating of 200,000 wells with over 10 tonnes of bleaching powder, worth an estimated Rs. 40 lakhs worth of medicines went into the disease management in Kottayam recently (The Hindu, 28<sup>th</sup> February, 2000).

## 2.4 LOCAL PERSPECTIVE

Thiruvananthapuram City, once considered to be one of the cleanest cities in India, is now faced with growing problem of inefficient solid and liquid waste management, threatening to set off epidemics and other health hazards. These problems have the potential to mar the well being of its inhabitants and affect the economy as well by its adverse impact on tourism.

Tourism in this region is a leading source of revenue and foreign exchange. Though Kerala State Tourism and Development Corporation has stressed on the maintenance and cleanliness of the environment during the construction and operation of tourism-related projects, this is largely observed in its breach (The Hindu, 7<sup>th</sup> November 1999). In a recent tourism study done by the University of Kerala, a sample of 40 tourists was selected to assess perception scores of destination attractiveness attributes. The highest satisfaction and quality factors recorded were attractive beaches and the quality of accommodation in the hotels, whereas highest dissatisfaction (where expectations

exceeded performance) resulted due to the unhygienic conditions on the way i.e. roadsides, streets, etc among other factors like trouble from peddlers and stray dogs (Krishnan, 1999).

Since Thiruvananthapuram city is one of the two main gateways through which foreigners enter the state, it would be a rude shock to them to see the stark contrast between the advertisements depicting Kerala as “God’s Own Country” and the reality filled with uncollected garbage, foul odour and general atmosphere of squalor that surrounds most parts of the city. Apart from intensive marketing, improved hygiene and better infrastructural facilities will also help to improve the tourism potential (The Hindu, 10<sup>th</sup> October, 1999).

Infectious diseases are making a comeback in the city, due to factors like lack of a proper disease surveillance system i.e. the recent typhoid epidemic in Pettah, Chackai, Kunnukuzhy wards. Experts feel that current public health interventions used in combating these diseases are just merely fire-fighting exercises. Establishment of a greater role for local bodies in public health management with a downsizing of the Health Department’s role to just that of a facilitator of technical assistance has been mooted. A greater degree of multi-sectoral sharing of responsibility is expected as far as public health is concerned (The Hindu, 28<sup>th</sup> February, 2000).

A study by a leading environmental research organisation has estimated a total quantity of 290-300 tonnes of solid waste generated daily in the city. Approximately 320 ragpickers who work in the city collect, recycle and reuse a sizeable proportion of this waste through a network of Kabadiwallahs or waste collecting shops (Ambat et al., 1999).

The 116000 households with an average of five members in the city generated an average of 0.32 kg per capita per day. This adds to a total of 181 tonnes per day (62.8% of the total quantity of waste) ( Ambat et al., 1999).

Up till 1984, the Corporation disposed garbage by the land filling method in designated areas. However, for the last fifteen years, due to unavailability of land, the Corporation has been dumping waste indiscriminately, sometimes in privately owned land. The recent effort by the Corporation to control indiscriminate dumping of garbage on the roadside by the installation of garbage bins in designated areas of the city has proven futile. Faced with the shortage of manpower and infrastructure to effectively and regularly clear the bins (only 1 bin/ tractor/ day), they are now over filled, making it slow and difficult for the garbage (which could at least decompose naturally if it were on the ground) to break down and decompose (Ambat et al., 1999).

The proposed construction of a garbage processing plant in Vilappilsala, near Thiruvananthapuram has also been the subject of recent controversy. The Corporation had purchased 12.5 acres of land there almost two years earlier but only started excavation work six months ago. The responsibility of operating the plant has been given to a private waste processing company, while the Corporation has been appointed to collect and transport the city waste to it daily. The local residents of the area have recently raised concerns regarding serious environmental consequences that could occur when the plant becomes fully operational.

### **3. METHODOLOGY**

This chapter gives the details regarding study design, a brief description of the study location, plan for data collection and analysis and the limitations of the study.

#### **3.1 FOCUS OF STUDY**

The study concentrated on the Thiruvananthapuram Corporation, the main player of waste management in Thiruvananthapuram city as well as a few individuals and organisations who are carrying out similar activities within their own areas.

#### **3.2 STUDY DESIGN**

This is an explorative case study. It aims to study the process of waste management and the associated problems from the perspective of one of the main players – the Thiruvananthapuram Corporation. It is divided into three specific sections. Firstly, a brief description and development of the urban local bodies and Thiruvananthapuram Corporation itself. Secondly, the specific process of SWM by the Corporation as well as by other minor players. The third part deals with the problems associated with the various processes of SWM.

#### **3.3 BRIEF DESCRIPTION OF STUDY AREA**

The city of Thiruvananthapuram presently covers an area of 75.11sq km and has a population of 524006 people or 6594 persons / sq km (1991 census). Thiruvananthapuram agglomeration has an area of nearly 93.74 sq. km and a population of 825000 (1991 census). The city has grown from a central business area and the population progressively decreases in an outwardly direction (see Appendix VII).

There has been rapid expansion of residential area, mainly found in the peripheral zone of the city, largely in order to improve efficiency and size of the transport network.

A major part of the land is used for residential purposes, and this grew from 4027.78 hectares in 1981 to 4426.50 in 1996 comprising of 59.1% of total land area (Ambat et al., 1999).

Thiruvananthapuram Corporation has divided the city into 50 residential wards. These 50 wards are divided into 15 different health circles which are:

**Table 4:** LIST OF HEALTH CIRCLES IN THIRUVANANTHAPURAM

1. Beach.	2. Secretariat.
3. Chenthitta.	4. Nanthencode.
5. Chalai.	6. Sreekanteswaram.
7. Fort.	8. Palayam.
9. Jagathy.	10. Thirumala.
11. Karamana.	12. Poonthura.
13. Manacaud.	14. Sasthamangalam.
15. Medical College.	

### 3.4 DATA COLLECTION TECHNIQUES

Methods used in the three parts of the study include general informant and key informant (expert) interviews, semi structured questionnaires containing both closed ended and open ended questions (see Appendix I) and several on-location group discussions. The interviews were recorded using a tape recorder after permission was granted by the interviewee. Three translators were also enlisted to assist to conduct interviews or to translate and transcribe interviews. The study was conducted between 16<sup>th</sup> December 1999 to 5<sup>th</sup> February 2000.

Ethical considerations were taken to preserve the anonymity of informants and their identities.

### 3.5 STUDY SAMPLE

The sample consisted of 60 informants. This included :

- ❖ 15 Corporation Health Inspectors (HIs) of the various health circles of the Corporation.
- ❖ 5 Junior Health Inspectors under them.
- ❖ 5 sweepers (female), 6 lorry helpers (male), 4 public cleaners (male) of two selected circles and 2 drivers.
- ❖ 2 residential association presidents for the opinion and description of their own initiative in solid waste management in their respective neighbourhoods.
- ❖ 5 senior Corporation officials of the Public Health, Accounts and People's Plan department.
- ❖ 1 senior officer in Health Department of the Municipal Directorate.
- ❖ 1 retired senior officer of the Municipal Directorate.
- ❖ 1 senior environmental engineer in Kerala State Pollution Control Board.
- ❖ 2 leading experts in SWM, one a director of a leading environmental NGO and another working as consultant engineer in a leading medical institute.
- ❖ 6 residents of which 3 were selected each from the two circles in which Corporation workers were also interviewed.
- ❖ 4 ragpickers from Chalai and Uloor.
- ❖ 1 recyclable waste trader in Chalai.
- ❖ 1 senior panchayat official from Vilappilsala, where the Garbage Processing Plant is likely to be located.

### 3.6 PLAN FOR DATA COLLECTION

The Health Inspectors and Junior Health Inspectors were initially interviewed. They were asked about the residential wards, Corporation workers (both public cleaners and sweepers) in their circle, waste disposal equipment, mustering points and job vacancies in all posts. Next they were asked about the activities related to the day to day running of their circle, the main problems they are facing, their opinions on how to improve the situation in their respective areas.

On-location focus group discussions were conducted with Corporation workers and ragpickers who were working in groups in two selected circles of high and low socio-economic status of residential areas respectively. Non-participant observations were undertaken for randomly chosen Corporation workers on duty. Households located in the same areas were also selected for interviewing as to the efficiency of waste management in their area as well as opinions on the current situation.

**Secondary data** was collected from officials of the Corporation, Municipal directorate and State Planning Board of Kerala State, to give a brief overview of the historical background, legislative groundwork, budget allocation and the chain of command involved in the decision making process of SWM. Extra translators were recruited for translating data from Malayalam to English wherever necessary.

### 3.7 PLAN FOR DATA PROCESSING AND ANALYSIS

Data from the interviews and group discussions was translated and transcribed and processed using appropriate word processing packages. Secondary data was also manually entered and tabulated using a personal computer. Content analysis was the main method used for analysis of the qualitative data collected.

### 3.8 PROBLEMS WITH DATA COLLECTION

Difficulties occurred while obtaining interviews with some of the HIs as they were frequently away on ward duties, which led to atleast two to three visits in some of the circles. The same also applied towards some of the Corporation officials.

Some idiomatic phrases in Malayalam used by certain Corporation workers during their interviews could not be translated accurately by the interpreters.

Constant monitoring and surveillance of Corporation workers during the observational analysis was not possible as following behind them had to be at a distance in order not to distract the workers.

There were also some difficulties involved in obtaining the vernacular literature like the Kerala Municipal Act and having them translated.

### 3.9 LIMITATIONS OF THE STUDY

This is a descriptive study of the situation which describes SWM in Thiruvananthapuram city. It is not generalisable to other urban areas.

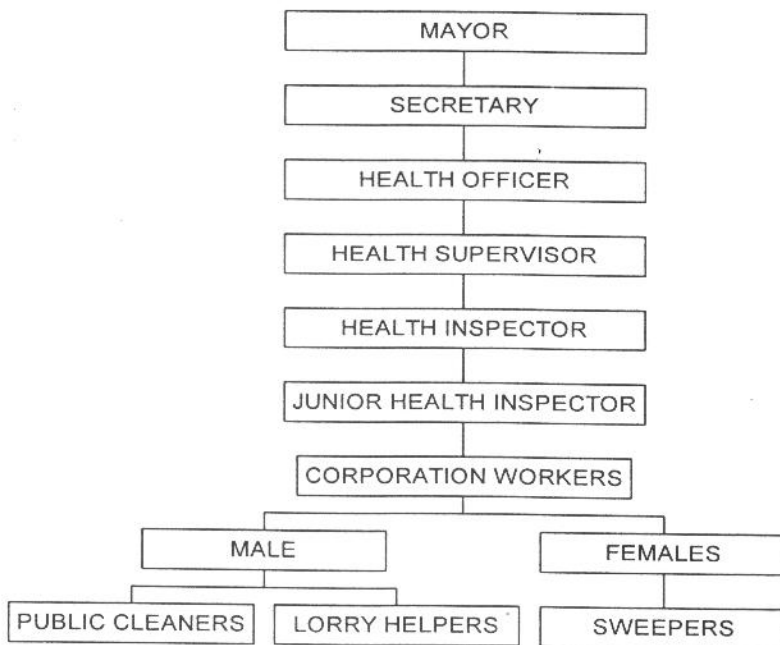
Only a brief outline and description into the various aspects of the study was possible. It does not include a systematic evaluation of budget, management, work productivity, etc.

A comprehensive analysis was not done on relevant legislation pertaining to Kerala Municipality Act i.e. waste management, fund allocation, chain of command, etc.

## 4. PROCESS OF MUNICIPAL SOLID WASTE MANAGEMENT IN THIRUVANANTHAPURAM CITY

In the following sections, the City Corporation's structure and function is discussed with respect to SWM within Thiruvananthapuram City. The structure consists of the Mayor who is the legislative head of the City Corporation. The executive functioning of the Corporation is under the Secretary who oversees its daily functioning. Under this office functions the Public Health/ Health Services Department which is supervised by a Grade I Health Officer. In addition, another Grade I Health Officer and a Health Supervisor (HS) also assist in supervising the Public Sanitation (SWM) Department (See Figure 4).

**Figure 4:** DIAGRAM SHOWING HIERARCHY OF COMMAND WITHIN THIRUVANANTHAPURAM CORPORATION



The Public Health departments, including Public Sanitation operates within a set of 15 Health Circles, which are headed by Health Inspectors (HIs). Under the HIs, in each circle office there are about one to three Junior Health Inspectors (JHIs) who usually allocate and supervise the work of the sanitary workers. The Corporation also runs a garage, also manned by a HI, and operates out of a zonal office in the central commercial / residential part of the city. This houses the Corporation vehicles used for waste disposal and the manpower (drivers, etc.) required to drive them (See Appendix IV). Each one of the above positions has a role in solid waste management for this city. The stated role and observations of actual activity are discussed in the following sections. For a brief description of the overall budget analysis of the Corporation, see Appendix V.

#### 4.1 DEVELOPMENT OF URBAN LOCAL SELF GOVERNMENTS IN INDIA:

It is appropriate to dwell briefly into the historical background of **LOCAL GOVERNMENT BODIES** over the last hundred years or so since this forms the backbone of the urban public health programmes. The evolution of urban local government in British India was very much the consequence of the interests, convenience and needs, fiscal and otherwise of the East India Company and later the Central Imperial Administration. According to the Charter Act of 1793, the first local institutions were set up in the three trades centres Bombay, Madras and Calcutta. They were wholly official bodies, having no elected representatives. Thus there was no motivation to fulfil the needs, aspirations and demands of the local people. The East India Company was concerned mainly with comfort, well-being of the British and European population (Nair et al, 1976).

The origins of municipal bodies in 'mofussil' (rural or provincial locality) towns came with the Town Improvement Acts of 1850 and 1865, which authorised the

government to introduce municipal administration in any town whose inhabitants were desirous of improving construction, repairing, cleaning, lighting or watering any public street, roads, drains, tanks, etc. Increasing dissatisfaction and agitation by the local people towards policies of the British rulers led to Lord Mayo's and Lord Ripon's famous resolutions in 1870 and 1882 respectively. These promoted greater autonomy to urban local bodies and less official control by the Imperial government. Emphasis was devoted to local interest, supervision and management of funds devoted to education, sanitation, medical relief and local public works (Nair et al, 1976).

The Town Improvement Acts of 1871 and 1878 also gave further responsibilities to the urban bodies such as maintenance of hospitals, dispensaries, schools, birth and death registration and vaccination.

The first specific form of local taxation came when the Charter of 1793 empowered the levy of House Tax of 5% in the Presidency towns of Madras, Bombay and Calcutta. The initial resentment of such a direct tax by the public made the Imperial government to revise and devise mechanisms for indirect taxation. Thus **OCTROI** (levy of duty) emerged as a potential source of revenue even before 1870.

In pursuance of Lord Ripon's resolution, tax resources were divided into Octroi, house tax, tax on profession and trades, and tolls.

This list of taxes has been modified and amended several times over the last century and it varies with different municipalities in different states. At the moment, the main taxes levied by the urban local bodies in Kerala are property tax, profession tax, tax on animals, vessels and vehicles, show tax, tax on advertisements and entertainments (Nair et al, 1976).

## 4.2 LIST OF IMPORTANT MILESTONES RELATED TO WATER, SANITATION OF THIRUVANANTHAPURAM MUNICIPALITY AND CORPORATION.

Due to the worsening public health conditions that affected Thiruvananthapuram towards the latter half of the 19<sup>th</sup> century, various steps were taken to improve the water, sanitation and hygiene standards over the last hundred years. These include:

The appointment of the first sanitary inspector for the city took place in 1895. This was followed by the introduction of pushcarts for garbage disposal in 1897. The town improvement committee took systematic steps to clean public places from 1903. In 1904, house to house scavenging (collection of night soil) was implemented. A clean water distribution programme was started in 1928. A full-fledged cleaning campaign was inaugurated for the first time in 1940. Five years later, the first under ground drainage system was created. In 1958, scavenging services, an integral component of public health system, were terminated. A year later, the sanitary type toilets scheme was started. The next relevant major developmental scheme occurred between 1996 – 97. Under the 2<sup>nd</sup> phase of the Brighter city scheme, a solid waste management / civil works project to be implemented at Vilappilsala was sanctioned and approved. (A detailed scheme of events is listed in the Appendix VI.)

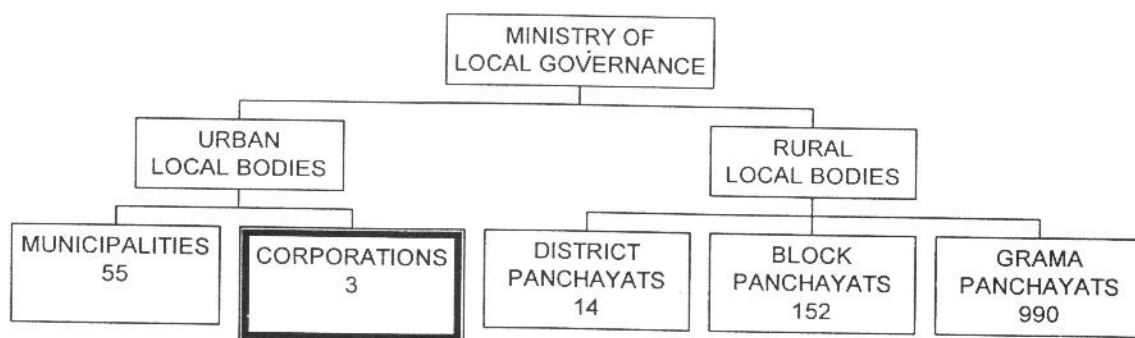
## 4.3 STRUCTURE OF LOCAL GOVERNANCE WITHIN KERALA STATE

Under the MINISTRY OF LOCAL GOVERNANCE, two main divisions exist: Urban Local Bodies (ULBs) and Rural Local Bodies (RLBs). The Urban Local Bodies are divided into Municipalities and Corporations, whereas the Rural Local Bodies are

known as panchayats. The headquarters is in Thiruvananthapuram, known as the Kerala Panchayat and Municipal Directorates.

The three Corporations in Kerala are found in the cities of Thiruvananthapuram, Kochi and Kozhikode (See Figure 5).

**FIGURE 5: STRUCTURE OF LOCAL GOVERNANCE IN KERALA STATE**



#### 4.4 LEGISLATION AND LEGAL MECHANISM

The ULBs of Kerala are all legally bound under the Kerala Municipal Act of 1994 (last amended in 1999). Detailed rules that concern the appointment of various officials, proper performance of duties of each department, levy of taxes, as well as responsibilities of the public and penalties incurred for disobeying these rules exist. The sections pertinent to SWM are highlighted in the Table 5 (George, 1999).

#### 4.5 PEOPLE'S PLAN CAMPAIGN AND ITS RELEVANCE TO GRANT IN AID CONTRIBUTION TO URBAN LOCAL BODIES.

As according to the 73<sup>rd</sup> and 74<sup>th</sup> Amendments for newly constituted self-government institutions, the State government decided to devolve 35-40% of the state's 9<sup>th</sup> plan outlay (in 1996) for projects and programs drawn up by the local self-governments. This was aimed to reduce the magnitude of state government interference in the day to day functions of the local bodies.

Relevant amendments were also carried out to the existing Kerala Panchayati Raj Act 1994 and Kerala Municipality Act 1994 (Isaac, 1999).

The plan grant (or grant-in-aid) to finance NEW projects is prepared as per procedure under the People's Campaign for the Ninth Five year Plan. In this case, the technical viability and financial feasibility is studied by a Corporation Level Expert Committee. Final approval and sanctioning is carried out by the concerned District Planning Committee. The total contributions for the last three years is listed in Table 6.

**Table 5: Relevant legislature pertaining to SWM**

Section no.	PARTICULARS
326	Municipality has the right on basis of contract to collect or not to collect in full or part of solid waste from public or private areas.
327	The duty of owners / tenants to collect and store garbage / solid waste.
328	Describes the contract with owners / tenants to dispose off garbage / solid waste.
329	Highlights schemes / engagements for house to house garbage collection.
330	Garbage and other solid waste will be the property of the municipality and their right to dispose off by sale or auction.
331	Deals with the final terms / conditions with regards to solid waste disposal.
332	Deals with terms / conditions for recycling / refining solid waste.
333	Deals with the share / interest of people who have control over pilgrimage places.
334	The garbage / solid waste which has accumulated in commercial establishments – who are the people / agencies responsible.
335	Prohibition of disposal of animal waste / corpses in undefined manner.
336	Prohibition of keeping waste in surrounding environment.
337	Prohibition against waste emissions.
338	Prohibition against indiscriminate disposal of leather waste.
339	Prohibition against using vehicles without any covers for waste disposal.
340	Prohibition against putting garbage in public places.
341	Prohibition against putting waste in public streets.
342	Describes presumptions of guilty parties who disobey the rules of solid waste disposal.
343	Prohibition of putting waste in places other than those stipulated by municipality, by the assigned Corporation workers.
344	The power / right to inspect places to clear waste.
345	If somebody acts against the above rules, punishment incurred for that.

**Table 6: Annual grant-in-aid contributions through People Plan's Campaign**

YEAR	GRANT IN AID CONTRIBUTIONS ( Rs. in millions)
1997-1998	7490
1998-1999	9490
1999-2000	10200

Under a detailed Sectoral Investment Pattern, grant-in-aid is divided into General Sector Plan, Tribal Sub Plan and Special Component Plan.

The General Sector Plan is further sub-divided into Productive (Agriculture, Animal Husbandry, etc.), Service and Infrastructure (Roads, buildings, etc.) sectors. In 1998-99, the allocations for these 3 sectors were 39.33 %, 35.69% and 23.79%. In the service sector, sanitation and public health were 3.5% and 2.18% respectively. Ideally, a minimum of 40% of the plan fund should be allocated to the Productive sector and a maximum of 30% to the infrastructural sector.

Some special conditions applied here are: town planning schemes emphasising on solid waste management, water supply, upgrading of traditional markets, slums and house sites are given more priority; and **no salary is to be paid from the plan grant.**

Other sources of local body finance are through State Sponsored Schemes, Centrally Sponsored Schemes, Surplus from own funds, Loans from Financial Institutions, Voluntary Labour and Donations, Beneficiary Contributions, etc (Isaac, 1999).

#### 4.6 MANAGEMENT WITHIN THE CORPORATION

The Mayor, who holds the top most position, is appointed by an executive committee made up of councillors. The next is the Secretary (previously known as the Commissioner) who is in overall charge of the day to day activities of all departments of the Corporation. He is selected from a group of chief municipal executives who are state cadre officers. The Public Health / Health Services department is one of the various departments under the Secretary and it is run by a Grade 1 Health Officer. Responsibilities include supervision of Prevention of Food Adulteration Act, Birth and Death Registration, Sanitary Establishments, Immunisation programs, Mosquito control, Maternal and Child Health Care, etc. He is assisted by another Grade 1 Health Officer who largely supervises Public Sanitation department. An additional health supervisor also assists in supervision of certain Health Circles which generate a lot of waste i.e. Palayam,

Chalai and Manacaud markets which contain most of the wholesale trade of the city. Monthly meetings of all HIs and Health Officers are carried out for discussion of the current waste management situation within the city.

Investigation of public health issues and implementation of certain projects are carried out by the Public Health Committee. For example, this includes sanctioning orders to quell outbreaks of certain diseases (like the recent typhoid epidemic), supervision of various programs and personnel (i.e. Junior Public Health Nurses) under the World Bank funded RCH project and liasoning with the Ministry of Environment for enforcing authority for private hospitals in disposing their waste properly. The committee is headed by a chairperson and comprises of 5 councillors, the 2 Health Officers and other senior experts outside the Corporation i.e. hospital superintendents, environmentalists, etc.

Projects on a large scale are discussed and debated by the Council, which is made up of 50 councillors from each of the 50 wards.

The final authority to sanction depends on its cost. For instance, up to Rs. 10,000 is sanctioned by the Secretary only, up to Rs 25,000 is sanctioned by the Mayor and up to Rs 3 lakhs is sanctioned by the Standing Committee. Dry projects costing greater than Rs 3 lakhs is sanctioned by whole Corporation Council.

#### THE CIRCLE OFFICES

Of the 15 circle offices, those situated within the market premises, essentially dispose market waste only. One circle was located just adjacent to the Corporation Garage. Another five offices were situated away from busy areas (one had no road), 3 within market premises and the remaining 6 were on busy roads, including one just before the National Highway. In that particular office, on the way to the HI office room, the pungent odour of urine emanated from the toilet situated adjacently. Most of the offices'

outside as well as inside walls were covered to a certain extent with grime, and the paint had faded away considerably. Only 9 circles had a working phone connection.

Fourteen circles were situated in independent single storey tiled roof houses with at least three separate office rooms (about 5 feet by 5 feet in size), one for the HI, and the rest for either clerical staff or JHIs. It was observed that each circle office was at least fifteen to twenty years old, considering the date of inauguration on foundation stones placed in the front wall of each circle. The fifteenth one, located east of Thiruvananthapuram had been shifted (including furniture) to a single large room (about 10 ft by 15 ft) on the second floor of a newly-built Corporation owned shopping complex a few months earlier.

Upon visiting another office located near the beach, it was noticed that, apart from the inside walls which were covered with dirt and paint which had faded and peeled off in certain areas, the furniture which included three tables, 3 chairs which looked very old, plus two *Godrej* cupboards which were in advanced stage of corrosion. In addition, holes were seen in the tiled roof in certain places. One of the *Godrej* cupboards was placed directly underneath one of the defective areas of the roof. As a result of the exposure to the elements, it was completely covered with rust, and not shifted at all.

#### STAFF POSITIONS: ROLE AND DESCRIPTION OF HEALTH INSPECTORS (HI)

All the HIs were of middle age, between 35 to 45 yrs, having served in Thiruvananthapuram Corporation or other municipalities in Kerala for a period between 10 to 20 years. The salary they earned depended on the number of years of service. Barring one HI who was female, in general all HIs were male.

All of them had passed their basic **SANITARY INSPECTOR COURSE** (which includes the subjects: Maternal and Child Health Care, Basic Health Care, Environmental Sanitation, School Welfare, Health Education, etc.). Some of them had undergone their

training in Kerala while others had it elsewhere i.e. Bombay. One of them also had additional military training and experience for a number of years.

Six of them had just been recently transferred (up to two months) to their current posts as HIs, while the other 9 have been working continuously for one to three years in the same post. While most of them had been transferred within Thiruvananthapuram Corporation, two said they were transferred from other municipalities, one from Nedumangad, the other from Kochi. Almost all of them had a two wheelers for conveyance except for one of them, who had purchased a small car (worth around 400000 rupees) recently.

All of the HIs were quite cordial and were willing to assist in the study. However, five of them were exceptionally busy at the time with administrative work, or were just on their way out for 'ward duties / supervision', especially those working in the market areas. When asked about technical and statistical details of circle supervision in particular i.e. number of workers, waste disposal equipment, most of them had to seek assistance of their JHIs, who would be sitting in the next room. The JHIs used the necessary registers and ledgers from the cupboard to clarify the doubts.

#### ROLE AND DESCRIPTION OF JUNIOR HEALTH INSPECTORS (JHI)

Roughly over half of the JHIs currently working were permanent staff, having spent a number of years in their posts. They were very experienced and aware of the activities going on in their respective circles. A few of them were on temporary posting, having spent only a few months. In every circle, there was at least one JHI post vacant for considerable period of time ( up to three years). In Poonthura, the JHI (who has been working there for more than five years) was unable to recall, according to his knowledge, that all the JHI posts were ever filled totally at any one time.

## LIMITED ROLE OF THE KERALA STATE POLLUTION CONTROL BOARD(KSPCB)

The KSPCB is the enforcing authority for commercial and industrial establishments in terms of waste disposal. However, for municipal waste, they give recommendations to the local bodies, and do not enforce them.

### 4.7 PROCESS OF MANAGEMENT

This sections describes the normal work detail of HIs, JHIs, Corporation workers in the circle offices and the Garage, and observations of a selected group of workers while on duty.

#### ALLOCATION OF WORK

At 7 a.m. every day except Sundays, the Corporation workers, HI and JHIs arrive at the Circle office. The HI and JHIs mark the attendance of workers who are present. In certain circles, where the area covers more than three wards, an extra *mustering point* - a particular meeting point elsewhere in the circle area - is used for this head count (usually by a JHI) and this facilitates workers to proceed to their work areas without delay. For example, in Beach Circle, which covers five wards, two mustering points exist: one at the circle office in Pettah and the other in Chackai. Following the roll call, the workers are divided into their respective groups according to the location and type of work they are expected to undertake. For example, male workers are divided into lorry helpers and public cleaners and female workers as sweepers. At this point, the public cleaners and sweepers will leave immediately to their designated work areas while lorry helpers (usually numbering up to 3 to 4) will remain behind at the office to wait for a Corporation lorry/ truck/ tractor to arrive at the office to pick them up.

The job description of public cleaners involves: collection of garbage from unauthorised dumps on roadsides using wheelbarrows or push carts and moving them to a designated garbage or container bin or well ring. If not collected, it is to be burnt in situ.

In addition they are expected to cut grass or weeds on road pavements and attend to the maintenance of open drains on the roadside.

The workers usually work in teams. For example, two to three workers clean the drains on one stretch of road and will leave the waste in tidy piles on the roads, then another one or two workers will collect it in a wheel barrow and shift to a nearby bin.

The job description of sweeper (female) involves sweeping of paper and plastic waste lying on road pavements neatly into piles, to be collected later.

All this work is supposed to be undertaken between 7 a.m. to 11 a.m. After 11 a.m., the workers go back to the circle office to await further orders from the HI, pertaining to the 'mass / special work campaign'. This involves cleaning work in areas in dire need of waste disposal, by a large number of workers.

#### ADMINISTRATIVE WORK DONE IN THE CIRCLE OFFICE

Three circles had at least one to two clerical staff to undertake this. All the fifteen circle offices visited maintained registers containing details on salary paid (month wise), attendance and number of off-days for the employees. Registers from five offices were selected, examined, and were found to be up to date. When a worker failed to turn up for work continuously for up to two to three months, a decision was made as to whether to strike him off from the register and such a person will not be deemed an employee subsequently. When HIs were asked about the exact number of off-days or leaves, a Corporation worker was entitled to, there were no identical answers. The leaves are divided into three types: cash, earn and sick leaves (20 to 40 days for each type). The initial appointment of a worker is usually termed as temporary (initially salary is about Rs. 3500 per month ). After a certain period of service, he becomes a permanent employee. According to the number of years of service, a worker receive increments in his salary which can be as high as Rs. 4500 to Rs. 5000 per month.

## OBSERVATION OF THREE CORPORATION WORKERS

After noting the specific orders from the HI of one circle to a group of workers at the time of roll call, it was decided to specially observe them to see how would they perform these specified tasks.

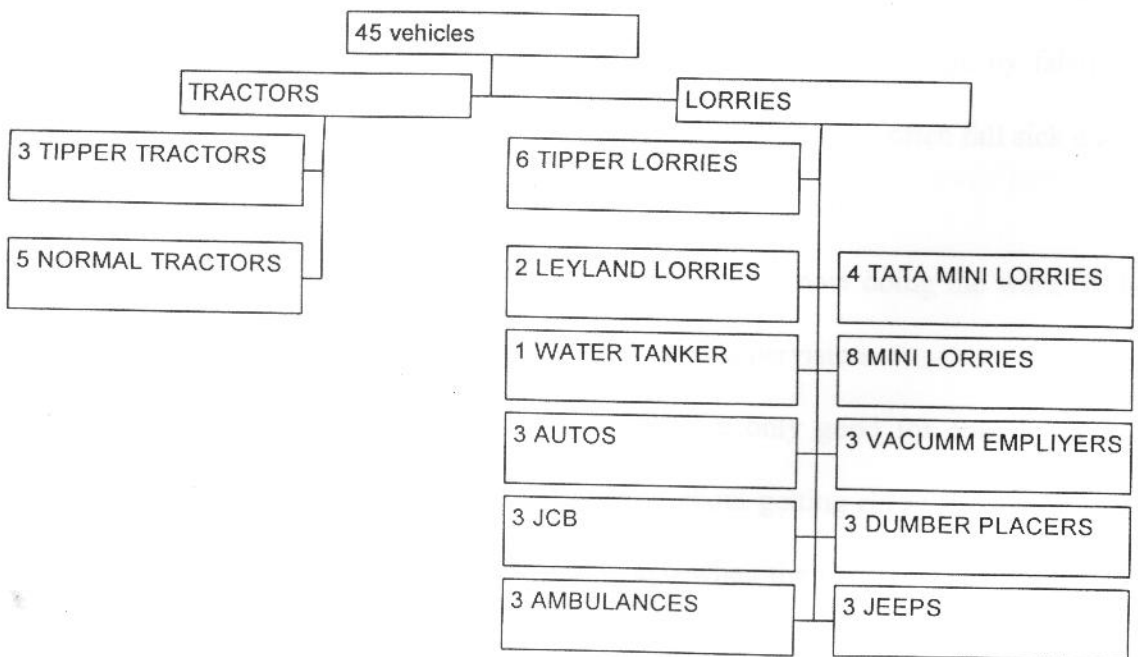
At 7 a.m. almost all the workers arrived at the circle office to have their attendance marked. The JHI was present at the time to perform the roll call. The HI came about half an hour later. After this, some of the workers immediately left to their respective areas to carry out their duties. Others, who were lorry helpers remained until the Corporation lorry came to pick them up at 8 a.m. Six of the workers who left earlier walked to a nearby coffee shop to have tea and breakfast. After about half an hour, they stood or sat outside talking. At around 8 a.m., 3 of them walked towards one residential area to do grass and weed cutting on that main road (about 1.5 km in length). This particular job, as observed, took 3 days to finish. The workers used shovels to cut grass on the pavements and removed weeds that were growing in the open drains. The waste was then kept in small piles along the sides of the roads to be collected later. Around 8.50 a.m., they stopped for a break and smoked bidis ( raw tobacco powder, rolled in a dry leaf to form a type of smoking stick). Along with this, the workers spent another 15 to 20 minutes for relaxing and talking amongst themselves. After working again for more than one hour, they finally stopped working at 10.30 a.m. and had another break. This time they talked for around half an hour. By around 11.10 a.m., they walked back to their circle office (about 1.5 km away). In between, they stopped at a small coffee shop for tea. At the office the HI gave them orders about the 'mass / special work campaign'. The next day, another worker arrived at the residential area around 8 a.m. with a wheel barrow to collect the waste, both domestic waste as well as grass weeds. Using only a small rectangular metal plate (about 25 cm by 20 cm) he collected the waste into the wheel barrow, only to dump it later in a

nearby well ring (which was already overflowing with the previous days' waste). Thus, most of the waste disposed, wound up into an open drain adjacent to the well ring. He also worked up to 11 a.m.

### THE CORPORATION GARAGE

The Garage, also known as the Zonal Office, is located in East Fort, the central business area of the city, and is manned by one HI and one JHI. It houses vehicles for waste disposal as well as other health related or developmental and construction activities. The drivers appointed for operating these vehicles arrive every day at 7 a.m. to have their attendance marked. According to the amount of waste and its locality, and the number of vehicles readily available in running condition, the HI decides on the routes the drivers have to operate. They are roughly divided into markets (eg. Chalai, Palayam etc.) and other main roads ( eg. MG road, etc.) Except for the circles in which the markets are located, in which drivers take two trips daily for waste collection and disposal, the rest of the circles are allowed only one trip for garbage collection. At the moment, there are 45 vehicles used for PUBLIC SANITATION (see Figure 6).

**FIGURE 6:Diagram representing the number and type of vehicles available in Corporation Garage**



## 4.8 PROBLEMS OF WASTE MANAGEMENT

### HEALTH INSPECTORS' PERSPECTIVES

The HIs' mentioned several problems that they faced. Shortage of land for land filling did not occur up until 15 years ago, when the Corporation were having about 9 acres of land in Vallakadavu, near the Airport, for this purpose. Then the Airports Authority Of India acquired the land for its own activities. Instead of being given an alternative area of land suitable for sanitary land filling, the Corporation was compensated financially at current real estate prices. As a result, its workers began to dump waste in private areas after negotiating some of the landowners. However some of the residential wards protested giving a memorandum to ban indiscriminate dumping. Most of the waste is now disposed off in areas 35 to 40 km away from the city. Only one circle has arrangements to dump its waste occasionally in some private area within their locality. However, within a week, that selected area would be full and an alternative space would have to be found.

One HI said that the average age of most workers ranges between 50 to 60 years and they have been working with the Corporation for more than twenty years. As reported by officials, this is because a few of them had lied about their actual age by falsifying their birth and education certificates before joining. As a result, they often fall sick due to old age.

The chronic shortage of JHIs means that most HIs are now doing the work of the JHIs i.e. ward inspections, and this also hampers overall supervision.

Another HI said that residential associations are only good for complaints and never give any suggestions. They are only bothered about getting rid of the waste as far away from their houses as possible. A few years ago when the Clean city campaign was

launched, some residents were co-operative and willing to participate in the activities organised by the Corporation, but now even they have lost interest.

‘Acting hands’, substitute or daily wage workers were employed by the Corporation to work in the event of vacancies within each circle or when current workers were on leave up until four years ago. This scheme was stopped because of their unreliability. Since they were working under the Corporation on a temporary basis and were paid daily wages, they were under no obligation to come punctually every day. After a certain period of time, these temporary workers would have to be taken in as permanent workers. This adds to the financial burden of the Corporation with respect to dispensation of further pension, bonuses, allowances, etc.

Some Corporation workers are tipped by commercial organisations to dispose off the waste generated by them. This emerges from our interviews with HIs working in health circles located in the market areas. Once used to accepting tips for undertaking legitimate work, the commercial area workers find it difficult to shift their site of work to residential areas where such tips are not forthcoming. Consequently, their work in such areas suffers.

Workers are also entitled to around 30 sick leaves, 20 cash leaves and 45 earned leaves. On an average, 5 to 10 workers take leave in each health circle every day which further hampers the daily work in each circle.

One HI said “After the People’s Plan Campaign, more work has been given to us to handle. Thus I have been unable to perform my own household duties such as cooking, cleaning and other household work.”

Certain circles faced problems due to their locality. For example, one circle faces extra burden of garbage disposed by the nearby military army camp. Another circle situated on a narrow road that links to the National highway, faces heavy traffic in that area. Big push carts are difficult to operate as well as shortage of space to dump waste on

the roadside for later collection. Finally, the absence of a sewerage and drainage system as well as gangster related activities causing property damage, further compounds the problem of waste management for another circle located near a fishing village.

Corporation workers in the past used to do all the jobs, including septic tank cleaning and scavenging. Nowadays, the new workers have found to be unwilling to undertake these menial tasks.

One HI said that though a list of 180 workers had already been finalised, they have not been posted yet due to certain delays. It should however be mentioned that three weeks after this interview was conducted, the list was released and most of the vacant posts were filled up.

#### PROBLEMS FACED AT THE CORPORATION GARAGE

It was mentioned that out of the 45 vehicles used for public sanitation and other disease control programs, only 20 are functioning. Thus the rate of usage is roughly 1 garbage disposal vehicle per garbage bin per circle per day. Circles catering to the market having a much greater volume of waste generated are allowed two vehicles or two trips per day. Maintenance work for these vehicles is frequent, necessary and expensive. At the same time, other demands within the department call for the diversion of funds to other projects. With such stiff competition for scarce resources, most of the vehicles lie in a state of disrepair for several months. For example, a garbage compactor has been non functional for almost two years. Currently, the Corporation commissioned six new imported garbage trucks purchased using the Plan fund.

## WORKERS' PERSPECTIVES

One Corporation employee working in a middle class neighbourhood said “ There is a huge shortage of workers. If one of us fall sick, retires or dies, there is double work for the rest of us. No new workers are being hired. ”

To cite another worker, “Because of the vacancies, sweepers have to sweep larger areas, though most of us are already 50 to 60 years old. But we cannot complain and tell about our age because it is embarrassing and it will cause problems for our jobs.”

“We are supposed to get 300 rupees each worth of uniform, gloves, soap, gum boots, chappals, raincoat every year, but that is not being done due to irregularity in supply. Then again, the raincoats supplied are too heavy and get spoilt very fast. We have asked many times, but they (Corporation) do not bother to give them to us. One or two years ago, we went on strike for these demands. We were arrested and then put in jail for 9 days”.

“We are not given proper tools like shovels or spades. Sometimes, we have to buy our own . One shovel costs 65 rupees”.

Some lorry helpers said “Because there is no space to dump the rubbish, we just dump it anywhere so long as people are not around to complain about it”.

Another group of cleaners and sweepers said that they come to work very early in the morning before 7 a.m., clean the garbage up into a neat pile on one side. “If we dump it elsewhere in some neighbourhood, we will be accused of negligence and the residents will say bad things to us”.

In reality, they do not have viable choices: either they dispose garbage in some private property and face harsh criticism or just leave it in situ and still face the music. In the end, they feel it is better to leave it as it is. Burning it is also difficult as some private property may be damaged accidentally.

## CORPORATION OFFICIALS' PERSPECTIVES

### PEOPLE'S PLAN CAMPAIGN:

As per rules of the People Plan's Campaign process, some 23 departments were handed to the Urban Local Bodies like the Corporation from the State Government to streamline and render them more efficient. However, in reality, this has added just extra burden to an already understaffed and under financed Corporation.

Ideally, the 6000 employees of the Secretariat and various other State Government bodies who are now without appropriate work, should be transferred and re-deployed to lower level local bodies and panchayats. But they are unwilling to let go of their current jobs as they are well established within their Departments. They have been successful in creating a strong lobbying group for themselves. Being transferred to local bodies would mean a break with their valuable contacts and losing their social status.

### HOSTILITY BY CORPORATION EMPLOYEES TOWARDS PRIVATISATION

Government policy at one time around five years ago, was to privatise the solid waste management. The Kochi Corporation handed over relevant areas of the city to a leading private automobile company for waste management. They hired their own workers to perform the disposal activities. The existing Corporation workers of those areas were transferred to peripheral parts of the city. This privatisation effort bore good results but the existing Corporation protested strongly from further privatisation citing reasons that finally they would have to hand over the SWM for the whole city to private companies. This would ultimately result in retrenchment of existing Corporation workers.

### STAFF REDUCTION

The Central government has, for the past few years stressed on the need to make the municipalities more efficient, and started downsizing the number of staff i.e. normally there would be annual recruitment to compensate for loss of staff due to retirement and

death of workers. But they stopped that and the staff size has consequently reduced considerably. For example, the number of workers five years ago was 1500 – now there are not more than 900 active workers, but the city population has also increased during the five years.

#### LEGISLATIVE DIFFICULTIES

Both Kerala municipalities and corporations are under one Municipal Act, whereas for other states, each municipality or group of municipalities have their own Acts. For example, Calcutta Municipal Corporation and Mumbai Municipal Corporation are under their own separate Acts, whereas the municipalities in these states are ‘clubbed together’ under one Act. Because of this unique distinction, municipal corporations in Kerala find it difficult to implement programmes catering to their large populations when compared to the minimal problems faced by other town municipalities in the state, which cater to small populations.

#### FRAUDULENT PRACTICES BY HIs WITH REGARDS TO HIRING OF SUBSTITUTE WORKERS

HIs usually take the attendance of these workers every morning. On the basis of that, they dispense salaries to them when work is completed at the end of the day. Some were eventually caught forging names of workers and collecting the salary for themselves. They were let off with a warning, but this stalled the hiring of new workers in each section.

## RESIDENTS' PERSPECTIVE

### WASTE MANAGEMENT PRACTICES ADOPTED BY ONE RESIDENTIAL ASSOCIATION

An interview with a President of one of the residential associations, repeated that up until a few years ago, there was no system of waste disposal in his neighbourhood. This resulted in piles of garbage in front of each house left uncollected for days altogether.

After several rounds of meetings with some of his neighbours, he began using composting as a method of processing and disposing his food waste. Now, the rest of his neighbourhood are disposing off food waste within their own houses. The President is able to do this method easily as he has the biggest property in his neighbourhood.

In describing the process, segregation of household waste is first divided into biodegradable and non-biodegradable waste within the house itself. The food waste is then transferred to a pit dug up in a convenient place away from the house. Its dimensions vary according to the size and quantity of waste generated. Dead leaves used to cover the waste. A little quantity of lime or salt is added to increase the saline concentration thus preventing mosquitoes from breeding. Cow dung or earthworms are sometimes used to hasten the process of composting. The whole process takes about three months. This is usually done in the rainy season when waste cannot be burnt. Since the monsoon lasts for six months in a year, the end product, called bio-fertiliser or potash, can be collected twice which is usually September and December.

Plastics and other non-biodegradable waste was removed privately by a worker, who was paid a salary of Rs1000 / month to dispose it elsewhere. The wheel barrow used for this purpose was donated by the association. Corporation workers were not involved at all

in this process. Legally they are bound by law to remove waste in public areas, not private areas.

#### LACK OF COMMUNITY INITIATIVE

Not all residential associations have been successful in initiating waste management processes. The same residential association president said “Thiruvananthapuram used to be the cleanest city. The Maharajah had initially taken initiative in maintaining public hygiene many years before. The situation now is very bad, both in this neighbourhood, as well as the whole city. The politicians have caused a lot of problems for the community. Because of them, the Corporation is understaffed and under financed.”

The Corporation workers, according to his observations only work 3 hrs/day. The rest of the time they are not doing work. Sometimes garbage bins are collected only after 2- 3 weeks.

He tried to start some sort of neighbourhood waste management initiative within his neighbourhood by hiring workers, purchasing wheel barrows, but the rest of the residents objected, stating that Corporation should solely do this since they were paying taxes and that no extra money should be spent from their pockets.

“Some residents are very indifferent. While they are sending their kids to tuition in the evening by motor bike or car, they just throw the garbage directly on the roadside while moving. Once the garbage bins are full, people get frustrated and start throwing their garbage into the filter canal or open drains nearby. When they get blocked, the residents complain to me to do something about it. I then have to call the Kerala Water Authority, the Irrigation Dept and the Corporation to clean the whole mess up”.

He felt that Corporation must enforce strict regulation regarding waste management and public hygiene i.e. no spitting, littering, etc. According to him, there is no private

initiative for waste disposal in his neighbourhood. His household waste is put into a plastic bag and kept outside the gate for Corporation workers to come and collect it. Some beggars in the area cause a nuisance by stealing the plastic bags and just discarding the waste on the ground. Most of them hailed from Tamil Nadu and Andhra Pradesh and reside nearby on the main road. They also pollute the canal by dumping their waste as well as practising open defecation.

On the other hand, a 60 year old resident living near the beach said that the Corporation workers only clean up garbage once in six months in front of her house there has never been a neighbourhood initiative in cleaning up garbage in her area.

Another group of residents in the adjacent ward, said that one worker comes to empty the sole container bin at the main junction once in every two weeks. Their association has hired one private worker to collect waste ( not segregated, in plastic bags) from each house and dispose them in the main bin. The worker is paid Rs. 100 per house per month. They also face additional problems of the nearby sewage farm, from which leakage contaminates their water supply.

#### CONCERN OF THE ENVIRONMENT AT NEW WASTE COMPOSTING PLANT SITE

A discussion with a senior panchayat official in Vilappilsala revealed that the construction work at the plant site started around mid December 1999 and was expected to continue for at least another six months. In view of the apprehensions and fears expressed by the local community, the Corporation had arranged a tour comprising of some of their officials and senior panchayat committee members to an already existing and functioning plant of similar type in Vijayawada, Andhra Pradesh. Arguments, as well as agitations regarding the setting up of the plant ultimately led to the organising of the tour as a result of serious doubts about efficiency of the Corporation in maintaining strict

standards while the plant is in operation. In addition, it was observed that the site of construction was situated on undulating ground. This created worry as to whether the ground water in the area would be contaminated.

The members of the local community at Vilappilsala returned with renewed optimism. They fully accepted the plan details of the plant with one major modification: That the designated areas for storing and processing biodegradable waste would be completely enclosed with sheds for two main reasons i.e. prevention of rain water collection and the nuisance of birds.

“ I believe now, the plant will perform satisfactorily. Earlier on, we wanted the Corporation’s guarantee to run it with 100% efficiency. But now, we realise, that in any case, this will be impossible to achieve so we have reduced our expectations to a reasonable extent, that is around 90 to 95%.”, said the panchayat official.

## OTHER PERSPECTIVES

A director of a leading environmental NGO stated that, after the introduction of People’s Plan Campaign, the Corporation is now flush with funds. Though they are financially capable of initiating new waste management projects, there is a severe lack of political will to sustain them. Community participation by residents on a large scale seems to be the only way to cope. Another leading expert in urban solid waste management has predictions of doomsday. He said that if the current situation is not checked, Thiruvananthapuram city will face a similar fate as that of the plague epidemic in Surat and such an event would have national as well as international repercussions.

## RAGPICKERS IN THIRUVANANTHAPURAM CITY

Out of the four rag pickers interviewed, one was from Ulloor and the others in Chalai. They were of ages from 35 to 55 yrs., and had worked as rag pickers (most of the

time only in residential areas) for a period ranging from 15 to 30 years. All of them were uneducated and had not worked in any profession before.

The three rag pickers said that they were paid on a daily basis by the waste trader, around Rs150 . They use this money for food expenses for the day as well as to cover the cost of waste material bought from residents. This will be given to the traders and the money remaining, usually amounting only up to 25 to 30 rupees is their profit. They have no working relationship with the Corporation employees at any level. The rag picker in Ulloor said that Corporation workers often become angry with him when they see him rummaging garbage bins for recyclable or reusable waste, because of the untidiness created as a result. The main problem they face is poor health. When they go to the hospital, for treatment, no concession is given. Nowadays the waste they collect is also increasingly difficult to sell. Up till now, they have not heard of or formed any sort of union for themselves. The trader said that a union exists for them but is not functioning properly. In Chalai and Aryasala there are about 150 traders alone dealing in recyclable waste.

#### THE HAZARDS OF PLASTIC WASTE

According to a senior environmental engineer working in the State Pollution Control Board, some environmental organisations are spreading misconceptions about the hazards of plastic bags. KSPCB has monitored and investigated the burning of plastic bags and found no serious toxic gases such as furans or dioxins emitted into the atmosphere. Almost all carrying bags used by the public are of non-halogenated type, containing polythene, which upon incineration, releases harmless compounds containing carbon, hydrogen and oxygen. Plastics containing halogenated compounds like Poly Vinyl Chloride release toxic gases but are not as frequently discarded or burnt compared to the above.

The ban of plastic bags has now become a political issue. One group of lobbyists who are plastics manufacturers, are against the ban, while others (paper carrying bag manufacturers) are advocating it.

Still, plastics consumption in India is relatively marginal compared to the rest of the world. The world average of plastic waste generation is 18 kg / capita / yr. (USA and Canada is 80 kg/ capita/ yr.). India is a nominal 1.88 kg/ capita/ yr., with Kerala only slightly higher than this.

#### 4.9 DISCUSSION

From the above primary and secondary data, certain relationships can be established between each section.

##### POOR MANAGEMENT STYLE

The hierarchy of chain of command for SWM in the Corporation itself deserves some scrutiny. Though SWM has serious public health implications (which a medical professional will have better understanding), it suffers mostly technical and managerial problems i.e. breakdown of vehicles, waste disposal equipment, field supervisory problems, etc, in which a medical doctor would be inadequate to attend to these details.

##### FINANCIAL AND FUND ALLOCATION PROBLEMS

A look at the budget analysis shows a mere 5% of total expenditure (121 crores) by the Corporation towards the SWM. Within SWM, almost 86% of this expenditure goes to salary, pensions and other contributions, while the remainder goes to vehicular maintenance and other fuel expenses.

##### LEGISLATIVE PROBLEMS

The relevant legislation found in Kerala Municipal Act gives provision for segregation and processing of solid waste as well as its collection and transportation. However, since all the Municipalities and Corporations in this state come under this Act,

difficulties arise for them to implement laws, projects and programs efficiently and effectively due to their distinct, varying needs of the communities they serve. For example, a municipality like Mavelikara ( a population of less than 50,000) will have a considerably low waste output and very low population compared that of Thiruvananthapuram.

Though the Kerala Municipal Act has provided specific provision for processing and disposing solid waste (Kumar, 1999), some other rules and regulations remain unclear. For example, in Section 326, the municipality has the option to dispose or not to dispose off full or part of the solid waste, and in Section 330, it states that all the solid waste generated is their property and they are at liberty to do as they please with it. In interpreting these two laws literally, the Corporation more or less absolves itself of any responsibility in maintaining public hygiene and at the same time can legally disallow other individuals or organisations from doing it. Section 338 prohibits the transport of uncovered waste, but most Corporation vehicles disregard this rule frequently.

Apart from the frequent demands by the residents and some environmental organisations towards the Corporation to maintain hygiene, there are no authorised government bodies to check and penalise the Corporation with regards to municipal SWM. As mentioned earlier, The Kerala State Pollution Control Board can only recommend and not enforce certain measures and precautions. According to a senior official, this will change once the Supreme Court Steering Committee's recommendations will be implemented in all Class 1 cities of the country.

#### EFFECTS OF THE PEOPLE'S PLAN CAMPAIGN

With the advent of the People's Plan Campaign in 1996, the devolution of responsibilities, powers and finance (Rs 33.5 crores to the Corporation for the year 1999-2000) of the State government to all the local bodies was supposed to assist and improve

the functioning of the various local government departments and also solve whatever legal limitations caused by the Act. On the contrary, new problems have cropped up. For example, bureaucratic delays have prevented redeployment of essential staff from the State Government to the local bodies.

Strict enforcement of Plan fund utilisation guidelines mean that only new projects can be initiated whereas current administrative and technical matters that really need attention would have to be funded from the existing, constrained financial resources. An example of this is the lack of and poor maintenance of waste disposal equipment and the adequate provision of protective clothing like raincoats, gloves, gum boots, uniforms, etc.

#### POOR INFRASTRUCTURAL MAINTENANCE

In observing the circle offices, almost all of them had at least one negative feature from one of the following: its location, appearance (both internal and external) and accessibility, cleanliness, poor condition of furniture. These problems have occurred probably due to inadequate allocation of funds for maintenance which is a recurring expenditure and therefore to be utilised from the non-plan allocation.

Contradictory statements have been made towards the provision of protective clothing and accessories for the Corporation workers. Most of HIs claim that a regular supply of gloves, raincoats, uniform and gumboots are given to the workers. Any perceived shortage is probably because the workers do not use them or try to sell them off or are not maintained properly. However, the workers deny this saying there have repeated requests to the higher authorities for adequate supply, but to no avail.

#### LACK OF WORK PRODUCTIVITY

It was stated by some workers that they follow their work timings as far as possible i.e. from 7 a.m. to 1 p.m. This has been contradicted by a few residents as well as personal observations, stating that they work only up to 3 hours in a day. The rest of time

is spent for bidi breaks, tea breaks and a large proportion for walking from their circle offices to their work areas and back. In comparing with the huge amount of budget allocation of salary, pension and other contributions, with the amount of actual time spent for waste collection and disposal, a serious lacunae in productivity and cost effectiveness is noted.

It has been stated by the HIs and the workers that waste in all roadside areas within each circle are collected and transported on alternate days as planned by the HIs and JHIs. However, this was contradicted by residents in selected residential areas. Uncollected garbage has been observed in front of their houses for two weeks to six months at a time. Corporation workers have mentioned garbage is collected on every road side for later disposal. But some residents say that these workers cover only main roadside or junction areas and do not work within residential areas. This concurs with the recent amendment of Section 326 of the Kerala Municipal Act.

#### THE ROLE OF RAG PICKERS

Their role has been underestimated considerably. While plastics constitute a growing proportion of the municipal solid waste, the rag pickers not only help in recycling used plastic covers and other items but also indirectly reduce the volume of roadside waste being burnt and subsequently air pollution.

#### POLITICAL INTERFERENCE

Politicisation of issues concerning SWM has had a negative effect in this city. For example, newspapers are daily reporting dissension and agitation within the Vilappilsala panchayat committee demanding for the immediate cessation of construction of the garbage processing plant even when the Corporation was given permission several months earlier to go ahead with it. Political pressure to downsize the Corporation contingency staff has also undermined the efficiency of the SWM in the city.

## 5. CONCLUSIONS AND RECOMMENDATIONS

There are many facets of efficient SWM by the ULBs. Since this study has briefly described how the overall process works, it would be ideal to investigate each facet separately in detail, like budgeting, management issues within each health circle, health status of workers and legislature through comprehensive evaluative and quantitative studies.

The problems of SWM facing Thiruvananthapuram city are not just the increasing quantity of waste or the lack of a site for a processing plant as had been stated earlier. Shortage of staff, equipment, and waste disposal vehicles as well as their poor maintenance, inadequate worker supervision, poor health of existing contingency workers, indifferent attitudes of some Corporation staff, lack of community participation and political interference are among the many concerns that affect this process.

In terms of volume, the annual amount of municipal waste generated in India is equal to that generated in some European countries (see Figure 3). However, these European countries are smaller in terms of population and size. This should be indicative of the relatively lower volume of waste generated in India. However, even the management of these reduced volumes is problematic. Clearly what is needed is an effort to tackle SWM problem using a multi-pronged strategy that covers all of the problems mentioned earlier.

There is an urgent need to realise that the city's main problem lies in its inability to collect and properly dispose off waste at the earliest.

It is doubtful that the City will have solved its problems of SWM when the proposed processing plant begins operation in a few months time. Even though the Corporation is legally obliged to collect and transport a minimum of 300 tonnes of waste from the city to the plant daily, it will first have to solve the problems of poor

maintenance and chronic shortage of garbage disposal vehicles. Secondly, since some of the residential areas on the coast are as far as 30 to 40 km away from the plant site, enormous amount of fuel expenses will be incurred to meet these daily needs. The further problem of maintaining safety standards in transporting such a relatively large amount waste as safely as possible without contaminating the surrounding environment also comes into play. Some recommendations that could be implemented are listed below.

### LEGAL ASPECTS

Revision of the Kerala Municipality Act should be done to cater specifically to Corporations and Municipalities separately. Existing legislation should be amended to make ULBs fully accountable for safe collection, processing and disposal of solid waste eg. mandatory covering of waste by garbage transporting vehicles. Such legislation should lay down clear and unambiguous terms for the management of solid waste.

### INSTITUTIONAL MODIFICATIONS

Municipal solid waste management should be deemed as a totally separate department and should be supervised solely by a environmental engineer with special training in public health (Report of Committee, 1999). In addition, a separate advisory committee comprising of medical experts and environmentalists also specially trained in public health research and municipal solid waste management should be inducted to cater to this department as well as others.

### FINANCIAL AUTONOMY

Funds should be allocated towards the strict maintenance or replacement of existing waste disposal vehicles, equipment and other accessories and to that extent HIs and JHIs should have the financial autonomy to take appropriate action. This will reduce the ratio of wages to other expenses within the Public Sanitation account. For example, as in the

case of Surat, equipment like mobile phones can also be used as part of a greater, well designed Management Information System (MIS) (Report of the Committee, 1999).

#### ROLE OF THE PRIVATE SECTOR

Because of the difficulties faced with recruiting new workers, the department can mobilise the combined efforts of the rag pickers in this city to assist in their work. Since complex labour regulations exist in this state, it would be unwise to hire them directly as contingency workers. Initially, with the help of an experienced NGO or a group of experts, the rag pickers can be organised into an independent autonomous union or association, say, 'Waste Recovery Workers Association'. Next, using the MIS, the Corporation can avail of their services by deploying them to various circles in need of attention. Funding could be channelled from the Plan Campaign. The 500 or so residential associations of the city could also be integrated into this system to improve the efficiency in communications i.e. setting up of a 'hotline' for lodging of complaints, facilitate regular meetings with Corporation staff. Ideally, waste generation (organic component) could be segregated and reduced 'at source' or at the household level through various techniques mentioned earlier with the help of contingency workers such that the total output of waste collected and transported to the plant could be reduced by as much as half.

#### WORK PRODUCTIVITY

The existing poor health status and productivity of many workers would have to be remedied by a host of preventive measures. In the first place, the speedy dispensing of necessary equipment and protective clothing is an essential requirement, as well as regular immunisation programmes for tetanus, typhoid, etc. Implementation of regular health check-ups for existing Corporation workers and rag pickers to monitor their health status will also enhance their work productivity and efficiency.

## EDUCATION OF THE PUBLIC

With respect to educational campaigns, the 'reconceptualization' of household and community responsibilities needs to be addressed. It is necessary to develop specific messages tailored to those people responsible for particular sets of waste management activities and specific domains of social and gendered space (whoever in the household is responsible for waste disposal), as distinct from generic messages encouraging the general public to clean up their houses and neighbourhoods (Nichter, 1995).

Two different types of approaches have been advocated by some countries to combat infectious diseases, i.e. public health approach and community development approach.

Public health approach stresses purely on an 'assistance' type of role by the community for the control of a particular disease, planned and organised by a panel of experts.

The second approach encourages participation, self-reliance and planning by the community in other health related activities as well as disease control. The ultimate objective is development as a whole and responding specifically to the community's needs. This approach lends more constructive focus and recognition of the underlying problems and seems feasible in a state where the local administrative units have been financially empowered as they have been in Kerala through the Decentralised Planning Process.

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# APPENDIX I

## QUESTIONNAIRE

### CORPORATION HEALTH INSPECTORS.

1. How long have you been working in this job?
2. What is your salary? Any perks? Bonuses?
3. How many workers are employed in your centre?
4. What are the problems you are facing in your area?
5. Are there a lot of complaints from the residents? Is there any community participation in your area with regards to waste management?
6. How many job vacancies are there in your centre and how long have they been vacant?
7. How punctual are the workers keeping their work schedule?
8. How are the condition of the push cart trolleys and other vehicles in your circle?
9. Do you hold regular meetings/ discussions with your workers?
10. Are there regular meetings with other inspectors and senior officials? If so, are they productive? Have you voiced any suggestions on how to improve?
11. Do any of your workers use protective clothing/ gloves?

### CORPORATION WORKERS

1. How long have you been working on this job?
2. Are you satisfied with your salary? Is it sufficient for you and your family's living expenses? Do you get any perks or bonuses?
3. At what time and how regular do you come to collect garbage?
4. Do you use any precautions in collecting the garbage? Gloves?
5. In your opinion, what types of garbage are common? Is it mostly plastic items or food?
6. Do you feel the existing system is inadequate for garbage collection? Have you voiced any suggestions/complaints to your superiors?
7. Which sort of establishments contribute the largest amount of garbage?

### CORPORATION OFFICIALS

1. What are your roles in the departments?
2. How much budget is allocated for solid waste disposal?
3. What are the functions of corporation workers? Do they work together with the Kerala Water Authority employees? How much salary are they earning? What is their work schedule?
4. Is the current amount of tax collections sufficient to maintain the running of this department? If not, how are you going to generate more funds? Are there any other sources of revenue?
5. What are the major projects that have been implemented in this area of interest? What are the future projects to be started?
6. Do you believe there has to be change in the system of functioning? Has it gone worse? What sort of change do you expect? More budget allocation? Improved technology? New equipment? More staff?
7. What control does the state or central government have over this department? Does the health ministry have any jurisdiction or say in the functioning?

## RESIDENTS

1. What sort of garbage do you dispose off from your house everyday? More of plastics or food?
2. Who usually disposes off the garbage in your household? Is there any supervision involved?
3. Is there anybody who comes to collect garbage from your house regularly? Is there any sort of neighbourhood initiative involved in collection, or are the Corporation workers collecting it regularly?
4. How do you describe the current state of hygiene in and around your area and Thiruvananthapuram city in general? Is it better or worse than before?
5. Who do you think is responsible for solid waste management? Should the government take full responsibility or should the public also be involved?
6. If people are dumping rubbish near your house, enough to cause a foul smell, what will you do? Will you complain to the authorities immediately? Will you take action by yourself?
7. Are you aware of the health hazards caused by the use of plastic bags? If so, why are you using it if you're still doing so? Are there any other methods of disposal you know of?
8. If there were a safe method of waste disposal started by your neighbourhood, would you contribute resources, financial or otherwise to implement or sustain it.

## APPENDIX II

### TECHNOLOGY OPTIONS FOR GARBAGE DISPOSAL (Sasikumar, 1999)

The important disposal options are:

1. **Crude dumping** is one of the most common methods in India. However it has serious problems of land and subsoil water contamination in the face of growing scarcity of land, not to mention a breeding ground for various types of infectious diseases.
2. **Sanitary land filling** is environmentally safer than crude dumping. It involves a more engineered process i.e. selecting the site, confining the refuse to the smallest practical area and volume and covering it with a layer of earth after each day of operation. The additional problem of leachate percolating to drinking water sources can occur during the rainy season. With hardly any recovery of materials except methane generated in the uncontrolled operation, as well as lining of the soil in unsuitable conditions can make the whole process costly.
3. **Incineration** is not a suitable option for India considering low calorific value ( 800 to 1400 Kcal / kg) and high moisture content (50 to 55%) of the waste generated in this country, which would make this costly.
4. **Pyrolysis** is a process by which wastes are heated to 600 to 1000 degrees Celsius in the absence of oxygen. The output consists of gases, light oils, tars, pitch, etc. Pyrolytic systems are generally more expensive than incinerators.
5. **Pelletisation**, the municipal solid waste (MSW) is strictly separated into combustible and incombustible materials and then dried to form fuel pellets containing 8 to 10 % moisture. Saw dust or coal fines are sometimes added to increase the calorific value.
6. **Biomethanation** involves separation of the MSW into organic and inorganic portions. The organic matter is ground into fine size. This slurry is then subjected to anaerobic compostion to produce a gaseous mixture of methane and carbon dioxide. This is known as biogas. An additional facility should be available to store and distribute the gas through pipelines.
7. **Composting** is biological process of converting organic solid waste into a stable soil conditioner or biofertiliser. It can be either aerobic (using microbial activity in the presence of oxygen) and anaerobic (in the absence of oxygen). Aerobic composting uses high temperatures, is free of foul odour and more rapid (4 to 6 weeks). Anaerobic composting on the other hand is characterised by low temperatures, odourous products and generally proceeds at a slower rate (4 to 6 months) compared to that of aerobic. Studies conducted by Tata Energy Research Institute and Kerala Agricultural University have highlighted the importance of aerobic mechanical composting as the most important disposal option for India. One main advantage is that such systems can handle any quantity and quality of unsorted or mixed waste.

### APPENDIX III

AMOUNT OF WASTE GENERATED IN DIFFERENT DISTRICTS IN KERALA STATE (SOURCE: PADMALAL, MAYA, 1999)

DISTRICT	MUNICIPALITY / CORPORATION	AREA	POPULATION	SOLID WASTE QUANTITY (tons/day)	PER CAPITA SOLID WASTE (g/day)
KOTTAYAM	Changanaserry	13.50	52445	10	191
	Vaikom	8.73	21788	3	138
	Kottayam	15.55	63155	16	253
	Pala	15.93	21890	6	251
ALAPPUZHA	Kayamkulam	21.79	67151	7	104
	Mavelikara	12.65	28299	3	106
	Chengannur	13.00	25872	5	193
	Cherthala	16.18	43326	5	115
	Alappuzha	46.77	174666	25	143
ERNAKULAM	Kothamangalam	40.04	35553	4	113
	Muvattupuzha	13.18	27595	6	217
	Perumbavur	13.59	24667	7	284
	Aluva	7.18	24774	12	484
	Kalamaserry	27.00	54342	5	92
	Angamaly	24.05	30391	5	165
	Thrippunithura	18.69	51078	7	137
	Kochi – Corporation	94.88	564589	250	443

APPENDIX IV

ANALYSIS OF STAFFING AND LOGISTICS OF THE HEALTH CIRCLES IN COPORATION AS ON 15<sup>TH</sup> JANUARY 2000

LIST OF HEALTH CIRCLES	WARDS SERVED BY EACH CIRCLE	NO. OF J. H. I. S	NO OF JHI VACANCIES	NO. OF PUBLIC CLEANERS	NO. OF ROAD SWEEPERS	NO. OF WORKER VACANCIES	NO. OF DISPOSAL EQUIP.	NO. OF MUST. PTS.
1. BEACH	Chackai, Pettah, Shankumghom, Titanium, Veli	2	2	25	20	5	1 pushcart 4 whlbarrws 10 cont bins	2
2. CHALAI	Chalai, Puthen street (old name)	2	1	40	25	7	6 push carts 4 whlbarrws 10 cont bins	1
3. CHENTHITTA	Thycaud, Viliyasala, Sree kanteswaram (Chenthitta division)	1	1	40	22	4 (sweepers only)	4 push carts 5 whlbarrws 12 cont. bins	1
4. FORT	Fort, Vallakadavu, Kamaleswaram, Sreevaraham	2	2	40	32	10	3 push carts 10 whlbarrws	1
5. KARAMANA	Karamana, Arannur, Nedumcaud, Kalady	1	3	35	25	1	2 push carts 4 whlbarrws 12 cont bins	2
6. MANACAUD	Manacaud, Attukal, Kalippankulam, Kuriathy	1	3	27	21	5	7 push carts 12 whlbarrws 8 cont bins	1

LIST OF HEALTH CIRCLES	WARDS SERVED BY EACH CIRCLE	NO. OF J.H.I.S	NO. OF J.H.I. VACANCIES	NO. OF PUBLIC CLEANERS	NO. OF ROAD SWEEPERS	NO. OF WORKER VACANCIES	NO. OF DISPOSAL EQUIP	NO. OF MUST. PTS
7. MEDICAL COLLEGE	Medical college, Pattom, Kamamoola	1	2	20	22	4	2 push carts 3 whlbarrws 4 cont bins	2
8. JAGATHY	Vazhuthacaud, Jagathy, Pangode	2	1	28	22	4	2 pushcarts 3 whl barrws 3 cont bins	1
9. NANTHENCODE	Nanthencode, Kuravanconam, Kesavadasapuram	1	2	30	20	4	3 push carts 1 whlbarrw 5 cont bins	2
10. PALAYAM	Palayam, Kummukuzhi,	1	1	50	32	2	6 push carts 5 whl barrw 9 cont. bins	1
11. POONTHURA	Poonthura, Ambalathara, Manickavala, Bheemapally, Valiathura	1	4	20	11	4	2 push carts 5 whl barrws 7 cont. bins	2
12. SASTHAMANGALAM	Kowdiar, Sasthamangalam, Vattiyookara, Kanjirampara	1	2	30	31	4	3 push carts 5whlbarrws 8 cont bins	2
13. SECRETARIAT	Thampanoor, Secretariat, Vanchiyoor	2	1	44	32	5	6 push carts 8 whlbarrws 16 cont. bins	1

LIST OF HEALTH CIRCLES	WARDS SERVED BY EACH CIRCLE	NO. OF J.H.I.S	NO. OF J.H.I. VACANCIES	NO. OF PUBLIC CLEANERS	NO. OF ROAD SWEEPERS	NO. OF WORKER VACANCIES	NO. OF DISPOSAL EQUIP	NO. OF MUST. PTS
14. SREEKANTESWARAM	Sreekanteswaram, Perumthanni, Rishimangalam, Palkulangara	2	2	43	30	23	5 push carts 5 whlbarrows 11 cont bins	1
15. THIRUMALA	Poojapura, Thirumala, Thrikannapuram, Mudavanmughal	2	2	25	16	8	2 push carts 6 whlbarrows 7 cont bins	2
16. GARAGE	ZONAL OFFICE ( ALL 15 CIRCLES)	1	1	60	NO VACANCIES	NO. OF VEHICLES: SHOWN IN PROCESS	NIL	

Whl barrws- wheel barrows

Cont. bins- container bins

## APPENDIX V

ECONOMIC ANALYSIS OF CORPORATION BUDGET FOR THE YEAR 1999-2000.  
LIST OF VARIOUS EXPENDITURES (Thiruvananthapuram Nagarasabha 1999):

<i>EXPENSES</i>	<i>REVENUE</i>	<i>CAPITAL</i>	<i>TOTAL</i>
1. TAX COLLECTION AND MAINTENANCE	79923000	450000	84423000
2. PUBLIC WORKS	38899000	168035000	206934000
3. TOWN PLANNING	3495000		3495000
4. EDUCATION	1566000	2500000	4066000
5. WATER SUPPLY	1000000	5000000	6000000
6. PUBLIC HEALTH	81859500		81859500
7. STREET LAMP LIGHTING	21600000	7500000	29100000
8. MUNICIPAL ASSETS	280000		280000
9. OPERATION COSTS OF INSTITUTIONS PREVIOUSLY HANDED OVER	62675000		62675000
10. POVERTY ALLEVIATION PROJECTS		55500000	55500000
11. WORLD BANK FUNDED RCH PROJECT	20000000	40000000	60000000
12. OTHER EXPENSES	1000000		1000000
13. PUBLIC EXPENSES		232600000	232600000
14. PEOPLE'S PLANNING		334218000	334218000
SUB TOTAL			116,21,50,500
EXPENSES PAYABLE			5,07,50,000
TOTAL			<b>121,29,00,500</b>

Or approximately 121.29 crores.

REVENUE ACCOUNT 1999-2000

INCOME	Rs.	EXPENDITURE	Rs.
Previous year balance	32162435		
<b>1. TAXES &amp; RATES</b>	219780000	1. ADMIN. & TAX COLLECTION EXPENSES	79923000
<b>2. INCOME FROM OTHER LAWS</b>	57600000	2. PUBLIC WORKS	38899000
<b>3. PROPERTY TAX</b>	19090000	3. TOWN PLANNING	3495000
<b>04. MUNICIPAL FEES</b>	21270000	4. EDUCATION	1566000
<b>5. GRANTS &amp; OTHER INCOME</b>	57600000	5. WATER SUPPLY &DRAINAGE	1000000
<b>6. GRANTS RECEIVED FOR EXPENSES OF ESTABLISHMENTS</b>	62675000	6. PUBLIC HEALTH	81859500
<b>7. RCH PROJECT BY WORLD BANK</b>	20000000	7. STREET LIGHTING	21600000
<b>8. MISC. INCOME</b>	2205000	8. MUNICIPAL PROPERTIES	280000
		9. EXPENSES FOR THE ADMIN OF TRANSFERRED ESTABLISHMENTS	62675000
		10. RCH PROJECT FUNDED BY WORLD BANK	20000000
		11. MISC. EXP.	1000000
<b>TOTAL</b>	460220000	<b>TOTAL</b>	312297500

CAPITAL ACCOUNT

<i>INCOME</i>	<i>Rs.</i>	<i>EXPENDITURE</i>	<i>Rs.</i>
<b>Amt. Shifted from revenue to capital a/c for poverty alleviation programs.</b>	140005000		
<b>1. GOV'T GRANTS</b>	54530000	1. MANAGEMENT EXPENSES	450000
<b>2. GOV'T LOANS</b>	20100000	2. P.W.D.	168035000
<b>3. LOANS FROM FINANCIAL INSTITUTIONS</b>	261000000	3. EDUCATION	2500000
<b>4. DEPOSITS RETURNED</b>		4. WATER SUPPLY AND SEWERAGE	5000000
<b>5. ENDOWMENT FUND</b>		5. STREETLIGHTING	7500000
<b>6. SCHEMES FOR GOV'T TRANSFERRED INSTITUTIONS</b>		6. PUBLIC HEALTH	
<b>7. GOV'T GRANT FOR PROJECTS UNDER PEOPLE'S PLAN CAMPAIGN</b>	334218000	7. ENDOWMENT	
<b>8. RCH PROJECT WITH WORLD BANK AID</b>	40000000	8. DEPOSITS	
<b>SUB-TOTAL</b>	1202230435	<b>SUB-TOTAL</b>	1202230435
<b>DEBT HEAD / LIABILITY A/C</b>	50750000	<b>DEBT HEAD / LIABILITY A/C</b>	5070000
<b>GRAND TOTAL</b>	1252980435	<b>GRAND TOTAL</b>	1252980435

BREAKDOWN OF TOTAL EXPENDITURE UNDER THE PUBLIC HEALTH ACCOUNT:

	1997-1998 AUDITED AMOUNT	1998-1999 BUDGET AMOUNT	1999-2000 BUDGET AMOUNT
1. MEDICAL SERVICES	-	-	-
2. MATERNAL & CHILD HEALTH CARE	2548883	4590000	5050000
3. OTHER HEALTH SERVICES	371476	485000	600000
4. HEALTH ESTABLISHMENTS (MINISTERIAL)	2022177	2165000	3085000
5. SANITARY ESTABLISHMENTS	1758301	2540000	2885000
6. D&O LICENSING AND CHECKING	4252604	3520000	4675000
7. PUBLIC SANITATION	52046885	53800000	59750000
8. IMMUNIZATION	-	-	-
9. BIRTH & DEATH REGISTRATION	-	826000	1151000
10. CONTAGIOUS DISEASES	377935	550000	525000
11. MOSQUITO CONTROL	1057821	3155000	2955000
12. FESTIVAL/ CELEBRATION EXPENSE	-	500000	500000
13. ANTI -FOOD ADULTERATION EXP.	104500	426000	483500
14. BURIAL AND BURNING GROUNDS EXP	325102	200000	200000
15. POOR PEOPLE SHELTER / REHABILITATION CENTRE EXPENSES			
<b>TOTAL</b>	<b>64865684</b>	<b>72757000</b>	<b>81859500</b>

BUDGET YEAR

PUBLIC SANITATION	1997-1998	1998-1999	1999-2000
1. SALARY AND ALLOWANCES OF	42046138	40000000	45000000
CONTINGENCY			
WORKERS			
2. PENSIONS AND OTHER	1000000	6000000	6750000
CONTRIBUTIONS			
3. CONTINGENTS	-	300000	300000
(UNIFORMS, FOOTWEAR,			
ETC.)			
4. VEHICULAR	8313142	6500000	7000000
EQUIPMENT			
5. FUEL EXPENSES	687605	500000	700000

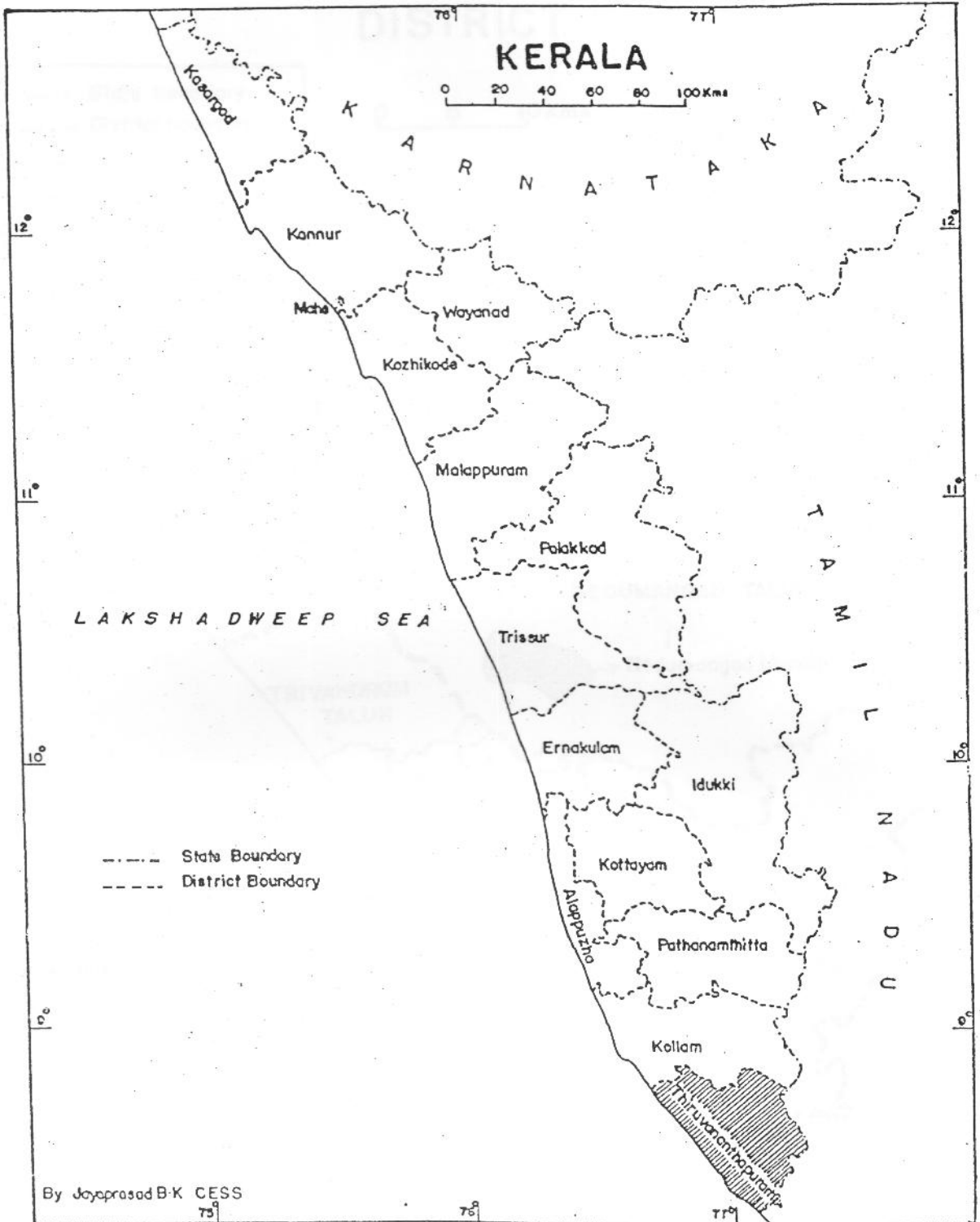
## APPENDIX VI

### DEVELOPMENT OF THIRUVANANTHAPURAM MUNICIPALITY AND CORPORATION (Thiruvananthapuram Nagarsabha, 1998).


- 1894- Thiruvananthapuram town improvement committee was formed.
- 1895- **First sanitary inspector appointed in Thiruvananthapuram.**
- 1897- **Push carts started to be used for the first time for garbage disposal.**
- 1901- Committee given power to collect taxes.
- 1903- **Steps were taken to clean public places.**
- 1904- **House to house scavenging (collection of night soil) implemented.**
- 1920- Thiruvananthapuram municipality came into existence.
- 1928- **Clean water distribution programme started.**
- 1940- Corporation came into existence in 30.10.1940.
- 1940- Division of the city into 24 wards. **First Cleaning campaign inaugurated.**
- 1941- Estimated population of 128480 for these 24 wards.
- 1942- 32 member council formed – 24 elected members and 8 government nominees.
- 1944- Cost value of buildings taken into consideration for allowing repair charges, house tax water tax and drainage tax and lighting. Scavenging fee was inducted – Previously, it was a flat rate of Rs 1 then increased on the basis of building value ie between Rs 4 per annum to Rs 12 per annum.
- 1945- **Under ground drainage system implemented.**
- 1953 – 32 member council became 40 member council. 24→32 wards
- 1958- **Scavenging work stopped.**
- 1959- **Sanitary type toilets scheme implemented.**
- 1960 – New council formed under Kerala Municipal Law Amendment Act.
- 1964 - New 45-member council came into being under Kerala Municipal Corporation Act 1961. 32→42 wards
- 1970 - 45 => 46 as per Amendment of Kerala Municipal Corporation Act. 42→46 wards
- 1972 – ‘C’ class city → ‘B’ class city.
- 1975- Council disbanded by gov’t.
- 1976- Corporation became under the control of administrators.
- 1979- New 50 member council was formed.
- 1984- After term of council finished, Corporation was again under the control of administrator.
- 1986 – 46→50wards
- 1988- New 50 member council appointed
- 1994 - After term was over, administrator was in control until 1995. Kerala Municipality Act came into being.
- 1995 - A new council was formed under this Act. Out of the 50 members , 4 were from SC/ST and 17 for women.
- 1996 -97 **Brighter city scheme 2<sup>nd</sup> phase included solid waste management/civil works project implemented at Villipsala.**

# APPENDIX VII

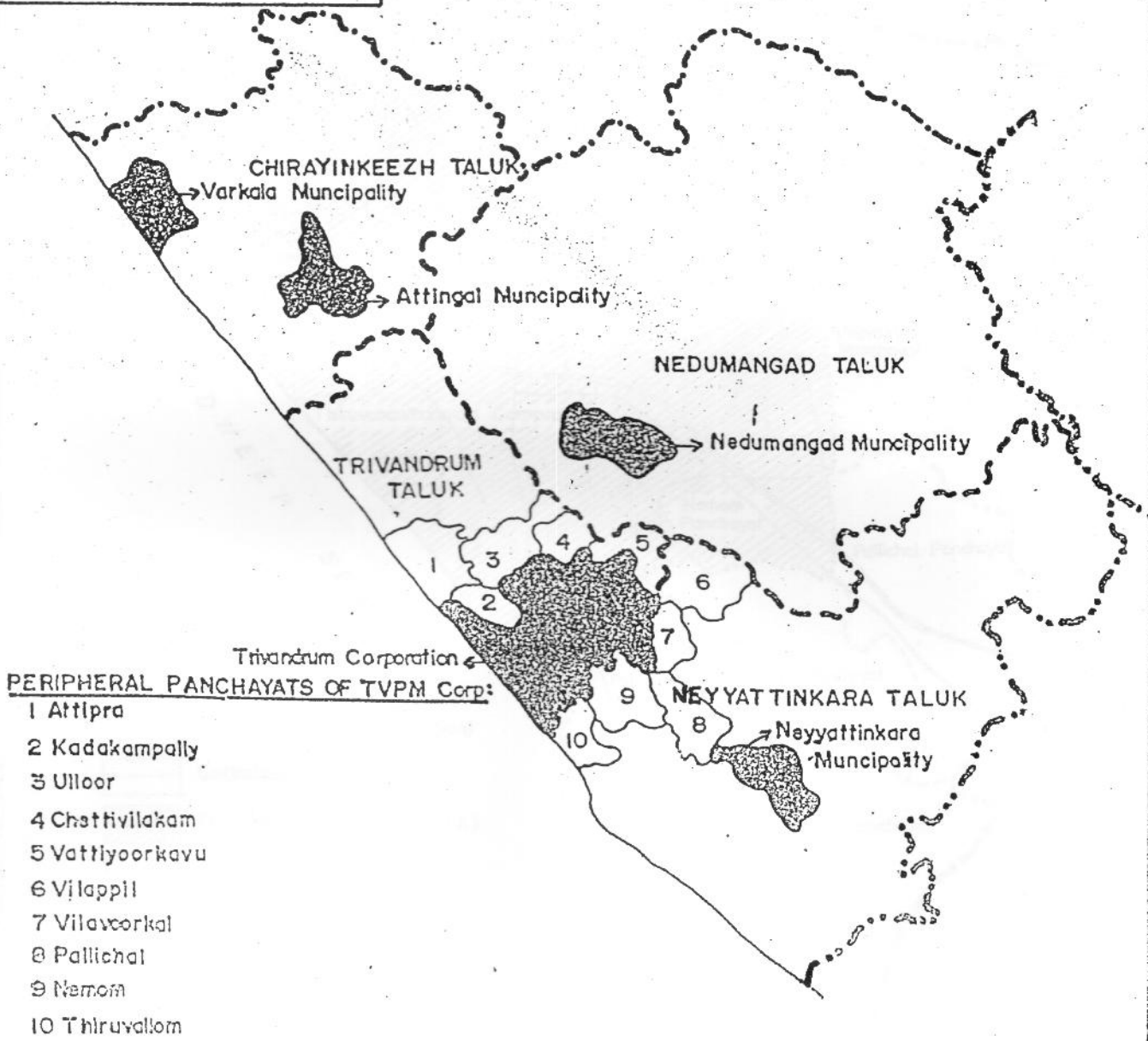
MAPS OF KERALA STATE, THIRUVANANTHAPURAM DISTRICT, CITY AND WARDS (Thiruvananthapuram Nagarasabha, 1998).



# THIRUVANANTHAPURAM DISTRICT

- State boundary
- . - . - District boundary
- - - Taluk boundary
- Panchayat boundary
-  Urban Centre

0 5 10 Kms

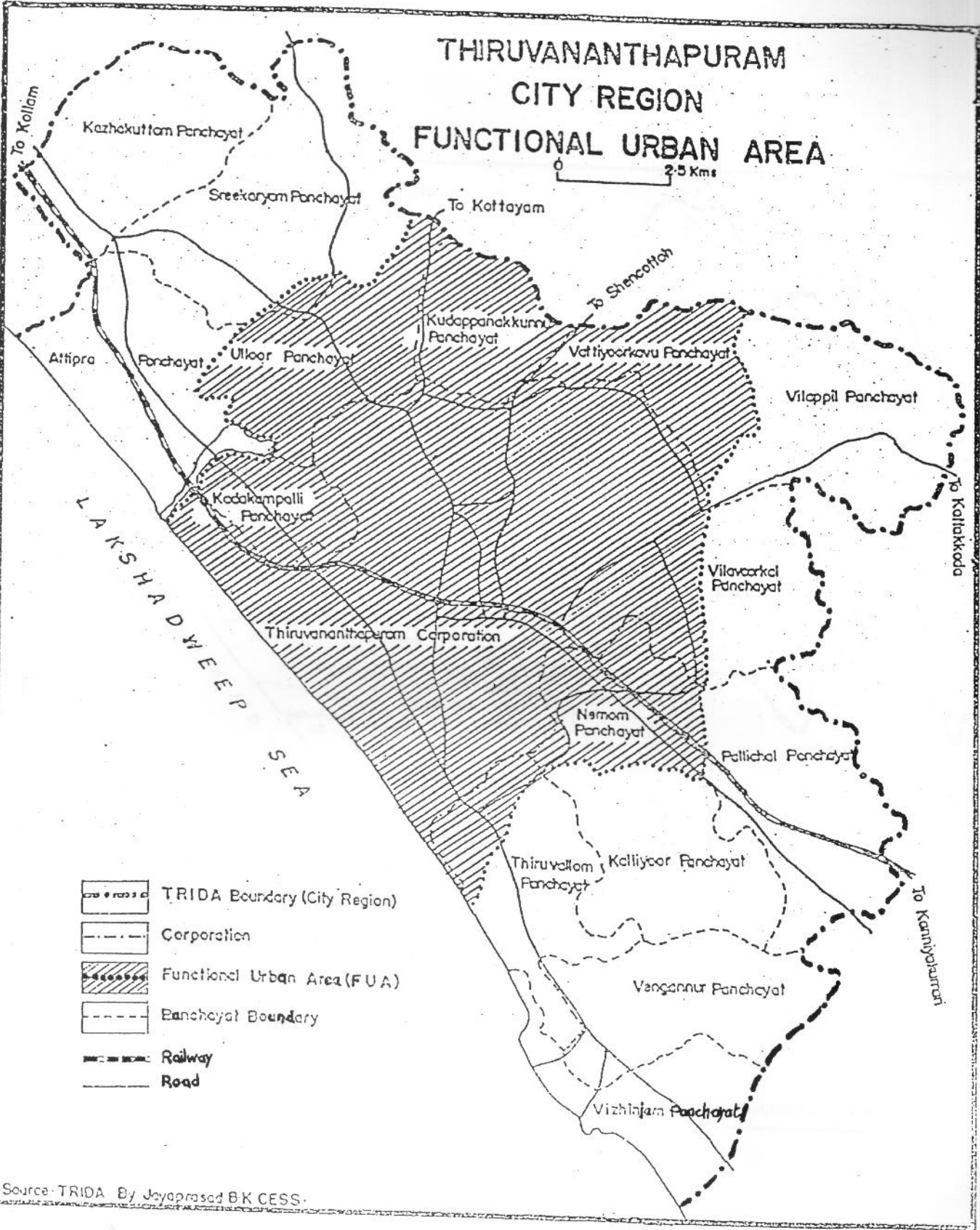








- Trivandrum Corporation
- PERIPHERAL PANCHAYATS OF TVPM Corp:
- 1 Attipra
  - 2 Kadakampally
  - 3 Ulloor
  - 4 Chettivillakam
  - 5 Vattiyoor kavu
  - 6 Vjilappil
  - 7 Vilavorkal
  - 8 Pallichal
  - 9 Namom
  - 10 Thiruvallom

Source: Census Hand book  
Compiled by B. K. Jayaprasad CESS

# THIRUVANANTHAPURAM CITY REGION FUNCTIONAL URBAN AREA

0 2.5 Kms



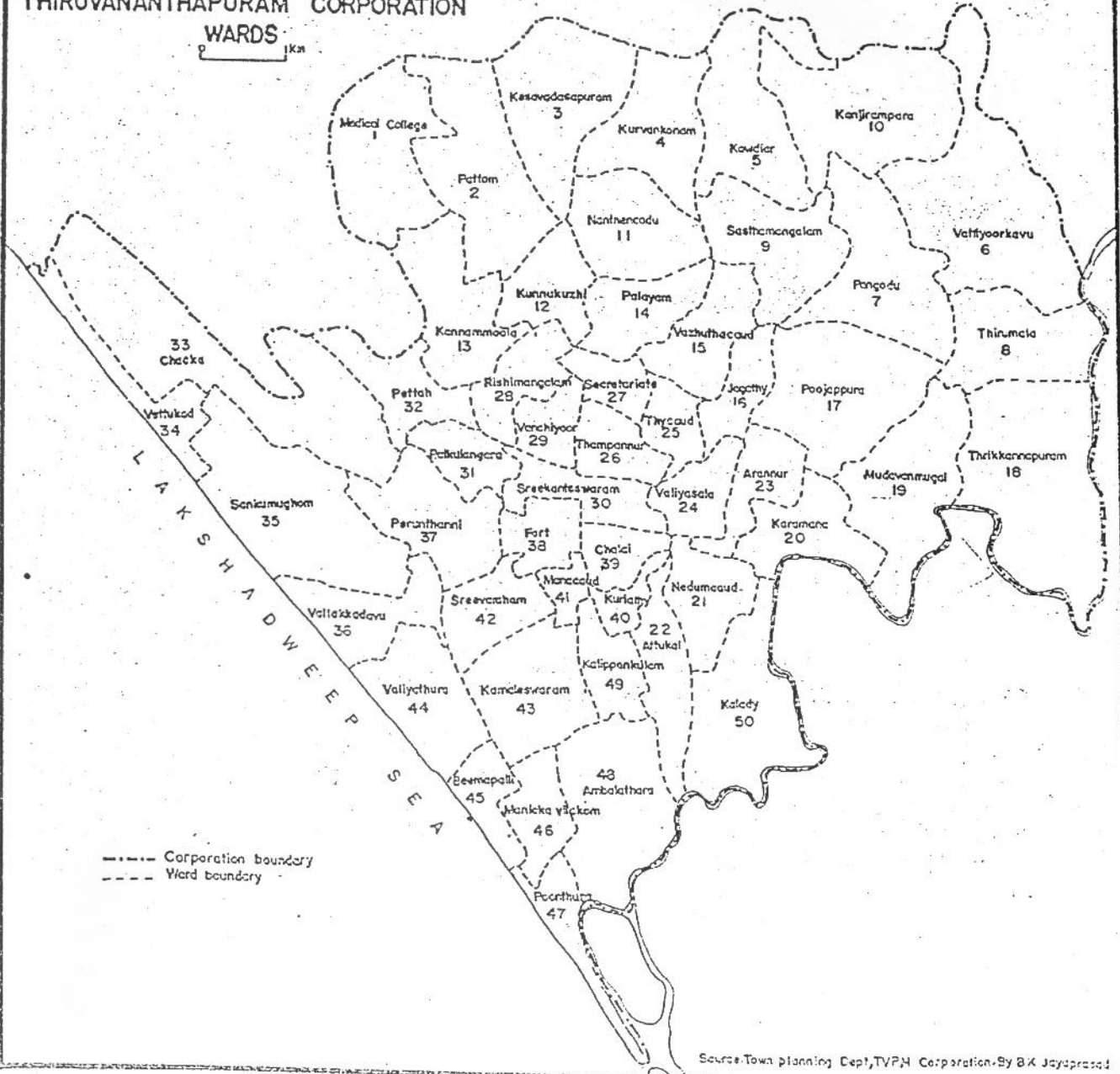
-  TRIDA Boundary (City Region)
-  Corporation
-  Functional Urban Area (FUA)
-  Panchayat Boundary
-  Railway
-  Road

Source: TRIDA By Jayaprasad BK CESS.

# THIRUVANANTHAPURAM CORPORATION

## WARDS

1 Km



Source: Town planning Dept, TVPN Corporation, By B.K. Jayaprasad