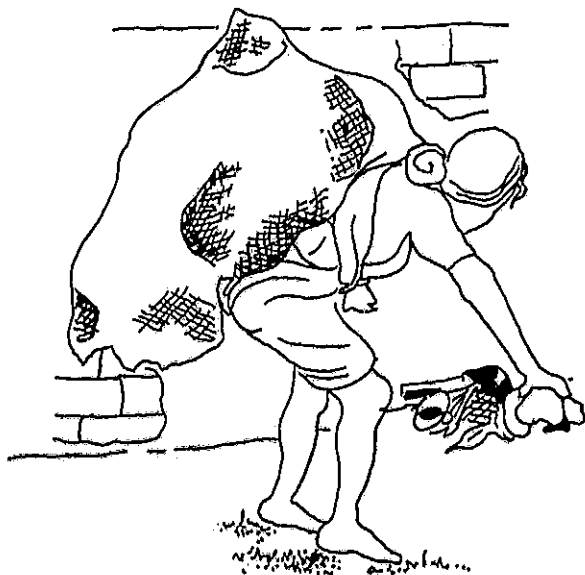


# THE WEALTH OF WASTE

WASTE PICKERS, SOLID WASTES AND URBAN DEVELOPMENT

SANDHYA VENKATESWARAN



**FRIEDRICH  
EBERT   
STIFTUNG**

# **The Wealth of Waste**

**Waste pickers, solid wastes and  
urban development**

**Sandhya Venkateswaran**

**A 94 - 01881**



First Published in 1994

© Friedrich-Ebert-Stiftung, 1994

No part of this book may be reproduced without proper authorization by the publisher.

Published by the Friedrich-Ebert-Stiftung, New Delhi  
Designed, Typeset and Printed by  
New Concept Information Systems Pvt. Ltd.,  
H 14/16, Basement, Malviya Nagar, New Delhi - 110 017,  
Phones: 647 5608, 647 9580.  
Printed at Pauls Press, E 44/11 Okhla Phase II, New Delhi 110 020.

## FOREWORD

The negative impacts of rapid urbanisation processes in developing countries are one of the most important issues today. Many people are leaving rural areas in order to seek employment opportunities in the cities. It is estimated that e.g. in Delhi 250,000 migrants are arriving in Delhi every year.

Waste picking is one of the major occupations in the informal sector taken up by the migrants due to lack of alternatives. Out of the total workers in the urban informal sector 75 per cent are women. 90 per cent of the waste picking population in India are women and children. This work contributes considerably to the removal of waste which could not be collected by the limited capacities of the respective municipal authorities.

In this book "The Wealth of Waste", Sandhya Venkateswaran analyses the socio-economic situation of ragpickers, the majority of whom are women and children, and various initiatives by Non-Governmental Organisations to improve their working and living conditions. She reports about ragpickers in various cities in India and other countries.

The Friedrich-Ebert-Stiftung (Friedrich Ebert Foundation) is a non-profit research and education institution, committed to the concepts and basic values of social democracy. Its wide-ranging activities in the field of political education and assistance to partners in developing countries include, inter alia, comprehensive projects in the areas of societal development, labour unions, political structures, business, science, scholarships and culture.

In order to facilitate the discussion of vital themes related to the developmental process in India, the Friedrich-Ebert-Stiftung publishes a series of Indian contributions, of which this volume is a part. The views expressed in this volume do not necessarily reflect those of the Friedrich-Ebert-Stiftung.

*Beate Martin*  
*Friedrich-Ebert-Stiftung*  
*New Delhi*  
*March, 1994*

## Acknowledgements

*I am grateful to the Friedrich Ebert Foundation for supporting this study and specially to Beate Martin who contributed to the study through several discussions and ideas. My thanks also to R. C. Jain, from the Municipal Corporation of Delhi, for being generous with his time, ideas and documents.*

*This study would not have been possible without the help and cooperation of several women, children and men who make a living from waste picking, in the slums of Motia Khan, Jahangirpuri and Rashtriya Camp, Pusa Road in Delhi. Thanks are also due to the NGOs Street Survivors and Chetanalaya, working in these areas, who provided support in numerous ways.*

# CONTENTS

	<b>Page</b>
<b>INTRODUCTION</b>	
Development Trends and Urbanisation	1
Women and Children as Workers	8
Need for an Alternate Model for Urban Development	11
<b>SOLID WASTE MANGEMENT IN INDIA-- PRACTICES AND ISSUES</b>	
Generation of Waste	14
Waste Management Practices	20
Environmental Aspects of Waste Storage/Disposal	24
Investments in Solid Waste Management	26
Extent and Coverage of Solid Waste Management Services and Emerging Issues	28
<b>WASTE OR RESOURCE? - ISSUES IN RECYCLING</b>	
Nature of Recycling Activities	33
Extent of Current Recycling and Future Potential	35
Economic and Ecological Implications of Recycling	38
The Processes of Resource Recovery for Recycling	39
<b>PROFILE OF WASTE PICKERS</b>	
Social and Demographic Profile	41
Waste Pickers as Migrants	44
The Compulsions for Scavenging	46
Conditions around Waste Picking	49
Economic and Work Profile	52
Intra Household Dynamics of Waste Picking	57
Occupational Mobility	61
<b>ROLE OF WASTE PICKERS IN WASTE MANAGEMENT</b>	
Ecological Contributions	65
Economic Contributions	66

## GOVERNMENT AND NGO RESPONSES

Government Policy and Initiatives	69
Non-Government Responses	71
Interventions from Private Entrepreneurs	81

## CONCLUSION

85

## REFERENCES

93

## LIST OF TABLES

1.1	Trend of Urbanisation in India	2
1.2	Reasons for Migration to Urban Areas, 1981	3
1.3	Slum Population in Selected Metropolitan Cities – 1981 & 1990	5
1.4	Urban Population Projection – India, 1991-2001	11
2.1	Typical Refuse Generation Rates in Different Countries	14
2.2	Per Capita Waste Generation in Different Countries	15
2.3	Composition of Waste in Different Countries	16
2.4	Comparison of some Physio-Chemical Characteristics of Waste	16
2.5	Average Physical Analysis of Indian City Refuse	18
2.6	Physical Analysis of Bangalore City Refuse	19
2.7	Per Capital Expenditure on Solid Waste Management in Different Countries	26
2.8	Municipal Corporation of Delhi Expenditure on Solid Waste Management	27
2.9	Manpower Provision Per 1000 Population for Solid Waste Management	28
2.10	Refuse Disposal Level as Proportion of Refuse Generation by Size Class of Cities, 1986-87	29
3.1	Demand for Plastic in India	35

3.2	Effective Installed Capacity and Production for Paper and Paper Boards	36
3.3	Projected Demand/Supply Balance for Paper, Paper Boards and News Print	37
4.1	Comparative Prices of Waste Items in Delhi (1993)	56

## LIST OF FIGURES

1.1	Rural to Urban Migration	4
1.2	Provision of Basic Services (All India)	6
1.3	Percentage of Workers Employed in Informal Sector	9
2.1	Composition of Waste in India	17
4.1	Percent Distribution of Waste Picking Population in India	42

## LIST OF BOXES

4.1	Waste Picking as an Occupation amongst Street Children	43
4.2	Not a Matter of Choice	48
4.3	The 'Crime' of Waste Picking	51
4.4	Only for Women?	58
4.5	Childhood in Waste	59
4.6	Once a Waste Picker, always a Waste Picker	62
6.1	The Paper Pickers Cooperative–SEWA	74
6.2	Mythri Sarva Seva Samithi–Waste Wise	76
6.3	The Zabbaleen Environmental and Development Programme	77
6.4	Waste Pickers of Columbia	79
6.5	The Clean-Green Project in Metro Manila	80
6.6	A State Run Approach–Shanghai	81
6.7	Extending the Concept of Recycling	82

## INTRODUCTION

### DEVELOPMENT TRENDS AND URBANISATION

Development priorities in India, over the past decades, have been reflected by increasing industrialisation and the consequent, real or perceived, creation of jobs in urban areas on the one hand and increasing unemployment and the seeming lack of income generating options through most of rural India on the other. Urban growth, in such a situation, has proved to be one of the most consistent characteristics of development trends in India. Be it large metropolitan cities, medium towns or small/semi-urban townships, the tempo of urbanisation has not faltered over the past several decades.

The result reflects itself in a population demographics which displays a somewhat lopsided rural-urban distribution. Whereas in 1911, only 10.29 percent of the total population lived in urban areas, at present, the urban population represents over 25 percent of the country's total population (see Table 1.1). India's urban population is in fact, one of the largest in the world.

A look at the factors determining the composition of the country's population point to the significant role played by rural-urban migration. The National Commission on Urbanisation, in 1988, estimated that as much as 40 percent of urban growth is accounted for by rural-urban migration. Natural increase, on the other hand, accounted for another 41 percent and the remaining 19 percent was attributed to reclassification. Clearly, migration constitutes a key determinant of urban dynamics. The pace of migration (see Figure 1.1) is reflected by the rate of increase of migrants to urban places, which during 1971-1981 was 48 percent (NIUA, 1988).

Whereas the determinants for rural-urban migration are many (see Table 1.2) : employment being the prime cause of male migration and marriage and associational migration being the dominant considerations for females, the resultant situation in urban centres is largely the same. Pressures on housing, employment, public transport and other basic services have emerged as the key characteristics of most urban centres.

Pressures on housing have given rise to vast slum settlements whereas a dearth of employment opportunities within the formal sector have created an

TABLE 1.1 Trend of Urbanisation in India

Census years	Total Population	Urban Population	No. of towns/UAs	Percentage of urban population to total population	Decadal urban growth rate (%)	Tempo of urbanisation (person per year)		
						Annual exponential growth rate	Annual gain in percentage of urban population	Annual rate of gain in percentage of urban population
1901	238,396,327	25,851,873	1,827	10.84	0.00	0.00	0.00	0.00
1911	252,093,390	25,941,633	1,815	10.29	0.35	0.03	-0.06	-0.51
1921	251,321,213	28,086,167	1,949	11.18	8.27	0.79	0.09	0.86
1931	278,977,238	33,455,989	2,072	11.99	19.12	1.75	0.08	0.72
1941	318,660,580	44,153,297	2,250	13.86	31.97	2.77	0.19	1.56
1951	361,088,090	62,443,709	2,843	17.29	41.42	3.47	0.34	2.47
1961	439,234,771	78,936,603	2,365	17.97	26.41	2.34	0.07	0.41
1971	548,159,652	109,113,977	2,590	19.91	38.23	3.21	0.19	1.08
1981	683,329,097	159,462,547	3,378	23.34	46.14	3.83	0.34	1.72
1991	844,324,222	217,177,625	3,768	25.72	36.19	3.09	0.24	1.02

Note : 1. Including Projected Population of Assam, 1981.

2. Including Projected Population of Jammu & Kashmir, 1991.

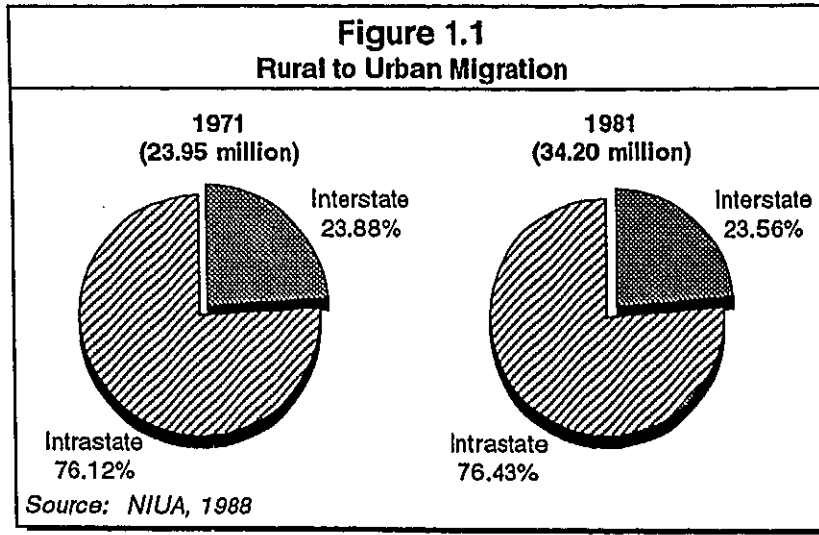
Source : Census of India, 1991 (Provisional Population Total) Paper-2 Rural-Urban Distribution. in NIUA, 1993.

TABLE 1.2 Reasons for Migration to Urban Areas, 1981

Place of last residence	Reasons for migration											
	Total migrants		Employment		Education		Family Moved		Marriage		Others	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Total migrants	100	100	43.14	4.20	6.61	2.36	27.31	32.51	1.06	46.61	21.88	14.32
Last residence elsewhere in India other than the place of enumeration	100	100	44.87	4.31	6.89	2.42	26.76	32.08	1.09	48.07	20.39	13.12
Within the state of enumeration	100	100	40.50	4.08	7.99	2.45	28.52	30.46	1.30	49.92	21.69	13.09
States of India beyond the state of enumeration	100	100	55.49	5.13	4.12	2.31	22.48	37.83	0.60	41.53	17.22	13.20
Other countries	100	100	15.24	1.96	2.08	1.10	36.26	14.44	0.46	16.47	45.96	39.03

Source : Census of India, 1981, Report and Tables based on Five Percent Sample Data in NIUA, 1988





ever increasing, parallel, informal sector of employment. The provision of public services and infrastructure, moreover, being the responsibility of the government, have not only been inadequate for the increasing urban population but unevenly distributed, bypassing those without a clout or an ability to pay. Potable water is not available to a significant proportion of the urban population; more than half of the same population is not covered by sanitation and increasing quantities of solid wastes litter the streets as the current systems prove inadequate in efficient collection and disposal.

#### Availability of basic amenities

Currently the urban housing shortage in the country has been estimated at 6.9 million houses (NIUA, 1993). The absence of clear policies on low cost housing to address, specially, the needs of the ever increasing migrants into the city has created such large slum settlements across the country that the sheer magnitude of the settlements now inhibit the formulation of any alternatives. Although the precise slum populations have not been worked out after 1981, the 1990 estimates for the same revealed that more than 21 percent of the total urban population comprised slum inhabitants whereas in 1981 this percentage was about 17.5 (TCPO, 1985). The same estimates revealed that for most metropolitan cities the slum population exceeded 30 percent, and in some cases was as much as 35 percent (see Table 1.3).

**TABLE 1.3** Slum Population in Selected Metropolitan Cities – 1981 & 1990

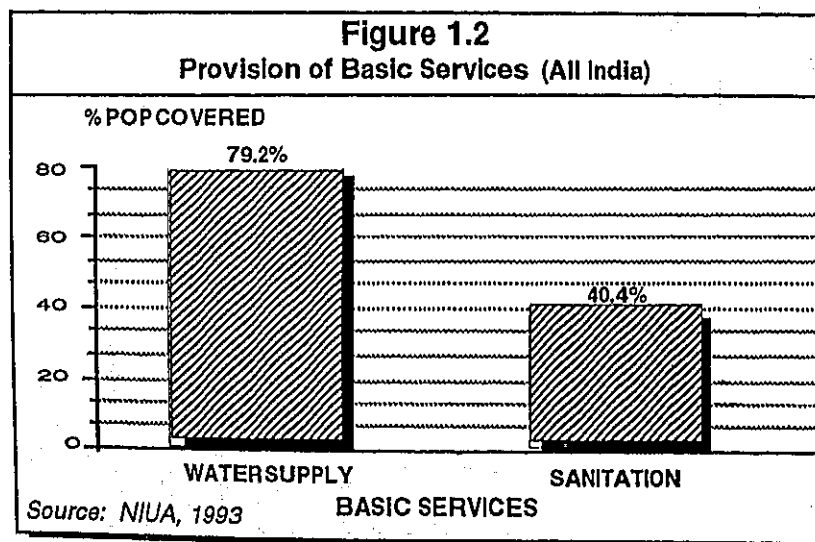
Cities	Urban pop (1981)		Slum Population (1981)		Estimated Urban pop. (1990)		Estimated slum population (1990)	
	No.	%	No.	%	No.	%	No.	%
Calcutta	91.94	32.9	30.280	32.9	125.33	43.86	35.00	
Greater Bombay	82.43	34.3	28.314	34.3	117.89	41.26	35.00	
Delhi	57.29	31.4	18.000	31.4	97.67	32.08	32.85	
Madras	42.89	32.1	13.630	32.1	60.22	21.08	35.00	
Bangalore	29.21	10.4	3.050	10.4	51.86	10.37	20.00	
Hyderabad	25.45	19.6	5.000	19.6	37.07	11.12	29.45	
Ahmedabad	25.48	20.3	5.363	20.3	37.76	11.33	30.01	
Kanpur	16.39	37.5	6.140	37.5	22.84	8.00	35.03	
Pune	16.86	16.3	2.743	16.3	25.73	5.15	20.02	
Nagpur	13.02	31.9	4.161	31.9	18.82	5.64	30.00	
Lucknow	10.07	28.3	2.850	28.3	13.12	3.94	30.03	
Jaipur	10.15	29.1	2.960	29.1	16.34	4.90	29.99	

Source: A compendium of Indian slums, TCPO, September, 1985 in NIUA, 1993

Increasing urban populations demand a corresponding increase in public services, which the government authorities are seldom able to provide adequately. It is estimated that 79.2 percent of the total urban population is covered by water supply schemes (see Figure 1.2) and only 40.4 percent of the same is covered under sanitation (NIUA, 1993). Rough estimates reveal that as much as 30 percent of municipal wastes are left uncollected in urban centres. The situation is much worse when this data is viewed in the context of the spatial distribution of these services, which reflects large intra-city variations in the level of services provided.

In such a situation it is the urban poor who are deprived of these most basic services. An extensive survey conducted by the National Institute of Urban Affairs during 1988 in 589 slums across the country found that only 41 percent of the slums had rubbish depots, less than 30 percent had any community toilets and that the average number of people serviced by each handpump in the slum exceeded 1500 whereas for the tap it exceeded 300 (NIUA, 1991 b).

These slums are then typically characterised by an excessive lack of basic services leading to unimaginably unhygienic living conditions, where several people are cramped into extremely small living spaces. Ill health and disease are rampant, there is no security of accommodation as the settlements are illegal, exploitation from local leaders abounds, compounding the vulnerability of the most vulnerable of the urban population.



Despite industrial growth, the nature of development has been such that an increasing proportion of the urban population lives at the margin of existence, often in acute poverty, and despite the reasons for changing residence to urban centres, their quality of life in these urban cities is abysmal. Planning Commission estimates (in 1983-84) for urban poverty revealed that more than 28 percent of the country's urban population lived below the poverty line (NIUA, 1988).

#### Employment opportunities and the informal sector

Even though industrialisation has created jobs, the expansion in employment opportunities has not been in balance with the additions to the labour force; the demand for jobs has in fact far outweighed supply. It was estimated that out of the five million people added to the labour force of urban areas every year in India (1985 data), only 10 percent were able to find employment in the organised sector (National Productivity Council in NIUA, 1991). Once again then, it is the poor, and specifically the migrants, who have found it increasingly difficult to enter the formal systems of employment. Lack of skills and education, absence of references and 'contacts', the inability to pay securities or their way into jobs are only some of the factors that contribute to the marginalisation of this segment of society from the visible economy.

The need for survival, however, on the one hand and the growing needs of urban centres on the other, have created parallel informal sectors within the economy. These informal sectors are estimated to engage anywhere between 50 percent to 75 percent of the urban workers (NIUA, 1990). The significance of these parallel sectors within the economy is somewhat illustrated by calculations made during 1971-1981 which found that during that period the unorganised sector had grown by 84.5 percent whereas the organised sector merely by 42.2 percent (Deshpande and Deshpande in NIUA, 1991). Unable to find their place in the formal systems, the poor are then found dominating the informal sector, as most activities within this sector do not require much skill or education.

Even though the informal sector activities account for more than 60 percent of the total transactions in urban areas, urban planning has mainly concerned itself with formal economic activities (ILO and NIUA, 1990). Consequently, the informal/unorganised sectors, which could range from self employment, casual labour, piece rate work to regular wage labour, are typically characterised by abysmal working conditions, with little security of

work or wages, irregular and long hours, excessive exploitation and no support structures.

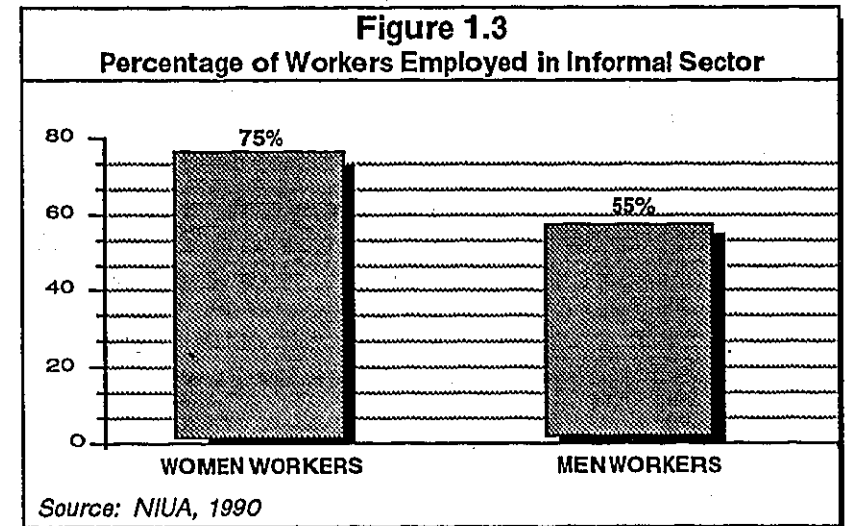
Despite these different forms of employment, as also the abysmal conditions surrounding much of the work in this sector, even the informal sector is not always adequately able to fulfil the employment/income needs of the population. Out of such situations, when even the regular or casual/contract wage work within the informal sector is out of reach of considerable segments of the urban population, as also self employment which may require investments, are born occupations such as waste picking or rag picking as it is commonly called.

Involving the retrieval of recyclable items from mounds of refuse or dirty street sides, it is not surprising that waste picking finds its place at the bottom of the social and economic hierarchy of activities within the informal sector. Despite this status, it is commonly adopted as a survival mechanism, linking in the process, the distinct situations created by adopting a specific development/growth path. For, on the one hand, this activity is born out of a complete absence of options and a desperate need to survive in an overwhelmingly overcrowded labour market; and on the other, deflecting resource which create the need for recycling coupled with inadequately provided public services create the scope for such an activity.

To understand who precisely constitutes the backbone of this activity, it would serve to take a look at the larger informal sector to identify the dominant participants. Contrary to common belief that women and children, who comprise more than 60 percent of the urban population, do not constitute any significant percentage of the work force, the informal sector in fact, includes a high percentage of both women and children.

### WOMEN AND CHILDREN AS WORKERS

It has been fairly well established that as production gets mechanised/industrialised, the demand for male skilled labour increases, forcing women to take up jobs not usually preferred by men (NIUA, 1991). As a result men are likely to have a greater mobility out of the informal sector while women tend to remain embedded in it. Lack of education and skill formation, among other reasons, most often constrain women from entry into the formal sectors. Thus it has been found that women who work are mainly concentrated in informal sector activities (ibid). National Sample Survey estimates reveal that as much as 75 percent of women workers are 'casually employed' or self



employed (see Figure 1.3), whereas for men 55 percent constitute this category (NIUA, 1990).

Moreover, it has been observed that whereas the economic participation of men in low income households is comparable to the average urban male participation rate, in case of females the former is four times higher than the latter, suggesting that the income level of households affects the economic participation of women (NIUA, 1991). Studies have placed the participation rate of women in low income households anywhere between 42 percent and 93 percent (NIUA, 1990). And since the low income households are predominantly engaged in the informal sector, the largest percentage of women workers are likely to be found in this sector.

Similarly, estimates of working children reveal that India has the largest number of working children in the world and accounts for more than 33 percent of the child labour force throughout the world (ICFTU-APRO, not dated). Within India, more than 20 percent of the Gross National Product (GNP) of the country is estimated to be contributed by child labour (ibid). These statistics however, as well as other government data on the number of child workers in the country, lose their meaning in view of the partial coverage of government figures - usually including only those children in regular/formal employment, ignoring the marginal, irregular, non paid or self employed workers all of whom constitute a very high proportion of the child work force. As labour and other organisations concern themselves with

working children, they focus their attention on issues of age of employment, working conditions, wages etc. - most of which relate to children employed by an external employer. What usually escapes the attention of such organisations is the multitude of children that are self employed in a wide range of activities.

Specifically, it has been pointed out that as much as 90 percent of India's child workers are engaged in the unorganised sector (NLI, 1992). Associated with growing urbanisation is not only migration but also a breakdown of the traditional family and community structures, which have all combined to create a vulnerable group of urban children called 'street children', the majority of whom work within the informal sector to survive.

Significantly, and again contrary to what is commonly believed, the contribution of women and children to the household, from their activities within the informal sector, is not marginal but crucial to the survival of the households. Women in the informal sector do not work merely on a part time basis, to supplement family income but work nearly as long as men and contribute as much to family resources as men do; in some cases being the main earners in the family (NIUA, 1991). Moreover, a large proportion of them work, or rather have to work, every single day of the year, which further reinforces the critical role of their income within the household. A large proportion of children similarly, not only work full time but their income constitutes as much as 30 to 40 percent of total family income.

The reasons for pursuing activities in the informal sector, and for a specific activity within this sector, are usually based on a lack of options. The lack of education and skill on the one hand, and the need for flexible hours of work within the demands of their gender determined responsibilities on the other, most often constrain women to the informal sector. Within the informal sector, lack of capital, lack of work space and absence of skills often determines the specific activity they can pursue. Moreover, government interventions for the poor have been such that usually men have benefitted from subsidised credit schemes, whereas women, in the absence of collateral, which is specially so for the majority of migrant women, have had no access to credit. In such a situation even if they are provided training for production related activities, they are unable to take them up. Activities such as waste picking, which require neither skill, education nor capital, then provide one of the few real options. Occupational mobility is found to be extremely low amongst women in the urban informal sector (NIUA, 1991) and

this would hold specially so for activities such as waste picking where no skill formation takes place in the process of performing the activity.

The conditions of work within the unorganised sector and the potential for exploitation assume far greater significance/proportion in the context of the vulnerability of women and children. Women for example, are constrained at two levels, one arising on account of the nature of the sector and the other, on account of their sex. Gender based discriminations within the informal sector abound, both in terms of the kind of activities that men and women perform (or even tasks within an activity) and in terms of the wages they are paid.

#### NEED FOR AN ALTERNATE MODEL FOR URBAN DEVELOPMENT

Clearly, the existing patterns of development are unlikely to arrest the pace of urbanisation. It is in fact projected that by the turn of the century urban population would constitute more than 30 percent of the total population of the country (see table 1.4). This would undoubtedly lead to far greater pressures on urban employment, basic services and infrastructure and resources than at present. Within such a situation, urban development needs to be viewed holistically, where issues of urban employment need to be viewed in the context of sectoral goals.

Table 1.4 Urban Population Projection - India, 1991-2001

Year	Total urban population (in million)		% urban population		% share of million plus cities to urban population*
	Committee of experts (A)	Now projected (B)	(A)	(B)	
1991	235	217	27.5	25.7	32.5 (23)
1997	-	267	-	28.3	-
2001	332	307	33.0	30.5	35.8 (40)

Note : \*Figures in the bracket indicate number of million plus cities.

Source: Eighth Five Year Plan, 1992-97, Vol.II, Govt. of India, Planning Commission, New Delhi in NIUA, 1993

## SOLID WASTE MANAGEMENT IN INDIA – PRACTICES AND ISSUES

This study then, attempts to look at how the larger goals of urban development could be addressed by identifying a meeting point for sectoral goals and needs of urban employment. Specifically, the study looks at waste picking: its context and the extent and nature of its contribution within the urban economy; and at waste pickers : their composition and profile, the conditions under which they work, specifically the gender based and other considerations, the reasons for adopting such an activity and their role within the waste economy as also the larger urban economy. In addition to the social aspects of waste picking, the study focusses on the economic and ecological contribution of waste pickers within the urban economy. It attempts to analyse how issues of solid waste management have been linked with the needs of the informal sector and examines the potential of addressing, simultaneously, social, economic and ecological issues by a collaboration of formal waste management systems and informal waste picking.

The study restricts itself to municipal wastes. Based on a combination of secondary information from different parts of the country and on individual and group discussions with several waste pickers in the slums of Delhi, this study does not attempt to provide precise or scientific data on the current situation. It merely attempts to provide, through case studies, impressions and rough calculations, a broad assessment of the situation; the context of the situation and the many forces working to create it, as also the key issues that emerge out of it. This then acts as a pointer in a direction which could subsequently form the basis for further research.

An acceptance of the possible linkages between urban development and the nature and extent of solid waste management, specially in developing countries, has seen a growing focus on issues relating to solid wastes. Clearly, the generation and management of solid wastes in urban cities and towns, has a bearing on three distinct aspects - environmental, sociological and economic. The wide range of people who are involved in and get affected by solid waste management, because of varying degrees of interests in and dependence on solid wastes, points to the multidimensional role of solid wastes within the urban economy.

As urbanisation grows, so also the extent and dimension of the solid waste problem. The quantum and type of waste generated in any urban centre is a function of the size and character of the urban centre. For example, industrial towns would generate large quantities of industrial waste, which could be in solid, liquid or gaseous form. As a broad categorisation, the different forms of waste generated in any urban centre would be:

- (a) Household/Commercial refuse
- (b) Street sweepings
- (c) Construction and demolition debris
- (d) Hospital waste
- (e) Industrial waste.

Even within this categorisation, there are most likely to be intra city differences in the composition and quantum of waste: slum settlements are likely to have a higher degree of organic matter in household waste and street sweepings than higher or even middle income areas. Refuse generation is a function of consumption, production and growth, which therefore affect not only the quantum but nature of refuse generated.

The domestic and commercial waste is primarily composed of organic matter, recyclables, toxic substances, soiled waste and dust/fine earth. The organic matter comprises food leftover, fruit and vegetable peels, spoiled foods etc. Recyclables comprise paper, plastic, rubber, metal and glass. Toxic substances comprise paints, aerosols, used batteries, medicines etc.

and soiled waste includes soiled cotton, syringes, sanitary napkins and baby nappies.

### GENERATION OF WASTE

Clearly, the quantum of waste generated varies across urban centres, depending to some extent on the population, the degree of industrialisation and consumption patterns in the centre (see table 2.1). Whereas for the country as a whole per capita waste generation varies between 0.1 kilograms and 0.6 kilograms per day, with an average of 0.33 kilograms (Bhide, 1990), Bangalore for instance is estimated to generate about 0.5 kilograms per capita per day or 2000 tonnes of waste per day (De Souza, 1991 or Rosario, 1992). Although for Delhi and Bombay precise data for waste generated (as distinct from waste collected) is not available, as a rough estimate based on a daily per capita generation norm of 0.5 kilograms it works out to about 4800 tonnes for Delhi and 6285 tonnes for Bombay. In Delhi, the daily waste generated has been increasing by about 200 tonnes every year.

**TABLE 2.1 Typical Refuse Generation Rates In Different Countries**

Place	Kg/Person/Day	Volume/Day (litres)
India	0.25	1.0
Ghana	0.25	1.0
Aden	0.25	1.0
Egypt	0.30	1.25
Syria	0.30	1.25
Sri Lanka	0.40	1.6
Phillipines	0.50	2.0
Turkey	0.60	2.4
Malaysia	0.70	3.5
Singapore	0.85	4.25
Arabian		
Gulf State	1.0	5.00
Europe	1.0	8.00
United States	1.25	12.00

Source : Holmes, 1984

Waste here refers to municipal waste and does not include such industrial waste as is disposed off by the industries themselves. Large industries are required to dispose of their waste separately. It is in the case of the small scale industries that industrial waste is at times disposed of along with municipal waste. In some cases, when the municipality arranges the transportation of industrial waste, the industries are charged separately, depending upon the quantity transported (Pienvichitr, 1990). Similarly, hospital waste is required to be treated separately from general waste, either incinerated or disinfected before dispatching for disposal. It is also required to be distinguished from the general waste and transported separately to the common landfill site. But in practise, this is rarely found to happen.

Compared with other developing countries in the South East Asian Region (WHO, 1991), the per capita waste generation in India is on the higher side for the large cities, but well below the others for the small cities (see Table 2.2). If waste generation is accepted as one of the indicators of prosperity, standard of living and consumerism, this data reinforces the dichotomy of economic extremes within Indian society.

A comparative analysis of waste composition across the same countries displays the relatively lower organic component and high ash/dust component within Indian waste (see Table 2.3). Compared with developed countries, waste generated in India reflects a much higher proportion of compostable matter and fine earth whereas the former has a higher paper content (see Table 2.4).

**TABLE 2.2 Per Capita Waste Generation In Different Countries**

Country	Smaller cities (kg/c/d)	Medium cities (kg/c/d)	Large cities/towns (kg/c/d)
Bangladesh	0.2	0.4	0.4
India	0.1	0.3 - 0.4	0.5
Indonesia	2.6 - 3.3*	2.2 - 5.1*	1.9 - 2.01*
Myanmar	-	0.36	-
Nepal	0.6	0.2 - 0.3	-
Sri Lanka	0.6	0.5	0.2
Thailand	0.8 - 0.9	0.7	0.6

\* litres/c/d

Source : Regional Overview on Solid Waste Management in South East Asian Region by WHO In (Asnani, 1991)

**TABLE 2.3 Composition of Waste in Different Countries**

Description	Percentage by weight				
	Thailand	Nepal	Myanmar	Sri Lanka	India
Vegetable/leaves / grass	54.21	56.9	75	61	40.15
Paper	15.48	5.4	3	5.4	3.80
Plastic	12.02	2.0	1	2.8	0.81
Leather/rubber	0.67	0.4	-	0.1	0.62
Textile	3.25	2.0	-	0.5	-
Wood/carton	2.14	1.3	-	-	-
Glass/ceramic	3.31	0.6	-	2.2	0.44
Metal	2.86	0.4	-	1.4	0.64
Stone-bone-dead animals	1.46	0.3	1	-	-
Stones, ashes, dust	-	28.9	1	-	41.81
Cane, bamboo, baskets	-	-	3	-	-
Miscellaneous	4.10	0.8	16	27	11.73

Source : Asnani, 1991

**TABLE 2.4 Comparison of Physio-Chemical Characteristics of Waste**

Characteristics	India*	Developed countries (Figures in Percentage)
Paper**		
Plastics**	3 - 7	20 - 50
Metals**	0.5 - 0.9	1 - 3
Glass**	0.4 - 1.0	4 - 14
Ash and fine earth**	0.3 - 0.8	3 - 10
Total compostable matter**	30 - 50	3 - 10
Moisture content**	30 - 50	10 - 20
Organic Matter***	20 - 30	15 - 30
	20 - 30	15 - 30

\* - Mean value of data from 33 Indian cities

\*\* - On wet weight basis

\*\*\* - On dry weight basis

Source: Bhide and Sundaresan, 1984

Although across different areas within an urban centre, such as residential, commercial, market and industrial, the waste composition is likely to vary significantly, it is estimated that overall, of the municipal waste generated in urban centres, anywhere between 45 to 75 percent constitutes organic matter (see Table 2.5). It is also important to note that waste composition varies significantly across areas of different economic levels of residents. The specific needs of a set of people, as pointed out by Ali (1993), play an important role in determining waste generation patterns. He points out how, unlike high income areas, low income areas, in addition to domestic waste, also generate waste resulting from a variety of informal sector activities pursued from home or surrounding areas.

Intra-city variations however could be extreme; in Bangalore city for instance, a study carried out in different residential, commercial, market and industrial areas, found that the organic content ranged from 13.7 percent to 76.9 percent (Rao, 1990). For the country as a whole, over 40 percent of the waste is estimated to be organic matter (see Figure 2.1). Residential areas have a larger component of organic matter and ash/fine earth in their waste. Commercial areas have a high content of recyclable material such as paper, glass etc. and market areas have the highest degree of organic matter (see Table 2.6).

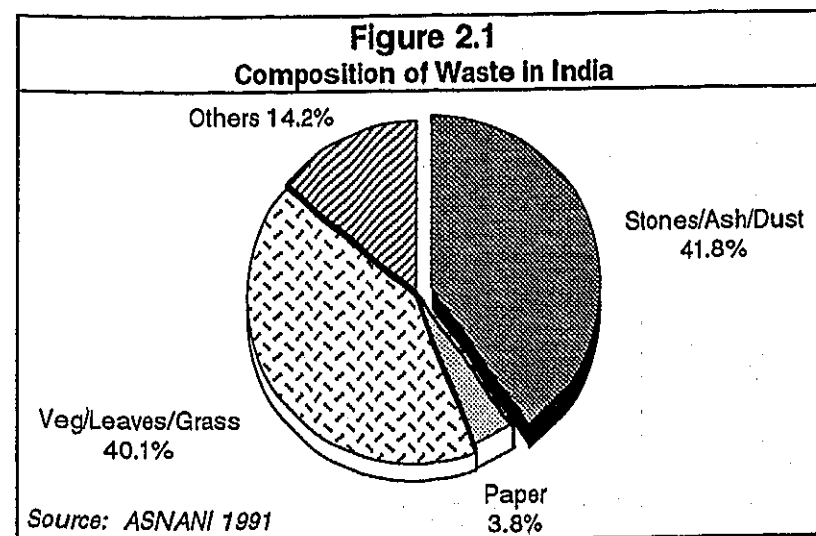


TABLE 2.5 Average Physical Analysis of Indian City Refuse (Percentage by Weight)

Name of City	Paper and card	Metals	Glass	Textiles	Plastic Leather and Rubber	Wooden matter Hay and Straw	Bones etc.	Stones etc.	Fine Earth and Ash etc.	Fermentable	Density Refuse (kg/cum.)
Lucknow	1.66	0.2	0.66	2.91	4.2	3.02	0.18	5.27	21.59	60.31	407.6
Kanpur	1.35	0.18	0.38	1.57	0.66	1.00	0.21	18.38	22.93	53.34	500.0
Madras	5.9	0.7	-	7.07	-	-	-	13.74	16.35	56.24	-
Delhi	5.88	0.59	0.31	3.56	1.46	0.42	1.14	5.98	22.95	57.71	-
Calcutta	0.14	0.66	0.24	0.28	1.54	-	0.42	16.56*	33.58	46.58	600.00
Bangalore	1.5	0.1	0.2	3.1	0.9	0.2	0.1	6.9	12.0	75.0	578.00
Ahmedabad	5.15	0.80	0.93	4.08	0.69	1.50	0.12	8.77	29.01	48.95	-
Bombay	3.20	0.13	0.52	3.26	-	17.57	0.5	-	15.45	59.37	-

\* Includes coconut shells

Source : Nath, 1984

TABLE 2.6 Physical Analysis of Bangalore City Refuse (Percentage by net weight)

Sl. No.	Type of Locality	Paper	Plastics	Rags	Metals	Glass	Rubber & Leather	Wooden matter	Croc key	Bones	Stones and Bricks	Ash & fine Earth	Vegetable matter
1.	Residential (Rajajinagar)	2.70	0.49	2.95	0.74	0.49	1.23	0.37	1.47	0.25	3.20	41.54	44.40
2.	Residential (Jayanagar)	3.29	0.98	3.05	1.10	0.49	0.73	0.37	1.34	-	4.02	41.95	42.08
3.	Residential (Malleswaram)	3.29	0.80	2.50	-	0.68	1.02	-	0.57	0.46	3.75	40.00	46.93
4.	Commercial (Brigade Road)	10.16	5.08	1.02	3.04	5.08	1.02	-	4.10	-	0.38	37.60	32.52
5.	Commercial (Commercial Street)	11.42	5.65	11.29	2.28	9.14	3.36	10.22	5.65	-	-	27.28	13.71
6.	Market (KR Market)	0.26	0.26	4.61	-	-	0.52	1.02	-	-	-	16.14	76.92
7.	Market (Russel Market)	0.54	0.68	4.34	-	0.41	-	0.68	-	4.34	1.08	26.05	61.87
8.	Industrial (Rajajinagar)	4.13	14.47	9.25	5.12	7.28	12.40	-	-	-	38.09	9.25	-
9.	Industrial (Peenya)	3.83	4.47	8.51	4.25	-	5.74	3.51	7.13	-	27.23	18.94	16.38
10.	Industrial (Mysore Road)	3.91	7.91	4.72	2.46	6.37	9.75	0.92	-	-	21.97	18.48	23.51
11.	City as a Whole	4.35	4.08	5.22	1.90	2.99	3.58	1.71	2.03	0.51	9.97	27.75	35.90

Source : Rao, 1990



## WASTE MANAGEMENT PRACTICES

A look at any of the Indian urban centres brings into sharp focus the state of neglect of solid wastes, raising issues not only of environmental degradation, but also of economic and institutional concerns in urban development. This is the situation despite the existence of extensive infrastructure and large investments in managing this waste, in most cities in the country. This, then, clearly merits the need to critically look at the systems of solid waste management in existence.

Waste management in India is generally the responsibility of the municipal corporations, within which it is either looked after by the corporation's health officer or the municipal engineer. The former leads to a focus on health aspects rather than on efficient and optimal waste disposal or resource recovery.

Within the Municipal Corporation there usually exists an extensive team engaged in the planning and implementation of solid waste management (SWM). In Delhi for example, the overall responsibility of SWM within the Municipal Corporation of Delhi (MCD) area lies with the Director, Conservancy and Sanitation Engineering (CSE). Other administrative heads, including three joint directors, one for each of the four zonal areas, constitutes part of the CSE department at headquarters. Each of the zonal areas are looked after by an executive engineer who is assisted by an extensive staff of zonal engineer, assistant engineers, sanitary inspectors and several thousand 'safai karamcharis'. The entire system of waste management is thus dominated by engineers and technocrats.

### Storage and collection systems

Collection of waste is done in community bins and it is only in some specific areas of a few metropolitan cities that house to house collection is carried out. The community bins, provided at specified locations on the streets, are of concrete or metal, at some places large enough to be the size of a room.

Storage in these bins is generally found to be unsatisfactory as people are often reluctant to walk to the communal bins and hence dump the waste on sidewalks, streets or open drains; even when they do find their way to the communal bin, they tend to throw the waste from a distance, in the process missing the bin altogether and scattering the waste all around the bins. Not

only does this create unhygienic conditions in the area, but also difficulties for the municipal staff in collecting the waste for transportation, as they do not have brooms or shovels to gather the waste. In the case of masonry waste collection structures, waste from the corner of the walls remains uncollected, starts decomposing and creates a foul smell.

It has often been found that these garbage bins have been situated at unsuitable locations. Location being an important determinant of acceptance or rejection of a facility, it is not surprising that in such cases people prefer throwing the garbage at any other convenient place.

Street sweepers, generally women, are employed by the municipality to manually sweep the roads and empty out the sweepings in the bins. The MCD for example, currently employs about 36,000 street sweepers or 'safai karamcharis' as they are called.

The character of waste determines how critical the frequency of collections is. Where organic matter constitutes a high percentage of waste and climates are warm, decomposition of waste is likely to take place more quickly than compared to areas with different waste composition. Uncollected waste, in such cases, would only increase bad odours and risks to health in the surrounding areas. In a country like India, where not only is the organic content of waste high but temperatures are very high and living spaces are usually small, the frequency of waste collection becomes a critical factor in SWM.

Although on paper waste collection is carried out daily, in actual practise it takes place less frequently. Whenever waste generation in a given area is less than one truckload with a capacity of about four tonnes, waste collection is carried out once in two days. Street sweepings are also irregular and could be as infrequent as twice in a week. In general, the lower the socio-economic level of the residents of an area, the lower is likely to be the collection frequency of its garbage.

### Transportation of waste

In most cases the transfer of waste from the bins to the transport vehicle is carried out manually, with an average of two to three trips made by a vehicle in a day. Only in a few cases, such as in large waste sites, front end loaders are used. Manual loading of waste is not only time consuming but also injurious to the health of the workers.

Open trucks are normally used for the transportation and only in some cases is the waste inside covered. Tractor trailers are commonly used in smaller towns, which also at times see the use of animal drawn carts, when the transport distance is small and traffic is low. Such animal drawn carts are usually engaged to collect waste from narrow lanes and transport it to a transfer station from where it is carried by a larger vehicle.

#### Waste disposal

Disposal of waste is carried out through various different processes, viz. uncontrolled dumping or controlled tipping at landfill sites, manual or mechanical composting and incineration. The most common of these is dumping at landfill sites located around the city and it is estimated that more than 90 percent of the waste collected in Indian cities and towns is disposed by landfilling (Rosario & Von Der Weid, 1990). Depending on the manner of dumping, landfilling can be categorised into (Nath, 1984) :

- sanitary landfilling
- controlled tipping in low lying areas adjacent to the sea for land reclamation
- uncontrolled tipping on municipal land
- uncontrolled tipping on private land
- uncontrolled tipping into water.

Most sites in India are uncontrolled dumps and not sanitary landfills. Domestic, commercial, hospital and industrial waste are dumped together. No daily cover is applied to the waste nor is the waste compacted. Dumping is also sometime carried out illegally on the private property of farmers.

Very rarely do local bodies carry out an environmental impact analysis in selecting a disposal site. Any site with depressions which can hold waste is usually used for disposal.

Disposal of waste in this manner then leads to ground water pollution through leachate as well as other problems associated with flies, rats, rodents and odours. Additionally, because of the loose or non existent control measures for incoming waste, industrial waste is sometime disposed of at such disposal sites. Similarly, hospital waste often reaches these sites, which, because of its hazardous nature, poses health problems for anyone handling the waste.

Although the landfill method is the most easily adopted and the least expensive of the various disposal methods (not taking into consideration the value of the land used for dumping), it does entail earmarking precious land sites near urban centres, which in view of the decreasing availability of land, as well as the environmental aspects, makes it less attractive. Naturally, distance of landfill sites from the collection areas is increasing; Delhi at present uses six dumping sites and the average distance of the sites from the collection areas varies between 15 kilometres to 20 kilometres.

The other systems of disposal are simultaneously systems of resource recovery.

#### Resource recovery

With the acceptance of waste being a misplaced resource, there are various forms of resource recovery that take place from waste. Recovery of recyclable items, composting and energy recovery are some of these.

Recovery of recyclable items takes place at various levels, viz. at the source of waste generation where paper and glass bottles etc are sold to itinerant waste vendors, from the community dust bins by waste pickers and the local sweepers, from the transportation vehicles by the municipality staff and from the disposal sites by waste pickers. It is difficult to establish accurately the quantum of waste recovery taking place in this manner. There have been few studies and the estimates vary considerably. Whereas Bhide (1990) estimates that about six to seven percent of the total waste generated is recovered in this manner, a study carried out in Bangalore (De Souza, 1991) found this figure to be 15 percent.

However, the conditions under which much of such resource recovery is carried out are abysmal and no efforts are made at maximising such recovery by attempting to change waste handling habits such as waste segregation at source.

Composting is another mechanism of resource recovery, where the organic manure so produced can be used as a soil conditioner by the municipal authorities in public parks etc, sold to farmers or used by farmers for their own purposes, where they are preparing the compost themselves. Manual composting has been adopted in several urban centres, producing fertilizer at a cost relatively lower than chemical fertilizer. Mechanical composting, tried in some cities in India, has met with little success, primarily because of the high capital and operating costs which increased the sale price of the

compost (the transportation cost also increased since the plants were located at a considerable distance from the point of use), making it less attractive to the purchasers.

Despite compost being an excellent substitute to chemical fertilisers for increasing soil fertility, which not only replenishes micro nutrients to the soil but reduces the country's import needs for petroleum products used in chemical fertiliser manufacture, it is nevertheless not favoured by municipal bodies as a form of waste disposal because of the costs involved. Whereas composting costs Rs 250 per tonne, disposal through landfill costs the Municipal Corporation Rs 10 per tonne (Jain, 1990). An additional problem with composting remains the need to separate out non compostable material from the waste to be composted. Often farmers experience cuts from pieces of glass which remain in the compost. The demand for compost moreover, has often been found to be affected by its price which becomes disproportionately high on account of excessive transportation costs.

Energy recovery from waste takes place in the form of biogas, through anaerobic decomposition of the organic component of waste deposited in landfills, as well as power generation from incineration of domestic and trade waste. However, given the high organic content as also high content of dust/earth in Indian waste, burning of waste has been possible only with the use of extra fuel, making the entire process of incineration too expensive. The unsuitability of incinerating waste for energy recovery is reflected by the 300 tonnes incineration plant set up in Delhi at a cost of Rs 20 crores. The plant was a complete failure because whereas the highest calorific value of the garbage which the plant could take was 1465 kilo calories per kilogram, the generated garbage gave only 750-800 kilo calories per kilogram (Seth, 1990). There were thus very high capital and operating costs in running the plant, which was closed down not very long after it was made operational.

The actual recovery of energy for cooking and/or power, through anaerobic decomposition, is not carried out on any significant scale in the country as yet.

#### **ENVIRONMENTAL ASPECTS OF WASTE STORAGE/DISPOSAL**

Indiscriminate dumping of waste around waste bins, on the streets and in water bodies give rise to air and water pollution. Unlifted waste from storage points causes health risks. In the case of waste dumped at landfill sites, improper selection of the site causes ground water pollution through leachate.

During periods of heavy rains, runoff could also cause surface water pollution.

Air pollution could also result from spontaneous combustion of waste at disposal sites. Based on an estimate of two cubic metres of methane gas generation from one tonne of garbage, Mr R C Jain (in Shunglu, 1993) calculates the total methane released into the air every day at 7000 cubic metres. Methane, as is well known, is harmful and contributes substantially to the greenhouse effect.

#### **Health impact on workers and the general population**

Workers handling waste come in constant direct contact with waste and remain exposed to the impact of wastes. Studies have shown that such workers suffer from skin diseases due to contact with waste; from respiratory and ophthalmic diseases due to inhalation or contact with infected dust; and from ulcers and infected wounds (Giroult, not dated). Studies carried out by the National Environmental Engineering Research Institute on waste workers found them to suffer from skin and eye infections, respiratory diseases, jaundice etc. (Bhide, 1990). A study in Ahmedabad found that more than 15 percent of sweepers suffered from tuberculosis (TB) and that the prevalence of TB among sweepers was three times higher than the national average.

Operators at the screening stage of composting plants are exposed to wounds and blood infections and those at manual composting plants are exposed to insect carrier of germs (Giroult, not dated). Workers at landfill sites similarly are exposed to methane gas explosions.

Clearly, waste handling is a hazardous occupation. Despite this however the workers are seldom protected by occupational health and safety measures and work without any protective equipment.

The general population on the other hand, is affected both by uncollected wastes as well as waste treatment and disposal activities. The former causes wounds, diseases transmitted by vectors breeding on wastes and a wide range of infections. Uncontrolled fermentation of wastes also creates conditions favourable to the breeding and growth of rodents and insects acting as vectors of diseases (ibid). Uncollected wastes also pollute the soil and waters.

The most significant impact of waste treatment and disposal activities on the general population consists of underground water pollution by leachates

from landfill sites, since regular water treatment does not remove such micropollutants.

### INVESTMENTS IN SOLID WASTE MANAGEMENT

The extent of waste generated and the range of activities involved in dealing with this waste in an efficient and optimal manner, merits a large infrastructure in terms of manpower, machines and therefore finances. It is not usually possible to determine the exact percentage of the municipal budget that is spent on solid waste management, since other functions such as drain cleaning etc. are often carried out by the same staff. It is however estimated that anywhere between 10 to 40 percent of the municipal budget is utilised for SWM (Bhide, 1990). Per capita expenditure on SWM for India (see table 2.7) in 1990 was estimated between \$2.38 - \$4.15 (WHO, 1990). For Delhi the total cleaning and waste management budget for 1993-94 is approximately Rs 70 crores (see table 2.8), which constitutes 20 percent of the total MCD budget.

**TABLE 2.7 Per Capital Expenditure on Solid Waste Management in Different Countries**

Country	\$/capital/year
Bangladesh	0.36 in Dhaka and range 0.07 - 0.30 in other towns
India	2.38 - 4.15
Indonesia	0.84 - 1.9
Myanmar	0.75 - 8.4
Nepal	2.03 in Kathmandu and range 0.25 - 0.84
Sri Lanka	1.79 in Colombo, 0.9 - 1.1 in medium and 0.15 - 0.25 in small towns
Thailand	1.6 - 5.35

Source : Asnani, 1991

**TABLE 2.8 Municipal Corporation of Delhi Expenditure on Solid Waste Management**

(In lakh Rs.)

Expense head	1989-90	90-91	91-92	92-93	93-94 (Budget)
Supervisory Salary					486
Street Cleaning					5600
Waste Collection and Transportation (including wages, repair and maintenance diesel etc.)					743
Disposal					80
<b>Total</b>	<b>5305</b>	<b>6162</b>	<b>6391</b>	<b>6906</b>	<b>6909</b>

Source : Municipal Corporation of Delhi

Solid waste activities in India employ a large number of workers. The average manpower provision for the country is estimated between two to three per thousand population (table 2.9); in metros it could be between four to six whereas in small towns it is typically around one (Asnani, 1990).

For Delhi, the MCD employs about 36,000 sweepers or safai karamcharis, of which about 2000 are involved in loading of waste into trucks and the remaining are essentially street sweepers. Their deployment within the city is such that the slum areas and resettlement colonies account for about 8000 sweepers whereas the rest of the areas account for the remaining 24,000 sweepers. It is estimated that every year about 1000 sweepers are added to the labour force. In addition to sweepers there are 1000 assistant sanitary inspectors, 150 sanitary inspectors, 600 drivers and 200 employees at the landfill sites.

**Table 2.9 Manpower Provision Per 1000 Population for Solid Waste Management**

Country	No. of persons/1000 persons served
Bangladesh	0.5 – 2.2 (av.) commonly less than 1
India	2 – 3 (av.) 4 – 6 in Metros and less than 1 in smaller towns
Indonesia	2.2 – 6.6 in metros and 0.4 to 1.4 in other towns
Myanmar	1.3 in Yangon – Range 0.3 – 3.1
Nepal	1.8 – 2.6 in big cities. 0.6 – 1.8 in other towns
Sri Lanka	4.7 in Colombo, 1.5 – 1.9 in medium and 0.2 – 0.5 in smaller towns
Thailand	1.3 – 3.0

Source : Asnani, 1991

### EXTENT AND COVERAGE OF SOLID WASTE MANAGEMENT SERVICES AND EMERGING ISSUES

Despite the extensive resources invested in SWM practices in the country, the eventual service provided is largely inefficient, with substantial amounts of refuse left uncollected in many cities. For the country as a whole it is estimated that waste collection by dustbin is 60 to 86 percent (Rosario & Von Der Veid, 1990). A survey carried out by the National Institute of Urban Affairs (NIUA, 1989) found that waste collection in different cities in India ranges from 66 percent to 82 percent of waste generated (see table 2.10).

**Table 2.10 Refuse Disposal Level as Proportion of Refuse Generation by Size Class of Cities, 1986-87**

Size Class	No. of responding urban centres	Average per capita refuse (grams/day)		% Disposal (as proportion to generation)
		Generation	Disposal	
I	98	302.8	217.6	71.9
II	27	479.9	319.0	66.5
III	13	375.9	288.9	76.9
IV	6	483.8	354.4	73.3
V	7	413.7	341.4	82.5
VI	2	294.4	203.4	69.1
VII	—	—	—	—
All/Av.	153	377.8	273.8	72.5

Source : NIUA, 1989.

Quite apart from the overall shortfalls in collection, a look at the spatial coverage of SWM services reveals that in most urban areas only about 70 percent of the population is served (Fritz, 1990). In the Calcutta Metropolitan district, 60 percent of the total annual expenditure on solid waste management is enjoyed by 30 percent of the population living in the city corporation area (Nath, 1984). Significantly, it is the poorer communities, the slum settlements or other areas of recent rural migrants, who have little political influence in demanding any service, which are left out. That slum settlements are poorly served is illustrated by a survey carried out in a little less than 600 slums across the country (NIUA, 1991b), which found that only 41 percent of the sampled slums had any municipal waste collection depots. As in most cases of infrastructure and public services, it is the poorer areas that are most easily marginalised. The result is clogged sewers, waste littered everywhere and disease caused by the unhygienic conditions created by uncollected waste.

In the case of slums the problem is compounded by the fact that because they are unauthorised, they already suffer from inadequate services of water supply, sanitation/toilet facilities, waste water disposal etc. The absence of SWM services, in such conditions, gives rise to piling of waste contaminated

with human and animal excreta, creating extremely serious health problems for the slum population.

Limited equipment and staff, rapid growth of "unofficial areas" and streets inaccessible to the equipment used are reasons most commonly cited for this. That choice of technology also has a role to play in the spatial coverage of services is illustrated by Cointreau (1982). She points out how accessibility of poorer habitats affects their access to service; local governments usually provide systems of waste collection which involve vehicles that can service only paved roads. In such habitats where paved roads are not present, it is common to find waste being dumped in drains, between houses and on any available land, where it accumulates and degrades. In Onitsha, Nigeria, she found that because of such technology adoption, the service levels in the low income areas was only 10 percent as compared to 80 percent in high income areas. She further observes, "there tends to be a discriminatory attitude on the part of those in power against the people living in these low income areas, an assumption that their neighborhoods are dirty because the people are dirty and too lazy to carry their refuse to a paved route where service is provided. There is a general lack of recognition of the disincentives that the absence of walkways, clean drains, and other basic infrastructure create to residents making this level of effort" (ibid).

Part of the overall inadequacies in waste management are attributed to shortfalls in staff. In the Delhi MCD area for example, the staff norm for vehicle maintenance is 0.7 persons per vehicle whereas in actual practise there are only 0.3 to 0.4 persons per vehicle. Even the staff that does exist is not motivated and often take attendance but do no work. Lack of supervision also contributes to the inadequacies in these services.

Clearly the gaps in services relate not merely to availability of infrastructure and investments, but also to inappropriate management of the service. In Delhi for example, the number of trucks and waste transporters, for waste collection and transportation, approximate 400. Taken at a capacity of about 5 tonnes per vehicle (it could range between 4 tonnes to 6 tonnes), 400 vehicles would be able to carry 2000 tonnes of waste. Clearly just two trips per truck per day would be adequate to clear the entire waste generated in a day. Even if some trucks were to be under maintenance, the truck availability would be adequate since in areas of low waste generation waste is collected only once in two days. In addition to this, some trucks could make three trips in the day as the number of trips currently made range

from two to three. Yet the local authorities are unable to clear the entire waste generated.

Another possible case of mismanagement is illustrated by a study carried out by the National Institute of Urban Affairs on Environmental Sanitation and Waste disposal, which found that even though the norms for deployment of sanitary workers for each city depended on the population of the city, the population density, the physical characteristics, quantum of waste generated etc., none of these norms were used in actual deployment of staff, resulting in suboptimal effectiveness of the systems.

In summary, waste management services suffer from many constraints: beginning in some cases with inappropriate technology (as in storage, collection and transportation systems) to inadequate and disinterested staff as well as an absence of efficient management and planning. There are also, as Furedy (1987) observes, attitudinal factors which inhibit genuine interest in waste management and accord this service little prestige. All these factors combine to result in large quantities of uncollected waste, health risks to workers and waste pickers and a waste or sub-optimal use of the resource that garbage constitutes.

The overall emphasis of waste management systems lies in technology as opposed to efficient labour management. With due focus on the labour needs of the system, not only could staff inefficiencies and inadequacies be addressed but, where it is more appropriate, labour could replace technology, for instance in the collection of waste from low accessibility areas.

Moreover, the current systems of disposal point to the need for greater resource recovery through recycling of dry waste, composting and energy generation. Not only do these gain relevance in the context of dwindling national resources and the economic status of the country, but also in terms of land availability for dumping and its environmental implications.

Hence, the predominantly technology oriented nature of waste management systems, without due social and ecological considerations, has been responsible in large part for many of the constraints and inefficiencies experienced in waste management. Clearly, the concepts of waste management have not, to any significant extent, included considerations of resource conservation, pollution reduction and employment generation.

## WASTE OR RESOURCE? - ISSUES IN RECYCLING

Although the resource poor status and low consumption levels of most developing countries would, *prima facie*, point to a very low level of recycling activity, specially as compared to the richer nations, in actual practise the very nature of such economies, the poverty and to some extent the cultural ethos, ensures that very little is actually wasted. The recycling industries, in fact, provide enormous opportunities for the economies of such countries. Not only are recycling activities extensive, spanning a wide range of products and providing jobs to vast numbers in the population but simultaneously save valuable raw material in the production of different commodities. The dwindling supplies of raw materials, whether it be wood pulp for paper or petroleum for plastics, only reinforces the need to recover from the existing resources. The shortage of land, additionally, for locating waste disposal sites adds another dimension to the importance of recycling.

That waste provides invaluable resources that can be recycled is reflected somewhat by the fact that in many cities of developing countries, municipal waste is privately collected at no cost to the city (Holmes, 1984). In Mexico City, private entrepreneurs are reported to pay a fee to municipal refuse workers for the privilege of picking up waste from residential buildings in high income areas (*ibid*). Similarly, in Cairo, families in the Zabaleen settlements pay a fee to middlemen who have purchased from the original builders the rights to waste in high income areas (*ibid*). In Bangkok, studies of waste collection crews have indicated that 40 percent of their loading time while on the collection route is spent retrieving recyclable material, through which they are able to double their regular wages. Closer to home, a survey in Delhi (Galloway, 1993) found that people have left well paying, secure jobs to become waste dealers. Clearly then, through recycling there exists an enormous value to these waste products.

### NATURE OF RECYCLING ACTIVITIES

Taking a close look at the different processes of waste recycling unfolds the wide range of products that different kinds of waste are transformed into. Waste paper, apart from producing paper (typically duplex boards and kraft paper) is also used for toilet paper, tissues, hand towels and wrappings. Similarly, steel scrap is used for making drums, buckets and jerry cans. It had been estimated that the United States imported some 500 tonnes

(1984 data) of newly rolled steel from India, on account of the considerably lower production price in India, which was made possible only because the steel was re-rolled from scrap (Vogler, 1984).

Glass products such as glass tumblers, bottles, jars and chimneys for oil lamps are made with glass pieces - breakages from bottling plants as well as other pieces collected from houses, streets etc. In fact, in some countries production of wall and floor tiles can also be seen to take place using coloured pieces of broken glass (Vogler, 1984).

Further, India produces several thousand tonnes of reclaimed rubber every year, used, depending on the basic grade of reclaim, for cycle tubes and beadings, motor tyres and moulded items, cycle tyres, shoe soles, coloured footwear, battery boxes and trolley wheels to name a few. Tyres, additionally, are used for producing footwear and repairing shoes, after which the nylon thread is used for binding. Strips of tyres are used by upholsterers to form the spring base of beds or the gently yielding seats for stools and chairs (Vogler, 1984).

There similarly exists an extensive industry producing low grade products from plastic scrap. In some cases waste plastic is melted to produce new plastic items. Buckets, water hose, containers, bottles, jerry cans are just some of the items that are produced through such recycling. Other types of plastic are ground into a fine powder and used as fillers to provide insulation in products such as quilted jackets.

Quite apart from the recycling of dry waste, the organic content of waste too offers tremendous opportunities for recycling, most of which are exploited only to a very small extent in India currently. Organic waste can be converted into compost which when used as manure in place of chemical fertiliser supplies nutrients to the soil and improves its fertility. Similarly, decomposed refuse produces methane which can be tapped to provide energy - for cooking as well as for electricity. In fact, the amount of biogas (a mixture comprising methane and carbon di- oxide) that can be recovered from waste (in sanitary landfills) is estimated to range between 85-115 cubic metres per tonne of waste disposed (Bhide, 1990b). Even though Indian waste is most often not disposed in sanitary landfills, given the high organic content of the waste and the higher ambient temperatures at which it decomposes fast, biogas recovery has been found to be feasible in Indian cities (ibid).

## EXTENT OF CURRENT RECYCLING AND FUTURE POTENTIAL

Given the nature of the recycling industry, which can range from some large organised set ups to several thousands of small scale operations, it is not really possible to estimate, to any satisfactory degree of accuracy, the number of recycling units or the number of people involved in such activities. The industry essentially comprises of several small units scattered across the country. In this situation, the scattered data that is available can at best be used as representative of the magnitude of operations. To illustrate this, consider the case of the thin coloured polybags which are used by all vegetable, fruit and other vendors when such items are purchased. It is estimated that Delhi alone produces 200 tonnes of such recycled bags daily (personal communication with a plastic recycler).

Clearly, given the current trends in consumption and lifestyle habits, the use of plastics is likely to increase manifold. This is reflected in estimates of future demand for different types of plastics (see table 3.1). Given the foreign exchange situation and the scarcity of petroleum products, this only reinforces the need to focus increasingly on recycled plastic.

**Table 3.1 Demand for Plastic in India**  
(Demand in MT)

Type	Use	1991	2000
Low Density Polyethylene	Packaging, films and bags, wires and cables, extrusion	1,75,000	7,00,000
High Density Polyethylene	Monofilaments, pipes, films, injection and blow moulding	50,000	-
Polypropylene	Films, strapping, injection moulding, fibres, crates, doors, windows	75,000	4,20,000
PVC	Pipes, fittings, wires and cables, footwear, bubble wrap	2,40,000	748,00,000
Polystyrene	Refrigerators, air conditioners, tape recorders, housewares, cassettes	35,000	1,20,000

Source : Galloway, 1993



Taking the case of paper, it is found (ICICI, not dated) that waste paper is one of the principal raw material used by small paper mills (with a capacity of upto 5 or 10 tonnes per day). Larger mills of 30 to 75 tonnes per day capacity use waste paper in a combination with agricultural residue. Not only is waste paper used by waste paper based paper mills, but also by wood based mills, which use waste paper upto five to ten percent of their furnish. Waste paper based mills are estimated to constitute about 27 percent (see table 3.2) of the effective installed capacity for manufacture of paper and paper boards (ibid). With a production of 4.20 lack tonnes (during 1990-91) the capacity utilisation of the waste paper mills works out to 63 percent (ibid).

**Table 3.2 Effective Installed Capacity and Production for Paper and Paper Boards (as on March 31, 1991) (Lakh Tonnes)**

Category	Total Installed Capacity	Closed Capacity	Effective Capacity	Percent Share	Production (1990-91)	Capacity Utilisation (1990-91)
Wood Based	14.44	4.00	10.44	41	9.90	95
Agro Residue Based	9.42	1.29	8.13	32	6.50	80
Waste Paper Based	9.18	2.56	6.62	27	4.20	63
<b>Total</b>	<b>33.04</b>	<b>7.85</b>	<b>25.19</b>	<b>100</b>	<b>20.60</b>	<b>82</b>

Source : ICICI, not dated

The closed capacity as also the relatively low capacity utilisation for waste paper based mills is a function of many factors, one of which constitutes the availability of waste paper as raw material. It is estimated that only 15 to 20 percent of the total paper production in India is currently recycled whereas the rest is used for packaging (ibid). Of course some of the material used for packaging may also eventually find its way into the waste stream, from where it might be collected for recycling; the process of such collection however, may result in the loss of substantial quantities of the material.

A projection of the demand and supply of paper and paper board by 2000-01 (see table 3.3) reveals that there is likely to be a deficit of 10.20 lack tonnes (ibid). If newsprint is added to this, the total deficit is projected at 13.6 lack tonnes (ibid).

The non availability of forest resources, specially bamboo and hardwood, as raw material for the wood based mills and also for newsprint is most likely to affect their production. It is estimated that about 34 lack tonnes of wood would be required by 2000-01 for the wood based mills, newsprint units and agro based large mills; as against this, availability of raw material is estimated at 32.1 lack tonnes as per the report of the Raw Material Committee of the Development Council for Paper, Pulp and Allied Industries (ibid). With increasing rates of deforestation however, the actual deficit may be much greater.

**Table 3.3 Projected Demand/Supply Balance for Paper, Paper Boards and News Print Year 2000-01 (In lakh Tonnes)**

	Estimated Demand	Production	Deficit
Paper and Paper Board	37.90	27.70	10.20
News Print	10.80	7.40	3.40
<b>Total</b>			<b>13.60</b>

Source : ICICI, not dated.

To augment production, the large mills as also newsprint industries are likely to focus their attention on waste paper as raw material. As mentioned earlier, already the large mills use waste paper in a small proportion. This would compound the existing shortage of waste paper as raw material and affect the waste paper based paper mills. This shortage, combined with the low estimates for the total quantum of paper recycled currently, point to the need to evolve mechanisms to optimise on waste paper availability for recycling.

## **ECONOMIC AND ECOLOGICAL IMPLICATIONS OF RECYCLING**

As mentioned earlier, precious raw material, most of which is dwindling at a rapid rate, is used in the production of various commodities. To examine the extent to which this can be arrested by reusing or recovering from waste, let us take the case of paper production. It is estimated that approximately 17 trees are cut in order to manufacture one tonne of paper. Deinking waste paper and using it for paper production, with or without virgin wood pulp, reduces the need to cut trees and therefore the process of deforestation.

Additionally, recycling of waste paper contributes to a reduction in environmental pollution and energy consumption. In terms of the three types of pollution caused by paper production viz. air pollution by particulate matter and toxic gases, water pollution by discharge of process water containing toxics and chemicals and land pollution through solid wastes, the pollution from waste paper based paper products, as compared to the wood and agro based paper products, is comparatively small.

The paper industry is energy intensive and energy costs can amount to 25 percent of the total production costs (ICICI, not dated). Whereas the wood based paper industries consume about 1600 kwh per tonne, agro and waste paper based mills consume 1000 kwh per tonne. Similarly steam is also used for various activities of paper production; for wood based paper mills the average steam consumption per tonne of paper is about 8.3 tonnes which translates into 1.7 tonnes of coal, for agro based mills it is 1.0 to 1.2 tonnes of coal and for waste paper mills it is about 0.6 tonnes of coal.

Clearly waste paper based paper production not only addresses issues of dwindling forest resources but saves energy and contributes less to environmental pollution.

Looking at metal similarly, it is found that recycling one tonne of scrap metal conserves about 1.5 tonnes of ore and one tonne of coal, minimising the need for mining operations. Plastic recycling conserves petroleum products and in the process precious foreign exchange for the country.

## **THE PROCESSES OF RESOURCE RECOVERY FOR RECYCLING**

Not only is the recycling trade extensive, but involves a wide range of people at several different levels, involved directly or indirectly, with recycling activities. In order to understand the many levels of operations in recycling, it is imperative to identify the various participants.

The collection of waste is carried out at several different levels: from homes and shops it is sold to itinerant waste collectors periodically; larger commercial establishments and industries sell their waste to contractors in bulk; and from what is discarded by households, commercial establishments and industries, as municipal waste, items are retrieved by a section of the population called waste pickers.

The material sold at the household level is in visibly reusable form, such as newspapers and magazines, whole glass bottles, tin boxes, items of rubber etc. Industrial/commercial waste would typically contain large amounts of paper, cloth, plastic or any other material depending on the nature of the industry/commercial establishment. Finally what finds its way into municipal waste is what is seemingly of no value. Those who live on the margins of society however, recognise the value of resource even in this, and retrieve it from various different sources: dustbins, communal waste collection points, streets and municipal disposal sites.

The next level of participants include petty traders, who are typically located in slums or other low income settlements, and who buy waste material from waste pickers and sell it further to wholesalers. These petty traders are usually found to be serviced only by waste pickers, as waste contractors and itinerant collectors sell their material to wholesalers or the recycling units directly. The wholesalers, who typically specialise in a specific item, have large godowns where extensive sorting of material is carried out. Since the petty trader buys material in a mixed form and has neither the manpower nor the space required to carry out any extensive sorting, different qualities or grades of each material are sorted by the wholesalers. The rate of returns from the recycling units are a function of the extent to which the material has been sorted, hence making such investments for the wholesaler worthwhile.

Clearly, the waste pickers constitute the lowest rung of the collection hierarchy and petty waste traders similarly, of the dealer hierarchy. The waste pickers, the most invisible participants in the entire set of recycling operations, are also the most powerless and inextricably linked with the petty traders. Dependent on daily income for survival and devoid of space for storing large quantities of collections, they have no option but to sell their collections to petty traders as the others would only buy in bulk. The traders in turn, constrained by space, are unable to maximise their own profits through sales to recycling units and are forced to deal with wholesalers.

## PROFILE OF WASTE PICKERS

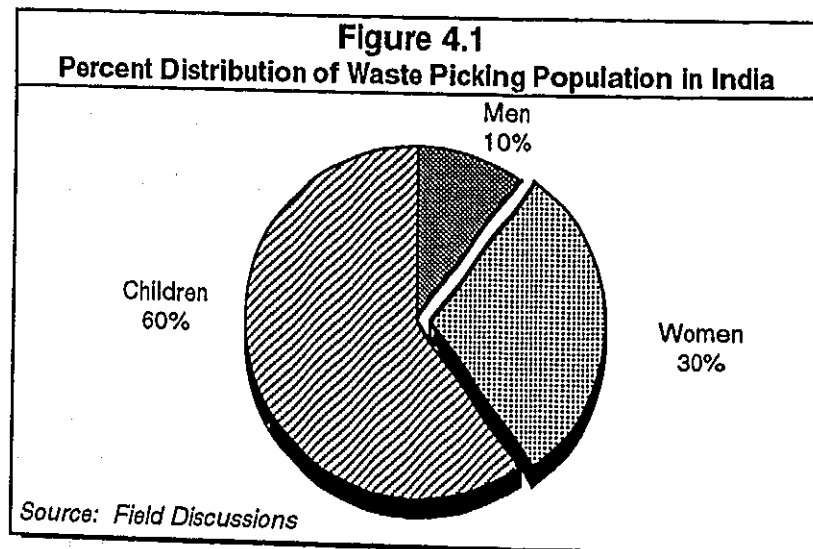
The nature of activities related to waste point to the wide range of people concerned with wastes; the municipal authorities concern themselves with the collection and disposal of waste, the larger population is concerned with the removal and to some extent the sale of wastes from their premises and a whole set of people engage themselves in collection, purchase and trade of waste. However, of all the people dealing with solid wastes, perhaps the most invisible are the waste pickers. Although the larger population knows of their existence, little, in terms of specific detail, is known about them. Who they are, how they live, what they do, what their compulsions are for doing what they do, what problems they encounter and what role, if any, do they fulfill within the economy are questions that seem to fade in the background of their overwhelming 'nuisance value' to urban populations.

Waste pickers, or scavengers or rag pickers as they are commonly called, constitute that segment of the urban population who make a living out of picking and selling recyclable material out of municipal waste. Attempts at categorising them meet with only limited success, because of the varied demographic and social characteristics they represent. Age, religion, community, marital status - none of these seem to display any single trend for the waste pickers.

### SOCIAL AND DEMOGRAPHIC PROFILE

From children below the age of ten years to adults above 50 years can be found engaged in waste picking. Because of the extremely unorganised and scattered nature of waste picking activities, it has not been easily feasible to estimate the waste picking population. Some very rough (and possibly unscientifically derived) and unofficial estimates do exist for individual cities and towns, but they can at best be taken as representative of the magnitude of people involved. Bangalore estimates the waste picking population of children at about 35,000 (De Souza, 1991), whereas for Delhi rough estimates place the figure around 50,000. In Delhi the total waste picking population is estimated any where between 80,000 to 1,00,000.

In the absence of a formal census, it is neither possible to ascertain the precise age nor sex profile of this population. Guess estimates of people working with these issues (Rosario, 1993 and Jain, 1993) suggest that 60 percent of the waste picking population constitutes children, 30 percent women



and the remaining 10 percent men. Clearly, regional and area wise variations exist, which, among other factors, are a function of the place of origin of the specific scavenging community. A slum settlement in Western Delhi, for example, inhabited almost entirely by waste pickers, consists of two communities, one from Tamil Nadu and the other from Bihar. Whereas in the former, entire households are involved in scavenging activities, the Bihari community is very categorical in not allowing their women and girls to go for waste picking.

On the whole it is found that either both the men and women within a household engage in scavenging or only the women are involved in it; rarely does it happen that the men in a household adopt scavenging while the women undertake other occupations. Therefore it is not uncommon to find households with women scavengers, whose husbands are involved in other occupations. Significantly, a considerable proportion of women scavengers are divorced or deserted/separated. The population of child scavengers constitutes those that live with their families and undertake waste picking as a family occupation, those who within their families are the only member involved in this work and finally street children, who have run away from home, are orphaned or deserted by their families, and depend on waste picking to support themselves.

Studies undertaken by the National Labour Institute (NLI) in 1987-88 found that waste picking constituted the fourth largest occupation for street children in Delhi, engaging 8.3 percent (of the 700 sample) of the working and street children population (NLI, 1992); the third largest occupation in Madras (after coolie (porter) work and hotel/restaurant employment), accounting for 9.6 percent of street children (NLI, 1992a); while in Hyderabad and Bangalore it is the single largest occupation, engaging 44.8 (NLI, 1992b) and 23.8 percent (NLI, 1992c) of street children respectively. The preliminary findings of a survey carried out in Bombay revealed that over 61 per cent of the city's street children engaged in scrap collection in order to survive (Advani, 1989). Additionally, studies conducted in Delhi (Sanon, 1986) and Bangalore (NIPPCD, not dated) found that the majority of child waste pickers belonged to the 8 to 15 year age group and that a large proportion of them start their work between the age of 5 - 8 years. The study in Delhi, in fact, found that as much as 50 percent of the 200 sample of waste picker children started their work between these ages.

**BOX 4.1**

**WASTE PICKING AS AN OCCUPATION AMONGST STREET CHILDREN**

City	Ranking	Percentage of Street Children
Bombay	Most commonly adopted	61
Hyderabad	Most commonly adopted	44.8
Bangalore	Most commonly adopted	23.8
Madras	Third largest	9.6
Delhi	Fourth largest	8.3

In the absence of a national census on waste pickers, from micro surveys conducted in limited areas, it is not possible to arrive at the religious or community profile of this population. Different communities follow more or less established migration patterns which determine their destination for migration. New migrants are then likely to seek destinations where there is kinship or an association with native place. As a result, the socio-demographic characteristics of slum settlements reveal that specific communities, in terms of religion or place

of origin, are clustered together to form homogenous communities. It is very likely, in such a situation, that a survey of specific slums in one city reveals a preponderance of a specific community in waste picking. This cannot however, logically lead to concluding the dominance of that community in scavenging activities.

Caste profiles, on the other hand, are easier to establish, possibly because work demarcations, within the unorganised sector, are still largely defined by caste. The majority of the scavenging population is found to come from lower/scheduled castes.

Literacy levels are abysmally low and, in fact, most of the scavenging community is completely illiterate. This trend finds exception in the case of a small percentage of the children who accompany their parents for picking waste. These children at times attend the informal schools located in slums, usually through the initiative of a local NGO. Of course, the number of such children as a percentage of the total waste picking community is likely to be quite small.

#### WASTE PICKERS AS MIGRANTS

Waste pickers are mostly migrants from rural areas; individual or entire families, who may have migrated anywhere within the last one to fifteen years. The exceptions to this are the second generation migrants, who also often undertake scavenging activities. In the case of women, very few women scavengers were found to have migrated individually : they came either with parents or with their husbands. However, they often found themselves alone subsequently - having been deserted, separated, divorced or widowed. It is in the case of children, most of whom are found to be migrants (see Sanon, 1986; NIPPCD, not dated; Naik, 1986) that migration (or run aways from home) often took place at an individual level.

The reasons for the preponderance of migrants within the waste picking population rest in the very nature of the activity, which requires no skill, no investment and no contacts or references. New migrants, in the absence of jobs in an overcrowded labour market as also capital to undertake self employment, find waste picking an activity that can easily and immediately be adopted as a survival mechanism.

Discussions with several waste pickers in Delhi as well as studies (Palnitkar, 1993) in other parts of the country reveal that in a very large number of cases the rural occupation of the migrants or the migrants' families, constituted

activities such as agriculture labour, share cropping, tenant farming, basket weaving and cobbling. Reasons cited for migration revealed that economic compulsions in the form of insecurity of employment, low and insecure returns were the most common causes for migration. Natural calamities were also given to be a cause for migration whereas for women, migration resulting from marriage was not uncommon. The NLI studies also found that the reasons for family migration for street children were usually poverty and the search for employment. When children migrate without families, they have either run away from homes or are orphaned.

#### Social costs of migration

Given the family occupations of most waste pickers prior to migration, the adoption of scavenging as an occupation usually implies a downward social mobility. Several members of the waste picking population do not like their family members in the villages to know of their involvement in scavenging activities. As labourers or weavers in the village, though there is economic insecurity, social respect of occupation does exist. This is eroded almost completely, not only from other members of society, but also from within themselves. Even within slum settlements, scavenging is looked down upon by other residents of the slums who are engaged in alternate occupations. There does exist a certain social hierarchy amongst slum inhabitants, arising out of the different occupations adopted, which whether it gets reflected in any tangible way or not, is nevertheless a definite part of their psyche.

Importantly however, even though on the one hand scavenging results in a downward social mobility, given the caste profile of the majority of waste pickers, social attitudes of the larger population towards this segment, arising on account of caste, improve substantially after migration. Caste biases are palpably dominant through most of rural India. As members of scheduled castes, large parts of the scavenging community face enormous exploitation, humiliation, hardships and constraints in their respective rural settings, as a result of the attitudes of and the societal norms laid down and practised by higher castes. Such caste barriers are distinctly weaker within urban environments, improving in the process, the social conditions under which such communities live.

This then, diffuses to some extent the impact of the downward social mobility arising out of scavenging. With forces acting in diverse directions, it is not easily and accurately possible to ascertain the net social impact of migration on the waste picking population. In any event, their economic position

invariably improves with migration, reflected by the unwillingness of most to settle back in their native villages. Even though there exists an acceptance of the hardships of urban life, specially those relating to scavenging and arising out of their living conditions in slums, economic security (relative to rural occupations, since waste picking has also its share of uncertainties, such as those on account of the season) is an overwhelming criteria for preferring life in urban centres.

Amongst the costs of migration, no less important is the cost of a degraded living environment. Most waste pickers live in slum settlements or on the pavements; the lone children wandering the streets during the day and spending the night in night shelters or on the streets themselves. The abysmal conditions in the slums and the complete lack of public services, not only create inhuman living conditions, but are a source of constant ill-health. Specially vulnerable are the small children, who are left to themselves in these conditions all day. A deteriorating health and large investments in medicines and medical services is then a direct consequence of the living conditions in cities.

Additionally, and no less significant, is the impact of the absence of traditional family and community structures in cities that exist extensively even today through most of rural India. Living in a nuclear family takes away the support systems provided by the traditional joint family structure. This implies that small children accompany parents to their work, which inducts children into the occupation of parents, or they remain behind and fend for themselves which could affect adversely their health and nutrition, education and value systems. Small children hence, become specially vulnerable in the changed environment after migration.

For women living alone, the issues do not entail a cost benefit analysis of waste picking in cities versus rural life. These are women who are widowed, deserted or separated, and practise scavenging as a means of survival, either because there exist no family or support structure to fall back on or societal norms in India do not permit them to return to their native village once they are married.

### THE COMPULSIONS FOR SCAVENGING

Why then do these people adopt waste picking as a means of livelihood? For most, it is not out of choice, but because all other roads to survival seem closed. A new migrant finds it very difficult finding a job, as most employers seek references and/or deposits in the form of security. When employment with

others does not work out, self employment is the only option available. Waste picking is possibly the only occupation which requires neither any investments nor working capital. Moreover, it requires no skill, no experience and has no prerequisites of any sort. It is clearly then, the easiest occupation to adopt, even though it is drudery ridden, tiring and entails its share of risks.

New migrants are also constrained by the lack of knowledge on the possibilities of different types of productive employment. Their options are often based on, and therefore limited to, what they see around. If the community where they have come to live consists, predominantly, of waste pickers, they too automatically join the ranks of the waste pickers.

Many pickers take to scavenging after trying out other forms of self employment such as vending of vegetables, fruit, other miscellaneous items or even continuing with the family trade such as basket weaving. In the absence of adequate markets, reasonably priced raw material for home production or harassment from staff of local authorities, scavenging is adopted as a last resort.

Interestingly however, women in some cases have been found to prefer waste picking to other occupations such as domestic help; waste picking is then a conscious 'choice' within the limited options available. The abysmally low wages paid to domestic help for washing/cleaning etc. (even waste picking at times provides better returns), the sub human treatment meted out in this employer - employee relationship, the inability to take small children to work, contrasted with the complete flexibility in waste picking activities - all combine at times to play a role in 'choosing' waste picking as an occupation. Thus, whereas theoretically a 'choice' may exist at times, in view of the economic and work considerations, specially for women, it does not prove to be a real choice.

In the case of women living alone, waste picking is resorted to when they get widowed or deserted by their husbands and the earlier occupation ceases to give adequate returns, or the women are unable to practise it individually (see box 4.2). Champa, living in the Motia Khan slum settlement in Paharganj, Delhi is a case in point. She and her husband practised basket weaving in Allahabad, which they continued after migration to Delhi, which took place about 10 to 12 years back. Two years ago Champa's husband deserted her for another woman. Champa, who earlier worked with her husband weaving baskets, found that she could no longer carry out the enterprise in a feasible manner on her own. A dearth (or lack of knowledge) of other productive options forced Champa to engage in waste picking.

## BOX 4.2

### NOT A MATTER OF CHOICE

Nirmala, a resident of Moua Khan, in the Paharganj area of Delhi was married about five years back. Her husband was a basket weaver and both she and her husband earned about Rs 300 per week from the sale of their baskets. About nine months back her husband left her and their one year old daughter. Unable to continue the basket trade without her husband, Nirmala now picks waste to support herself and her daughter. She leaves her daughter in the slum while she goes on collection rounds: from 4/5 a.m. to 8/9 a.m. and then again from 1 p.m. to 3 p.m., and sometime again in the evening. For this labour she earns on an average Rs 25 per day.

Since she and her husband both come from families who have traditionally been engaged in basket making, she perceives the change to waste picking as a definite downward move. Not only do others not respect her, she feels she has no respect for herself. Local sweepers harass her and make her carry their garbage before allowing her to pick waste. On the roads too, people often abuse her.

Even as the need to supplement family income remains the overriding factor for children's involvement in waste picking, the breakdown of the extended family system in urban areas also plays a significant role. As already mentioned before, the absence of support systems often requires that small children accompany their mothers for the collection work. Of course, when slightly older children are present to look after siblings, the younger ones may be left behind, only if economic compulsions do not require the older ones to go scavenging. Often when small children do accompany their mothers on the collection routes, they are not perceived as being involved in waste picking. In effect however, they assist their mothers, as and when they can, in the process getting initiated into the business of waste picking. In effect therefore, it is the need to supplement family income coupled with the breakdown of the extended family network, that necessitates children's involvement in waste picking.

For most children however, as reflected by the surveys in Delhi and Bangalore, the overriding factors for adopting waste picking are poverty, loss of parents or as a family occupation.

For the street children living alone, it is always economic compulsions and a means to survival that necessitates the adoption of waste picking as a means of livelihood.

### CONDITIONS AROUND WASTE PICKING

The word scavenger conjures a certain image in the mind; that of a very dirty, and possibly smelly individual, messing about in garbage bins and in the process scattering vast quantities of litter all around the bins, seemingly doing nothing that could possibly be useful or productive. In other words, someone who has only nuisance value within society.

The actual situation is often not too diverse from the image, except for the potential use or value of their task. The conditions under which waste pickers operate necessitate their having to search for anything of value from heaps of refuse or pick such items from the streets, in varying conditions of decay or disuse. Basically waste pickers can be categorised into three types, based on the area of scavenging. There are those that roam the streets and pick up anything lying about on the streets that seems of recyclable value. The second category includes those who in addition to roaming the streets also rummage through communal bins or domestic/commercial refuse lying at specific points on the streets. The third type consists of those who pick recyclables from the municipal disposal sites, after it has been taken there by the municipal authorities. There is additionally a fourth category viz. those who work for waste dealers. Such pickers are committed to sell their entire day's collections to the dealer and may get from the dealer a place to sleep and sometimes food.

Whatever be the location and nature of their activities, they pick used/ thrown/soiled material by their hands or with the help of a stick. It would be a rare sight to see a scavenger using gloves. Working in disposal sites and waste bins brings them in contact with organic as well as other waste, which not only makes the waste pickers smelly and dirty, but also proves to be a source of a large number of health problems.

#### Impact on waste pickers' health

The health of waste pickers is affected at two levels: one arising out of their poverty and the conditions in which they live, which has a bearing on their level of nutrition, their access to health services and the exposure to disease and infection and the other arising as a function of their occupation. Their poverty and



living conditions make them extremely vulnerable, which only compound the impact of the latter.

Specifically, problems that arise on account of waste collection range from infection to poisoning. Cuts from pieces of glass, metal or other sharp objects are common, which often turn into severe infections. When not treated they could lead to tetanus. Since animals also often scavenge in the same refuse heaps, dog bites are found to be quite common. A survey in Delhi (Sanon, 1986) found that waste pickers, on the average, suffered from as many as six cuts and injuries in a month. Certain illnesses are found to occur more frequently in summer: nose bleeds from being under the intense sun for long hours and headaches are common among these.

Exposure to fumes in disposal sites results in respiratory problems and even tuberculosis. Since all kinds of waste is handled by hand, without any protective equipment, skin diseases are common. Infections from contact with faecal contaminants is also common. Waste being a breeding ground for vectors, a large number of diseases and infections are transmitted through such vectors. Additionally, the nature of work is such that it requires constant bending, which gives rise to severe back pains.

Chemical poisoning is not uncommon through the use of empty containers of chemicals. Several pesticide cases for example, have been documented in children who have used discarded pesticide tins for drinking water (Ramachandran, 1986).

More recently, even AIDS has been found to be a risk through accidental contact with infected needles in refuse which have not been disposed adequately. This phenomenon has been found by an NGO working in some slums in Delhi.

Since waste pickers' contact with waste is similar to that of the municipal workers handling waste, or in fact much more in terms of the degree of contact, the health impact for them would be similar to that for the workers as elaborated in the section on Solid Waste Management in India - Practices and Issues.

#### Nature of harassment

In addition to the inherent hazards of the occupation, given the nature of work, the scavengers face constant harassment from the police, municipal staff, local miscreants and even local municipal sweepers. Social prejudices abound, where they are cursed, screamed at for picking up waste and often held

responsible for any wrong that may have taken place in their area of activities. They are vulnerable; unprotected, voiceless and easy scapegoats, given the nature of their work. Accusations of theft, for instance, are very common and the police is often over eager to arrest them for any petty theft that may take place in a particular area.

Harassment to children from the police and home guards is specially common and constitutes the single largest problem faced by children in the course of their work as waste pickers. They are often arrested for no apparent reason and even locked up for varying lengths of time, beaten up and made to clean the toilets in the police station (see box 4.3).

Another common form of harassment comes from municipal sweepers at collection points who do not allow waste pickers to pick items from the communal bins unless some of their own work is done by the waste pickers, such as carrying waste to the communal bins. This harassment arises largely out of the sweepers' own interest in picking which provides them with an additional income. To reconcile this, the local sweepers demand payment from the scavengers: anything upto Rs 50 per week or in kind, in the form of a bottle of alcohol, in the absence of which they report the pickers to the police under the guise of some petty crime.

Of course the police are not far behind in making money in this manner. A memorandum presented at a street children's rally in Bangalore alleged that the police extorted 50 percent of the waste pickers earnings as commission. Payments are also sometimes required to be made to the municipal staff, to ease the process of collection from disposal sites and community collection points. This could range upwards from Rs 50 per month.

#### BOX 4.3

##### THE 'CRIME' OF WASTE PICKING

Sixteen years old Mohd. Hussain, a resident of Jahangirpuri Delhi was arrested by a local policeman because when asked what he was doing, his reply of 'collecting waste' did not satisfy the policeman! He was then taken to the police station and locked up for the night. Another nine year old boy from the same area was similarly arrested and after being given an electric shock at the police station was beaten mercilessly.

For women and young girl waste pickers, harassment assumes sexual dimensions. Passes are made at them and vulgar comments passed, specially when young girls set out on their own. It is not uncommon to find girls being initiated into prostitution, when they are by themselves on the streets for the better part of the day, so much more accessible to a variety of people.

### ECONOMIC AND WORK PROFILE

A typical day of a waste picker begins anywhere between 4 a. m. and 5 a.m. in order to have access to the waste before local sweepers or municipal vehicles start removing them. Some start somewhat later in the morning, but the very latest seems to be around 8 a.m., which is not very common. The actual time spent on and pattern of collection activities varies considerably over different groups of waste pickers. Some leave for scavenging in the morning and return only towards the end of the day, spending the better part of the day in collection. This would typically comprise a working day from 4/5 a.m. to 3/4 p.m. or from 8 a.m. to 5/6 p.m. and is most likely to hold for those groups who travel a considerable distance to the source of collection, as in the case of the municipal sites. The second group consists of those who make about two to three separate trips in the day for collection, whose destination is relatively nearer. Such groups make individual trips of about three hours each, and sort the entire days collection at the end of the day. The last group is likely to make only one trip in the day, lasting about four to five hours, returning for sorting and selling by mid morning.

In the absence of a detailed survey it is not possible to estimate the percentage of women who work in this activity on a full time basis, although a survey conducted in Bombay (Palnitkar, 1993) found that the majority of them tend to do so. It needs to be pointed out here that full time work in this case does not entail the traditional nine to five schedule as waste picking is typically done during the earlier part of the day, starting as early as 5 a.m. However, in terms of the number of hours spent in the activity, it works out to eight hours or even more, which constitutes the traditional full time working day. In the case of children similarly, the Delhi survey found that as much as 75 percent worked in this activity on a full time basis and could be spending as much as 12 hours in waste collection.

#### Patterns in collection and sale

Collections comprise paper (all kinds), cardboard, glass pieces, whole glass bottles, iron, wires, foam, plastic in different forms such as polythene bags, milk

packets, hard plastic such as combs, buckets and boxes, footwear and rubber, to name a few. Anything that has recyclable value is collected and daily collections could range from 5 kilograms to 30 kilograms. Although the majority of waste pickers collect any item they find, a very small percentage concentrate on specific items. Lakshmi in Motia Khan, Delhi, for instance, usually goes to the iron market and collects mainly iron scrap.

The composition of daily collections clearly varies across areas and across waste pickers. The main items collected include paper/cardboard, different types of plastic and glass; combined these could constitute upto 70 percent of the total collections by weight.

Waste collection is also vulnerable to seasonal variations; the quantum of available waste in summer (except for the duration of the monsoons) far exceeding that in winter. To some extent waste generation in summer is greater as shelf life of various items is lower and wastage is likely to be higher. The main factor affecting waste availability however is the use of waste to generate heat; in winter large amounts of waste are burnt to produce heat for warmth, reducing considerably the amount available for recycling. The monsoons are a time of the year when waste collections are the lowest. Not only is it difficult to go on waste collection rounds during the rains but items such as paper, which disintegrate when wet, are not available for collection.

There are neither any set areas of collection nor any fixed routes. The distance travelled would therefore depend on the area of collection and also whether collection is done on neighbourhood streets and collection centres or the municipal disposal sites. There are therefore extreme variations in the actual distance travelled; what is significant here is that this ranges from 5 kilometres to 20 kilometres. In the Jahangirpuri area in Delhi, 12 year old Jamail travels about 16 kilometres daily for waste collection and there are several others like him. Of course, when such large distances are involved, the waste pickers usually make use of local public transport.

There also exist a small proportion of pickers who travel out of the city and may stay out for a few days before returning with their collections. Pickers from Jahangirpuri for instance, travel from Delhi into the neighbouring areas of Haryana, where they stay for four to five days at a disposal site before returning to Jahangirpuri.

Whereas the majority of waste pickers travel on foot to collection destinations or through collection routes and carry back their collections on their backs, on foot, in case of long distances they do make use of local public transport. Some even have bicycles of their own while others may use a hand drawn cart to carry the collections. The most common mode of travel however, remains by foot whereby on an average anything between 10 kilograms to 20 kilograms may be carried on the back.

The time taken for sorting is obviously a function of the quantum of collection and can vary from half hour to three hours. After sorting, the material collected is sold, usually to the local trader based in the slum. Patterns for sale are also variable, although the majority of waste pickers sell each days collection on a daily basis. In some cases, material is collected for two or even three days and sold together. A survey conducted across several areas in Bombay (Palnitkar, 1993) found that 67.5 percent of the waste pickers' sample sold their collections on a daily basis, about 25 percent sold them once every two days, 5.7 percent sold them twice a week and 1.7 percent transacted only once a week.

Although a large number of waste pickers sell their collection to the local slum trader, this is more likely to happen in the case of those who carry out collection operations in the surrounding areas. Scavengers who travel a considerable distance, for instance to the disposal sites, are as likely to sell to other traders, who may offer a better price, or by which they are likely to save on the cost of transportation. In Bombay for instance, it was found (Palnitkar, 1993) that many waste pickers take their collection to Dharavi (a slum on the outskirts of the city, which is also the largest slum in Asia), which houses several small recycling units, to get a better price. Of course, such a transaction requires much larger volumes than can be collected in a day, and such pickers pay for storage space, to have their collection stored until optimal quantities have collected.

The links between the local trader and the waste picker are usually strong, with considerable dependence of the latter on the former. In times of financial need (which occurs often), it is the local trader who extends loans/advances to the slum residents, thereby providing a sense of security. For the slum dwellers this need necessitates a loyalty towards the trader, and in the process ties the picker to the trader for business transactions. Moreover, most such traders wield a considerable clout within the slum society and its internal politics. They may head local political bodies, and are influential in relation to anything that may concern life in the slum settlements. They also carry out such tasks as paying off

the police so that harassment to waste pickers can be reduced. Within such a situation, it is in the interest of the community to maintain a good relationship with the trader.

#### Earning patterns and extent of economic exploitation

Earnings from waste collection and sale could range anywhere between Rs 10 per day to as much as Rs 60 to Rs 80 per day for each person, although the average is likely to be between Rs 25 to Rs 40. In the case of small children it is likely to be much less, starting upwards from Rs 5. Earnings for children are typically found to range from Rs 100 to Rs 300 per month (see NIPPCD, not dated and Sanon, 1986). Daily earnings are variable, depending on several factors such as the season, time of day and route taken.

The monsoons, for example, are the worst time of the year for waste picking activities, as waste becomes wet and for items such as paper, cardboard, plastic packets/sheets etc., the price therefore is affected considerably. It is estimated that upon drying up, the weight of these items is reduced to one third the wet weight. The price, accordingly, paid by the trader for wet items is reduced considerably and could be as little as half the price of the dry item.

Seasonal variations are also found to exist: winter finds a decrease in waste prices despite the overall reduction in waste availability. This is in part due to waste being wet in winter and in part because of reduced activity in recycling units which reduces the demand for raw material.

The earlier the pickers set out for waste collection the greater are their chances of finding not only large quantities of waste but high value items, and therefore of increasing their earnings. Similarly, earnings for those operating at disposal sites are likely to be less than others since a considerable proportion of the recyclable material is already removed from the waste before it reaches the disposal site.

It is estimated that on the average anywhere between 10 to 15 kilogrammes of total waste is collected by each waste picker on a daily basis, whereas for children it is between 5 to 7 kilogrammes. The prices per item for the commonly collected items is given in Table 4.1.

**Table 4.1 Comparative Prices of Waste Items in Delhi (1993) in Rupees**

Item	Waste picker to Trader	Trader to Wholesaler	Wholesaler to Recycling Unit
Paper (mixed)	1.00 - 1.50	1.50 - 2.00	3.00 - 4.00
Cardboard	1.00 - 2.00	2.50 - 3.00	3.00 - 3.50
Plastic			
LDPE (Milk packets)	9.00 - 10.00	13.00	15.00 - 16.00
HM (Thin polybags)	2.00 - 3.00	4.00	6.00
Hard Plastic (eg. buckets/toys)	14.00 - 16.00	16.00 - 18.00	20.00
Mixed	8.00 - 10.00		-
Glass	0.40 - 0.50	0.80	-
Iron	3.00 - 4.00	5.00	7.00 - 8.00

Source : Discussions with traders and wholesalers

Contrary to what may be commonly believed, waste constitutes a flourishing trade where even petty traders could earn upto Rs 10,000 per month (Kumar, 1989). However, as with most activities within the unorganised sector, the primary collector/producer is the most exploited in the entire chain of activities. The waste pickers are completely exploited by the traders who buy waste from them. Illiteracy, the lack of awareness, the absence of organisation and indebtedness to the trader - all combine to create a situation where the waste pickers are unable to bargain. Table 4.1 gives the comparative prices, and therefore the profit margins, for the same items at different levels: sold by the collector to the petty trader, by the trader to the wholesaler and finally to the recycling unit. The table reflects the level of exploitation and the extent of mark up at each level, as the items find their way from the waste collectors to the recycling units.

As can be seen from the various prices in the table, the final price at which the recycling unit buys an item could be as much as three times the return to the collector. The main reason for this lies in volumes; the economic conditions of the pickers as also the space available with them for storage necessitates frequent sales which does not allow large quantities to collect whereas the recycling units only buy in bulk. The extent of sorting carried out by the collectors is also likely to play a role in returns, since they often sell items (say different types of plastic) in a mixed form for which they receive an averaged price.

If not daily, most waste pickers sell their collections once in two days as the days needs are usually fulfilled by the day's earnings. Savings are rare and loans are frequent, usually from the local waste dealer.

To compare earnings from waste picking with earnings from other occupations, the wide variation of earnings within waste picking itself need to be borne in mind. A survey carried out in Delhi (Galloway, 1993) found that people living off waste tend to be better off economically than those in other occupations. The survey found that whereas half the population dealing in waste received Rs 400 per month or less, in the case of other low paying occupations this figure was Rs 180. It needs to be pointed out however that this survey dealt with the entire range of people dealing with waste viz., waste pickers, itinerant waste collectors, waste dealers and waste godown owners. The data therefore relates to this entire set of people, and when considered only in the context of waste pickers, may change significantly.

It needs to be borne in mind that what is of significance here is not the relative earnings from waste pickings vis a vis other occupations, but the earnings from and conditions surrounding this work in absolute terms. It is significant, in the context of this discussion, to note that returns from waste picking are low and the conditions of work abysmal; and that to maintain even that given level of earnings is becoming increasingly difficult because of the interest in waste displayed at various levels - domestic help, municipal sweepers and other staff - all of whom recognise its value in terms of additional income and reduce the waste availability for waste pickers by collecting it themselves.

#### INTRA HOUSEHOLD DYNAMICS OF WASTE PICKING

Gender based differentiation in the availability of occupations are fairly well established, whereby not only do a disproportionately higher percentage of men find their way into the organised sector, but even within the informal sector most men are concentrated in activities which are better paying and require a higher degree of skill (see for example NIUA, 1991). In fact, even within the same occupation, men are typically found to carry out less strenuous and higher skilled tasks. As a result, activities such as waste picking which are strenuous, low paying, require no skill and are associated with a negative status are most often relegated to women

#### BOX 4.4

##### ONLY FOR WOMEN?

After working as agricultural labourers on a share cropping basis in Churu district, Rajasthan, Lakshmi and her husband migrated to Delhi about four years back for better security in income since in the village they found work only three months in the year. Lakshmi's husband took up shoe polish on the pavements, when the income proved insufficient for them and their two children, Lakshmi took up waste picking. Now between the two they earn Rs 50 per day, of which Lakshmi's income comprises about Rs 20. While Lakshmi is away for waste collection their five year old daughter looks after their two year old son.

Therefore, as mentioned earlier, except in the case of some specific communities, it is seldom found that men within a household undertake waste picking when women are engaged in an alternate occupation. What does happen frequently is the reverse, that is women adopt waste picking as an occupation while men are involved in something else (see box 4.4). In such cases, the men are typically involved in occupations such as driving a rickshaw, shoe polish, vending, daily wage labour, buying waste from individual houses and shops and even traditional family occupations like basket weaving. Often when men continue with or adopt traditional family occupations as in the case of basket weaving, it is common for women to be involved in the same activities; but when returns from such activities are not adequate, women take to picking waste to supplement family income.

Significantly, discussions with several women waste collectors in Delhi revealed that the decision to adopt waste picking as an economic activity was usually their own and in no way influenced or forced by their husbands. The involvement of other women around them in the same activity on the one hand and the lack of other concrete employment options on the other often had a decisive role to play. The relative flexibility of timing involved in the work moreover, also proves to be an important factor whereby their domestic responsibilities can be fulfilled along with economic ones.

It is of course not uncommon to find that the men are not engaged in any productive occupation at all; or when they are, for such earnings to be spent

entirely on the men themselves - on drink or gambling - necessitating the women to financially support the family.

In the majority of families where one or both parents are engaged in waste picking, the children, at least some if not all, are also usually involved in it. Importantly however, there exists a significant proportion of families where only the children engage in waste picking. A survey in Bangalore (NIPCCD, not dated) found this proportion to be as high as 80 percent of the sample. Whereas the parents in some of these families are likely to be engaged in other informal sector activities where the children supplement family income through waste picking activities, it is also quite common on the other hand to find the parents not engaged in any economically productive activity (see box 4.5). Some of the men spend their entire time drinking and gambling and if the women are unable to work, the children constitute the only working members of such households. This is also found to happen in single parent homes or where the parents are unable to work because of age, disability or sickness.

The conditions or compulsions under which children take to waste picking even when their parents are not involved in it need to be analysed at two levels. First, even in the case of working parents, children often need to be economically active to supplement family income. Jamil Ahmed in Jahangirpuri drives a cycle rickshaw to earn a living. When one of his children had to undergo an operation he found that his own earnings from rickshaw driving were not adequate to finance the medical treatment. This then necessitated that three of his six

#### BOX 4.5

##### CHILDHOOD IN WASTE

Twelve year old Mantu Kumar left his family in Bihar and came to the Rashtriya Camp, Pusa Road in Delhi about one and a half years back. On arriving here he saw other people around engage in waste picking and adopted the activity himself. About five months back his father joined him in Delhi, but is not productively employed even now; he cannot find a job and does not want to do waste picking. Mantu, who then supports himself and his father, picks waste for three to four hours daily and earns about Rs 25. He faces enormous harassment from the police and is often beaten up by them on accusations of theft.

children take up economic activities and they started waste picking. At the second level it needs to be understood that amongst the various different economic activities, waste picking is commonly chosen by children because of the relative ease with which it can be undertaken.

#### Patterns of collection

Discussions with several waste pickers, both men and women, do not reveal any conscious difference in choice of collection route between the two. The only prominent difference that does exist is in the total distance travelled for waste collection. Whereas women typically collect in the surrounding areas within a distance of about five to seven kilometres, men are more likely to go to distant areas, which could be upwards of 15 kilometres from their slums. When both members of the same family are engaged in waste collection, they almost never head for the same area, as different routes are more likely to yield higher collections. However, decisions on the route to be adopted by each seem arbitrary. Similarly, the composition of the collection does not display any differential that could be attributed to the collector.

Although men and women seldom go on collection routes together, women are often accompanied by their children. In the case of children accompanying parents (or specifically mothers) for waste collection, it is found that it is girls, most often, who accompany their parents, whereas boys either engage in other activities such as boot polish, or set out on waste collection rounds on their own or in some cases even attend school. In the Motia Khan slum, in Paharganj, Delhi, Kallo's son attends school, while her daughters accompany her on her waste collection rounds. Banarsi's two sons contribute to the family income by polishing shoes while her daughter helps with waste collection. In the same area, Champa and Tejia take their respective daughters for scavenging whereas their sons often do not do anything at all.

It is significant to note however that this does not imply that there are more girl children involved in waste picking than boys. In fact, the contrary has been revealed by the surveys conducted in Delhi and Bangalore, which found that as much as 75 to 80 percent of the waste picking population consisted of boys. This demonstrates that amongst street children it is predominantly boys who are engaged in waste collection whereas girls are more likely to adopt it as a family occupation and carry it out mainly along with their parents. Informal discussions with waste pickers in Delhi did point to a predominance of girls amongst children who carry out waste picking as a family occupation, with one or more

parents. Even when it does happen that girls go for waste collection without their parents, they prefer to go in groups of several girls.

#### Earning patterns

Women's income from waste compares favourably with and is most often as much as the man's income from other sources such as boot polish, basket weaving etc. Income from waste collections are clearly then, not mere supplements to the family income, but a critical input for family survival. Children's contribution to household income similarly, is significant and was found to be above 30 percent in Delhi (Sanon, 1986) and about 27 percent in Bangalore (NIPPCD, not dated).

Additionally, of course, there is the case of both men and women in a family involved in waste picking. In such cases, although the two take up distinct collection routes, the entire collected material is sorted and sold together. Similarly, when children accompany parents on collection routes, the collections are combined together for sale. In such cases it is not possible to assess the precise contribution of any one member of the household towards waste collection.

#### OCCUPATIONAL MOBILITY

'Once a waste picker, always a waste picker' is a commonly held opinion of the waste pickers met with in Delhi. The nature of waste picking work is such that it does not offer a wide range of possibilities for work upgradation. Since no skill formation takes place while carrying out this activity (except the ability to recognise and differentiate items of different values), to the set of people who undertake this work with no skills to their credit, even after several years of carrying out this work their level of skills remains the same.

The level of earnings moreover, does not allow for savings in most cases. There is hence no scope for building up a capital base which may have allowed them to take up other petty ventures. In the few cases that such a capital is built up or loan facilities are availed of, the waste pickers do sometimes upgrade themselves to waste dealers by setting up a waste shop. Some who try other petty businesses are often forced to close shop because of varied reasons such as police harassment, unfavourable market conditions, the need to pay bribes etc. The financial situation of most such people is inherently insecure which makes them extremely vulnerable to any minor setback in their business activities. Several waste pickers in Delhi were found to have tried petty vending as an alternate occupation, often after taking considerable loans. They were forced to



return to waste picking however, on account of inadequate sales, high level of bribes required to be paid or police harassment as happened in the case of Mohd. Sabir Ali, who had taken up fruit vending but lost everything when the police came and took away his cart (see box 4.6) for no apparent reason.

The socio-economic status of most waste pickers, as also their relatively recent migration into the city has a strong bearing not only on their low awareness levels but also the lack of clout in relation to the transactions and dealings carried out in their daily lives. This in turn makes them particularly susceptible to the different forces operating in an urban milieu. Such conditions further compound the impact of lack of skill and capital in occupational stagnancy.

When issues of awareness and capital are addressed by a local agency, such as a voluntary group, a change of occupation or distinct improvements in their working conditions are not uncommon. Experiments from across the country have demonstrated how small groups of waste pickers can be organised to undertake recycling activities themselves; increasing in the process not only their returns but adding a new dimension to their occupation. This is discussed in detail in a later section.

#### BOX 4.6

##### ONCE A WASTE PICKER, ALWAYS A WASTE PICKER

Mohd. Sabir Ali, now a resident of Jahangirpur, Delhi, came from Assam about 15 years back. For about 12 years he supported himself and his family by waste picking. He often thought of doing something else, but a lack of skills and capital prevented him from changing his occupation. About three years back, along with a friend, he took a loan for Rs 8000 to start a fruit vending business. He bought a cart for carrying the fruit, until one day the local municipality staff came and threw all the fruit on the road and took his cart away - his crime being that he was standing with his cart in a place where he was not supposed to be! Not only did he lose everything, he is now burdened with debt and is back to waste picking, not only to support himself but also to repay his large debt.

In the case of children too, very few children engaged in waste picking are themselves (without the intervention of an external agency) found to change their occupation. Significantly however, it is observed that a large proportion of such children display no particular dislike for, and hence desire to change, their occupation. This observation is also corroborated by other studies in Delhi (Sanon, 1986) and Bangalore (NIPCCD, not dated). Waste picking allows children a freedom which is rarely found in other occupations. There is no employer and hence no rules and discipline. This constitutes an important criterion for children, for whom flexibility, lack of accountability and the freedom to be on their own are of prime importance.

Equally significant is the role of the social stigma associated with waste picking; whereas for adults this constitutes a prime factor in their desire for occupational mobility, in the case of children it is almost completely absent. It is only when they reach the age of about 16 or 17 years that such factors begin to affect their process of thinking.

An important issue arising in this context is the diversion of waste picker children, predominantly boys, into anti social activities such as petty thefts, drug peddling, gambling etc. Whereas at times this occurs out of spending a disproportionately high time on the streets which increases the chances of being exposed to such activities and 'anti social elements', at other times such activities are resorted to out of a lack of any other option. As Mohd. Sirajul Haq, in the Jahangirpuri area in Delhi observes, most of his contemporaries in waste picking are today engaged in thefts, gambling and other such activities primarily because their efforts to engage in alternate occupations did not yield satisfactory results.

## ROLE OF WASTE PICKERS IN WASTE MANAGEMENT

Despite being an intricate part of the solid waste stream, waste pickers, possibly because of their social and economic poverty, are the most invisible and unacknowledged workers within the waste systems. Having outlined, broadly, the current waste management practices of the municipal corporation and their limitations on the one hand and the profile and workings of waste pickers on the other, it becomes imperative to establish the exact role and contributions of waste pickers, if any, in waste management and/or resource recovery.

It is clear, at the outset, that municipal waste management systems are inadequate in effectively handling the waste generated in most urban centres in the country. Not only are large quantities of waste left uncollected, creating enormous health and environmental problems for the population, but resource recovery is minimal, allowing to go 'waste' precious resources that could otherwise be retrieved/saved.

A critical look at the various forces that affect the flow of waste points to the key, and potential, role that waste pickers do and can fulfill within the larger waste management systems.

### ECOLOGICAL CONTRIBUTIONS

The waste collected by waste pickers clearly reduces the quantum of garbage that has to find its way to disposal sites. If this were not collected by them, given the percentage of uncollected waste as at present, it would very likely contribute to the choking of sewers and drains, as uncollected solid waste often finds its way into urban drainage systems, increasing manifold sanitary and other environmental health problems. To put the issue into perspective, the following calculations illustrate the quantum of waste removed by the waste pickers from the waste stream.

Assuming that, on an average, each waste picker collects about 10 kilogrammes of waste daily and using the estimate of 30,000 waste pickers in Bangalore in 1989 (based on estimates of 25,000 for 1986 and 35,000 for 1991), the total collections per day by waste pickers in Bangalore amount to 300,000 kilogrammes. Taking the per capita waste generation in the city (during 1989) at 0.5 kilogrammes (TECSOK et al, 1989), the waste collected by waste pickers is equivalent to the quantum of waste generated by 600,000



residents of Bangalore. Similarly, an estimated 80,000 waste pickers in Delhi, with an average daily collection of 10 kilograms, would collect 800 tonnes daily, which would be equivalent to the quantum of waste generated by 16,00,000 residents of Delhi. In other words, if these waste pickers were not doing what they do, the waste situation in Bangalore city would be equivalent to what it would be if the city's population increased by 600,000 people and in Delhi by 16,00,000 people.

Moreover, based on the above calculations waste pickers collect about 300 tonnes of waste per day in Bangalore. Taking the total waste generated at 1800 tonnes per day (TECSOK et al, 1989) this implies that about 16 percent of the daily waste generated is collected by waste pickers. This has been corroborated by other studies (Rao, 1990 and ASTRA in Rosario, 1992) which estimated the percentage of waste collected by waste pickers in Bangalore to be around 15 percent.

The above calculations are based on an estimated average waste collection of 10 kilogrammes per person per day. Clearly the contribution of waste pickers would be far greater in areas where this figure proves to be a conservative estimate. In Bombay for example, the National Slum Development Federation estimates that ten thousand waste pickers contribute almost 500 tonnes (50 kg per person) of scrap every day to the waste trade (Kumar, 1989).

The total waste removed from the waste stream is also significant in terms of the decreasing availability of land for locating waste dumping sites. If waste pickers are further organised around the decentralised management of organic waste for compost production, this issue could be further addressed.

Additionally, no less is the environmental contribution of waste pickers in terms of the environmental advantage of recycling. A previous section elaborates on these aspects. Since waste pickers facilitate the process of recycling, they are in fact indirectly contributing to such environmental advantages.

## ECONOMIC CONTRIBUTIONS

No less important than the environmental implications of reducing the total quantum of waste to be treated/disposed is the impact on the municipal expenditure, and therefore the taxpayers money. Rough calculations reveal that the impact of waste picking on the municipal budget is not insignificant.

It has been estimated that municipal expenditure on solid waste in Bangalore was about Rs 13.1 crores in 1989 (this is not an exact estimate as this may include sanitation activities other than those relating directly to waste collection, transportation and disposal). This expense relates to the waste amount collected by the municipal authorities which is in the range of 1225 tonnes per day (TECSOK et al, 1989), or 447125 tonnes for the year. At the rate of 300 tonnes per day, the waste pickers of Bangalore collect 109500 tonnes over the year, which would cost the municipal authorities Rs 3.2 crores to collect, transport and dispose, or another 24 percent of their existing expenses. The waste pickers therefore, save the municipal authorities approximately 24 percent of their expenses by removing waste from the waste stream.

In Delhi similarly, the waste collection and disposal budget for 1993-94 is about Rs 70 crores for a daily collection of 4000 tonnes or annual collection of 14,60,000 tonnes. At a rate of 800 tonnes per day as calculated above, the Delhi waste pickers collect 2,92,000 tonnes during the entire year, which would cost the municipal authorities Rs 14 crores or 20 percent of their annual budget on waste management. They thus save the local authorities approximately 20 percent of their budget by removing waste.

A word of caution however, would be in place here in that these calculations are very approximate and therefore only indicative of the situation. Since some of the waste is collected by waste pickers from dumping grounds, the expenses on collection and transportation would have already been incurred by the municipal authorities. To this extent then, their contribution to savings towards municipal expenses would have to be discounted. Moreover, as already mentioned, the expenses supplied by the municipal authorities include activities such as street sweeping and hence do not relate only to collection, transportation and disposal of wastes. Another factor which could change these calculations is the variation in the actual daily collections of waste pickers; during the months of rainfall for instance, collection are usually very low.

A look at the waste pickers contributions to the recycling industries reveals not only the important role they perform in supplying raw material to a host of industries, which in turn generate employment for a large number of people, but also in saving the nation's resources by making possible this recovery from waste.

Moreover, waste pickers constitute a prime component of a process that makes available to the country's population consumer products of daily use at considerably lower prices than otherwise. The extent of difference in prices between recycled products and those manufactured through non renewable raw material can be illustrated through the case of polybags. Whereas the price of polybags made from pure petroleum granules of 50 percent low density polyethylene (LDPE) and 50 percent high density polyethylene (HDPE) works out to around Rs 56 per tonne, those made through recycled granules of LDPE and HDPE in the same proportion work out to Rs 35 per tonne. The consumer thus incurs a saving of Rs 21 per tonne.

Employment generation is another contribution to the economy, which although cannot directly be attributed to waste picking, is nevertheless facilitated by the activities of waste pickers. Once again taking the case of plastic recycling to produce plastic granules, which are then used for polybag manufacture, it is estimated that for every 100 waste pickers collecting only plastic, approximately, a little less than 40 people can find employment in recycling units.

A plastic wholesaler receiving only road waste, either directly from waste pickers or from traders who are in turn buying from waste pickers, buys anywhere between 30 to 45 tonnes in a month. Discussions with a recycling unit producing plastic granules from HDPE and LDPE road waste revealed that there is a wastage of about 20 to 30 percent in the case of LDPE. This implies that 30 tonnes of LDPE waste would produce 21 tonnes of plastic granules. The same unit employs about 24 people in the production of approximately 24 tonnes of granules and another 8 people for producing about 10 to 11 tonnes of polybags. Therefore, the production of about 21 tonnes of granules and about 20 tonnes of polybags would require the services of about 37 people.

The input of 30 tonnes of road waste per month, translates into one tonne daily and could be supplied by about 100 waste pickers if collections are estimated at the rate of 10 kilogrammes per person per day. Although this figure would be reasonable for all material combined, it may not be accurate for those collecting only plastic. Discussions with wholesalers supplied by waste pickers however found that this estimate is not inaccurate. Therefore it can be stated, although with some degree of reservation about the accuracy of these calculations, that 100 waste pickers facilitate the employment generation of about 37 people.

## GOVERNMENT AND NGO RESPONSES

Clearly three distinct, or seemingly distinct, issues viz., employment needs for the progressively increasing multitudes of urban poor, the collection and disposal of vast quantum of solid waste and the raw material requirements of a rapidly growing recycling industry have all combined to create the increasingly growing occupation of waste picking.

Even as waste picking has emerged as a result of these three factors, very few responses to issues concerning waste pickers have addressed all three factors. Government approaches in India have usually been found to be compartmentalised and it is only in the case of a very few NGOs that the three issues have been taken up collectively. Away from home, other countries have seen some innovative efforts at addressing issues of waste picking which combine the multiple factors involved.

### GOVERNMENT POLICY AND INITIATIVES

An analysis of government policies and responses in this regard reveals that not only have employment opportunities for the urban poor been the only area addressed but even urban poverty, as a priority area in urban development strategies, has gained recognition only recently. It is in fact in the Seventh Five Year Plan (1985 - 1990) that for the first time the growing incidence of urban poverty was taken note of. Whereas the first six Plans concerned themselves primarily with physical aspects such as housing; slum clearance, improvement and upgradation; preparation of master plans and municipal and civic administration, it was the Seventh Plan that recognised urbanisation as an integral part of economic development (NTUA, 1990).

Quite apart from needs of credit, moreover, until recently other requirements for activities within the informal sector were also ignored; the City Master Plans for instance, by and large concerned themselves only with the space requirements of activities within the formal sector (*ibid*). Therefore even when credit was made available, the employment options within the informal sector would necessarily have been restricted by the availability of physical space.

It was in the Seventh Plan then that a thrust was given to urban employment generation as a means to tackle urban poverty problems. The strategy adopted aimed to (a) provide gainful employment to the unemployed

(b) raise the earnings of those in low paid jobs (c) step up the productivity and earnings of self employed workers and (d) improve the access of urban poor to basic amenities (ibid). As part of this strategy, two programmes were launched during this period, that aimed at employment generation.

The first was the **Self Employment Programme for the Urban Poor (SEPUP)**, which focussed on the expansion of employment opportunities in all urban centres and the second, the **Nehru Rozgar Yojana (NRY)**, which provides wage employment guarantee with provision of opportunities for self employment, through a credit and training scheme. Importantly however, even within these employment generation programmes, the employment potential of distinct sectors have not been exploited to any considerable extent. Although the NRY recognises the role of shelter and housing sector in employment promotion, as NIUA (1990) points out, "much more is needed in terms of recognising that sectors like shelter, infrastructure and services, can, on the one hand, effectively contribute to the national goal of employment creation, and on the other, the sectoral goals themselves".

Whatever be the inherent constraints or potential in these programmes, experiences have revealed that they have rarely benefitted the most disadvantaged of the urban poor. Even the community groups that are reached have benefitted, most often, only marginally, due to various different reasons. Specifically, an evaluation of SEPUP (PNB, 1988) found that the programme did not have any specific targets for distinct socio-economic groups; the ones who were most in need of the loans were not amongst the beneficiaries. Moreover, women constituted a very small proportion of the beneficiaries. The evaluation also noted that the non availability of supportive facilities prevented optimal utilisation of the loans. The NRY similarly, has been found to be inadequate in addressing the needs of women and the other extremely disadvantaged of the urban poor such as street dwellers. The municipal bodies, most often, are either not able or not motivated to provide the kind of services and assistance necessary to help such groups.

A survey carried out by the National Institute of Urban Affairs (NIUA, 1991) found that the coverage of individual income generating schemes is limited relative to the reach of area based service programmes. Significantly moreover, a distinct gender bias has often been found in the reach of many such government interventions for the urban poor. In Faridabad for example, an NIUA study found that primarily males benefitted from the provision of subsidised credit while women benefitted from training and skill upgradation

programmes (ibid). Now whereas skill formation and upgradation is definitely desirable, and often necessary, for employment, it does not in itself guarantee employment. Credit on the other hand, as pointed out by the study, facilitates income generation more directly as it enables the initiation of a business. The availability of credit however, is most often based on requirements such as collateral, a system which is inherently discriminatory against poor women as they usually have no asset in their name.

Whereas poor urban men and women, specially new migrants, are both unlikely to have assets, men can show the *jhuggi* (the slum dwelling that they live in) as their own (since it is usually in their name) which serves as a collateral. The ration card additionally, which bears their name, provides the required proof of domicile. The two combined are adequate to fulfill the requirements for receiving credit. Women on the other hand can neither show the *jhuggi* in their name nor is proving domicile quite that simple in their case; many of them migrate to the city on marriage and are often harassed by the officials who insist on their place of domicile being the place of their birth.

The NIUA survey thus found that a negligible proportion of women benefitted from government sponsored schemes for vocational training, and that too mostly in the field of tailoring, embroidery, food preservation etc., which have a low demand in the labour market. It has also been found often that when allocations are made under programmes specifically for women beneficiaries, it is still men who take advantage of them; men for example, acquire loans on behalf of their wives, whereas the latter have no control either over the investment of the amount or the returns.

Clearly, the ineffectiveness of government programmes in reaching the most disadvantaged of the urban poor plays a significant role in the adoption and perpetuation of occupations such as waste picking. Additionally, the inability or unwillingness of the government to respond to a situation, which is in itself an informal response to multiple urban issues, prevents the improvement of prevailing conditions within that situation.

## NON-GOVERNMENT RESPONSES

The inability of government investments to be responsive to the needs of people has usually led to the emergence of such responses from non-government organisations (NGOs). The NGOs working in urban areas in India, very broadly categorised for the purposes of this study, comprise those that

work with urban poor in general and those that work specifically with street children. Such NGO initiatives work either at a local level, organising members and actually delivering immediate needs and services or as a catalyst between local authorities and communities in order to get access to basic amenities or services. The former, in such a case, typically provide services such as basic education, health facilities and nutrition education, skill development or income generation programmes and basic amenities such as water and sanitation. The majority of such organisations however, work around the traditional welfare approach of providing creches, learning centres, dispensaries and developing income generating activities such as sewing, making paper bags etc.

There are few groups working exclusively, or even predominantly, with waste pickers; waste pickers would usually form a part of a larger community of slum dwellers or street children that the specific agency has targeted for interventions. Waste management is not often undertaken by voluntary groups as an activity around which such disadvantaged communities are organised. Because of the distinct links between the two, however, groups are now beginning to look beyond the ecological implications of waste management and view them as social action for the poor.

However, of the organisations working with waste pickers (as a significant group within the larger target community), most concentrate on either providing access to educational facilities or on developing alternate income generating skills. Whereas access to education is no doubt essential, without undermining its importance, it is nevertheless necessary to note that it does not in itself directly address needs of employment.

Vocational training similarly, while it creates a skill, is not sufficient in ensuring employment. A whole network of other support structures in the form of credit, access to markets, technology etc. are required, without which the skill often does not translate into earnings.

Therefore even though many organisations focus on skill creation, commonly in activities such as tailoring, embroidery, scooter/car repair etc. not many are able to provide the other support services required; it is not uncommon therefore to find a large pool of children/adults with skills but without jobs. In the context of waste pickers, specially in view of the numbers involved, this then raises the question of the feasibility of finding alternate employment for them and diverting them away from waste picking, even if all of them were armed with at least one skill each.

Moreover, even if this task was somehow achieved, given the pace of urbanisation and the continuing trends in rural-urban migration, the inflow of job seekers into the urban labour market is unlikely to decrease. In the absence of job opportunities, they then would take to waste picking as a survival mechanism, as long as a demand for recyclable items exists. Hence waste picking as an occupation is unlikely to disappear even if all the existing waste pickers were to find alternate employment.

More importantly however, the preceding discussions have pointed out the key role fulfilled by waste pickers within the urban economy and the ecological, economic and social issues addressed by their work. In view of this contribution, it would hardly seem necessary, or even practical, to divert their energies away from waste picking; on the other hand it would be more relevant to improve the conditions surrounding their work and to possibly enhance the scope of their work by adding another dimension to their activities within the larger framework of recycling.

In recognition of this role, some groups across the country have formulated programmes around social and ecological goals based on waste management. Even amongst such initiatives, there exist diverse responses; some organise waste pickers for door to door collections from domestic areas, others organise them for collections primarily from offices and other commercial establishments from where waste can be collected in bulk. Most such efforts focus on eliminating the middleman by selling the collected waste directly to recycling units, optimising returns and assisting the people to do safer and more acceptable work. Some such groups even take up the recycling activity themselves, although on a small scale.

Clearly some of these activities would create the need for an additional set of inputs; usually where the local voluntary group plays a key role. Space requirements for example increase as supplying directly to recycling units entails the collection of large quantities of a particular item. Collections from establishments as opposed to roadsides similarly, requires that accessibility to such establishments be created.

Of course diverting collection activities from roadsides to establishments from where waste is collected in bulk changes to some extent the very nature of the activity. The Self Employed Women's Association (see box 6.1) in Ahmedabad for example, organised women waste pickers to collect paper in bulk from mills and government offices. Since they no longer collect waste off the streets, they are not contributing towards an overall reduction in the

waste to be removed by the public authorities; they now cut into the business of waste contractors as most often this waste does not find its way into the municipal waste. They however, manage to upgrade the nature of their work, increase their earnings and improve the conditions of work and most importantly raise their image - in their own perception as well as that of others.

#### BOX 6.1

##### THE PAPER PICKERS COOPERATIVE - SEWA

Several thousands of women (over 20,000 in 1988), mostly from scheduled castes, worked as paper pickers in Ahmedabad, scavenging for waste paper and other recyclable items for as long as 12 hours every day. Most carry out this activity for survival and not to supplement a larger family income; 67 percent of these women have a family income of Rs 200 per month with an average family size of six and 18 percent of them are the sole bread winners in their family.

SEWA's involvement with this group began in 1975 when the paper pickers asked SEWA for help with the feasibility of large collections in one spot. SEWA in turn approached some of the mills and requested that they turn over their low grade waste paper to these members of SEWA. SEWA managed to get several such contracts, although they had to battle with vested interests at many points since a large number of mill employees were already privately collecting the paper. Similarly, even though SEWA managed to get a directive issued to several government offices to give their 'D' category waste paper to SEWA women, its implementation created immense problems because of the interests of contractors and low level government officials who were involved in this activity.

Since the number of women in this activity who had joined SEWA were large and only a very few were required to actually collect the paper from the various offices and mills, it was decided to set up different cooperatives, offering alternate income generating opportunities. Although the cooperatives faced their share of problems, the achievements of some of the groups were no less. With the support of SEWA, the women were able to bid for and get a contract for picking up paper from government offices along with a commercial contractor.

They also have a godown of their own where large quantities of paper can be collected.

Apart from economic security and an improvement in work conditions, the process of organising, facing and dealing with corruption at various levels, dealing with government officials and contractors and fighting for their rights have all contributed extensively to the development process of these women. As Hirabehn, one of the paper picker members of SEWA pointed out, "Now I have developed and I have started speaking outside the home. I have learnt about business management, I can save money in the bank, my income is fixed and has improved. Not only this but my work takes up much less time and energy so I can spend more time on other things. Through moving about with the SEWA organisers I have learnt how to talk to officials...I have come to know more of the world and have gained confidence" (Bentley, 1990).

The Mythri Sarva Seva Samithi in Bangalore, on the other hand, organised waste pickers while they continued with municipal waste collection. Waste pickers have been organised to carry out door to door collection in residential areas of Bangalore, where through an awareness programme, the residents have been persuaded to separate their wet and dry waste (see box 6.2). Not only does this activity continue to address the ecological and economic needs that it previously did, but additional opportunities in recycling have been exploited through the production of compost.

In Pune similarly, the SNDT Women's University has organised women waste pickers for door to door collections. Local residents have been persuaded to separate waste at source, which is handed over to waste pickers, each of whom have been issued an identity card. Not only are the waste pickers recognised as legitimate workers through this process, but the waste collected has been put to diverse end uses such as composting, vermiculture, production of items such as paper bags etc.



## BOX 6.2

### MYTHRI SARVA SEVA SAMITHI-WASTE WISE

The project Waste Wise, initiated in Bangalore in 1990, was launched to improve the conditions of waste pickers with simultaneous benefits to the local authorities. Thus not only did the project aim to improve earnings of pickers, legitimise their work and create the potential for upward mobility, but also reduce waste collection and transportation costs of local authorities and decentralise waste treatment.

In the Jayanagar residential area of Bangalore, about 400 houses have been persuaded to separate organic, dry recyclable and toxic waste at source and hand it over to waste picker children. The waste pickers take the organics to a compost site, sell the dry recyclables and dispose the rest in communal bins. Authorisation has been taken from the municipal corporation for using an area of a public park for composting purposes. Earthworms are at present being provided by the University of Agricultural Sciences for vermi composting. The use of earthworms removes the problem of smell from the waste since once the earthworms act on the waste the smell is reduced considerably. Additionally, leaf litter is used to cover the pits used for storing the waste.

About 200 to 250 kilograms of organic waste is collected every day by four boys, producing one tonne of compost every two months. With better management and protection, the project staff feels, the compost production can be increased to one tonne every month. It is sold to a wholesaler for about Rs 4 per kilogram, resulting in an income of Rs 4000 every two months. The wholesaler in turn sells it to floricultural farms or other industry for about Rs 6 per kilogram.

In Bombay, Shelter, a project started by priests of the Salesian Order of Don Bosco, provides refuge and other support structures to street children. The waste picking children at Shelter have formed a cooperative called Hamara Dukan (our shop) to eliminate middlemen and sell scrap directly to end users. They have also learnt to save surplus money in savings account to tide them over days when they cannot go waste picking (Advani, 1989).

Further from home, several other countries have demonstrated similar or more innovative initiatives in organising waste pickers. Perhaps, one of the most extensive and integrated programmes can be seen in Cairo, Egypt where in recognition of the environmental, social and economic merits of the traditional system of waste collection by the Zabbaleen community, the **Zabbaleen Environmental and Development Programme** was launched (see box 6.3). The programme harnessed the resources of large number of low income groups to be gainfully employed in the service of the environment and the larger urban economy.

## BOX 6.3

### THE ZABBALEEN ENVIRONMENTAL AND DEVELOPMENT PROGRAMME

Cairo, with a population of 15 million generates about 6000 tonnes of solid waste per day. Responsibility for the management of this waste is shared by the municipal sanitation force and a traditional private sector waste collection system carried out by the ethnic communities 'Wahis' and 'Zabbaleen'. The actual waste collection is carried out by the latter group, whose income, until recently, derived predominantly from animal breeding and recycling activities.

The Zabbaleen transport waste to their own settlement, where they sort and recycle it. Accordingly, the sanitary conditions in which they live have not only been deplorable but constituted a threat to both the Zabbaleen and the management of waste in Cairo.

Over the years, as it became apparent that the survival of the Zabbaleen as effective service providers required a major intervention, the Zabbaleen Environmental and Development Programme was initiated around the mid-eighties to improve the living conditions in their settlements and to upgrade waste collection and processing systems. Implemented by the Government of Egypt in cooperation with the International Development Association of the World Bank and Environmental Quality International, intervention activities were targeted at improving environmental and living conditions, promoting enterprise among community residents specially women, increasing the service capacity of the Zabbaleen and instituting low cost technological innovations. The programme also aimed at putting an end to child labour.

Specifically, an enterprise promotion project was designed to provide the Zabbaleen with new business opportunities related to their trade. Small community based recycling industries, designed to maximise the resource value of the waste, were established. Additionally, a 160 tonne per day composting plant at the main settlement was established, to convert animal manure mixed with other organic residue into a useful compost product. The cost of operation and maintenance is fully recovered from the sale of compost products. Further, as part of the institutionalisation of the Zabbaleen system, more than 50 private companies of the Wahis and the Zabbaleens have been organised.

As part of the route extension project, sanitation services have been extended to low income areas in Cairo on a commercial basis, relying on community residents to pay the Zabbaleen for services rendered. At first, the Zabbaleen could not see a business opportunity in marketing their services to other low income areas, because of the low value of waste from these settlements and the limited capacity of residents to pay for such services. However, after a pilot project, the Zabbaleen realised that low income communities could in fact pay for a reasonable priced sanitation service.

The programme is a prime example of the potential of existing natural and human systems in providing solutions to current urban problems. It has demonstrated how a low income group, which would have otherwise been an economic burden on society, can be gainfully employed in a productive urban service at no cost to the city. It has allowed hundreds of thousands of small scale enterprises to access a cheap and renewable source of raw material from waste, providing essential products in the market at low prices. It has protected the environment from the annual accumulation of several thousand tonnes of waste and also reduced the need for the importation of high cost material and energy intensive equipment.

The human development benefits have been no less significant. The programme has provided the Zabbaleen community with security, dignity and confidence in being able to help themselves and sustain their economic and social gains. Household income has increased dramatically and child labour has been reduced considerable as a result of introducing motorised vehicles instead of donkey drawn carts. Thousands of new jobs have been created as a result of the introduction of cottage industries in the community and the expansion of Zabbaleen services citywide. Overall, the employment potential and the earning power of the Zabbaleen have been enhanced significantly. (CAPE, 1993)

Elsewhere, in Bogota, Columbia for example, as a result of forming cooperatives, scavenging has become a highly organised activity with considerably lower economic and social problems than those relating to similar communities in other parts (see box 6.4). In Metro Manila similarly (see box 6.5), through a network of waste pickers, waste dealers and an NGO, the waste pickers buy recyclable material from residential and other areas; not only improving their conditions of work through an upgradation in the nature of their work but also reducing the quantum of waste entering the municipal waste stream.

While most such activities have an inherent bias towards waste collection from upper income areas (because of the higher value of such waste), Brazil has successfully addressed issues of waste generation and collection in low income settlements. The Green Exchange Programme in Curitiba, Brazil, is based on exchanging recyclable garbage for produce with the needy population of the city.

#### BOX 6.4

##### WASTE PICKERS OF COLUMBIA

In Bogota, Columbia, several thousand people turned to waste picking as a result of rising urban unemployment. Several of these 'cardboarders', as they are called, have over the last few years organised themselves into recycling cooperatives; created in response to the government's announcement of privatisation of waste collection. With the financial and technical support of Columbian NGOs, these cooperatives joined forces to form a National Recyclers Association, representing over 50,000 families collecting waste.

Organising themselves has brought dignity and recognition to their work as also provided them with an income above the current minimum wage. The cooperatives have even set up their own company for selling recyclable material.

The Association has not only created economic opportunities for its members but addressed their social needs as well. In 1992, the Association established a recyclers home which provides the members an inexpensive and well equipped place to leave their children while they go for waste collection. Additionally it provides health care services and meals subsidised by the governments Child Welfare Institute. (Castellanos, 1993).

Through the programme, started in July 1991, about 10,000 participating families receive two kilograms of food for every four kilograms of recyclable garbage collected and delivered to a mobile unit.

A similar system, although not necessarily focussing on low income areas, but implemented through local authorities with community participation, is operational in China (see box 6.6). The state run waste recovery system, based on waste segregation at source, eliminates or reduces the scope of scavenging as a result of the direct flow of waste to purchasing depots, but employs instead a vast number of people in sorting and processing wastes.

Even of the organisations in India working with waste pickers around issues of waste, few seem to look beyond the recycling potential of dry waste viz. paper, plastic, metal etc. Organic waste too presents immense recycling potential; a potential exploited by very few. Furedy (1989) illustrates the recycling potential of organic waste by citing the case of Calcutta's main dumping site, where the municipal corporation leases out plots of mature

#### BOX 6.5

##### THE CLEAN-GREEN PROJECT IN METRO MANILA

Linis-Ganda or Clean-Green, is a project initiated by the Metro Manila Council of the Women Balikatan Movement, a regional women's organisation, in 1983. Based on source separation of dry recyclables, the project entails purchase and trade of recyclables through waste dealers. The waste dealers recruit the collectors, called 'eco-aides', and supply them with identity cards and a uniform in addition to advancing them money on a daily basis for purchasing waste material. Push carts are used for collection and are jointly funded by the dealers and the project.

The project organisers formulate the routes and schedules for collection. They not only organise educational campaigns in the city to sustain householders' interest but also help the dealers expand their scope of business by bringing them in touch with prospective buyers of the new kinds of wastes coming from households.

About 60 percent of the households in San Juan city, Metro Manila participate in the programme and benefit through earnings from the convenient sale of their recyclables. The eco-aides in turn work without harassment as a result of the recognition that the project has brought them. (Furedy, 1993)

#### BOX 6.6

##### A STATE RUN APPROACH - SHANGHAI

One of the most extensive state run waste recovery systems exists in Shanghai, China, where the Shanghai Municipal Government authorities have established waste collection, treatment and recycling through community participation. The self financing system is based on waste segregation at source, both at houses and industries, from where it is sold to redemption centres. There are 502 purchasing stations throughout the city and 1500 purchasing agencies in the rural areas working on a commission basis. The waste collected is sorted and to some extent processed before it is channelled to other industries. This system of waste recovery employs over 300,000 workers. (Palmitkar, 1993a)

dump land for productive farming. The city's refuse forms an extremely productive substratum, with vegetable matter, animal dung, sewer sludge, bones and other organic material. Twenty five varieties of vegetables are grown throughout the year, at an average rate of 150-300 tonnes per day, without the addition of chemical fertilisers. Not only is composting a waste reduction technique but also a means to increase urban food production.

However, given the failure of most centralised compost making efforts, specially through mechanical plants, (Furedy 1993) attention needs to be diverted to decentralised approaches to compost production. Jakarta, Indonesia, has seen extensive efforts in localised composting (see box 6.7).

##### INTERVENTIONS FROM PRIVATE ENTREPRENEURS

Whereas public services in refuse collection often prove to be inadequate or inefficient for varying reasons, privatisation of such services need not necessarily imply the optimal functioning of systems. Since private groups involved in waste collection and disposal would necessarily look upon the activity as a business venture, the risks of only selective populations within an urban centre being served cannot be ruled out. The urban poor in such a case are most likely to get affected; an inability to pay the required fee or the low content of recyclable material in their waste would result in the lack of interest of private groups in servicing such areas (Cointreau, 1982).



### BOX 6.7

#### EXTENDING THE CONCEPT OF RECYCLING

Jakarta, Indonesia has seen extensive experiments in decentralised neighbourhood composting. The Urban and Environment Project of the Centre for Policy and Implementation Studies in Jakarta has a project supporting a waste dealer engaged in composting, employing waste pickers as workers. Most waste material, comprising both dry recyclables and organic waste, is collected from neighbourhood transfer points and the organic is composted in local compost sites.

The project, aimed at improving solid waste management in neighbourhoods, has demonstrated that community based composting is technically feasible with appropriate sites and technical training. Ready markets however continue to be a constraint as the acceptable market price does not cover the costs of production. (Furedy, 1993).

the richer areas therefore have their waste collected several times a day resulting in skewed intra city expenses on waste collection varying from \$ 14 per tonne to \$ 113 per tonne. The potential for creating or compounding such inequities therefore need to be borne in mind while introducing private waste management systems.

Problems created by private entrepreneurs, although in a different context, have also been found in India. In the city of Pune, after waste picking women were organised to carry out house to house collections, private entrepreneurs recognised the business potential of this activity and decided to take advantage of the openings made by these women. They promised the residents to rid the area of waste pickers if the separated waste was given to them. Of course they charged the residents for the waste collection. They in fact employed two waste pickers to do the actual collection and were therefore in effect serving as middlemen in the entire set of activities.

As the conditions surrounding waste collection improve and waste generation habits change, as for instance with source separation, the entire set of activities are likely to attract the attention of private entities who may then affect the earning opportunities for waste pickers. The possibilities of such interventions from private entrepreneurs are very real; already a considerable interest has been demonstrated by private companies in industrial waste. The nature of activities are diverse; producing bricks from fly ash,

power from effluents, organic manure from distillery wastes, polyester chips from used plastic bottles.

Even as environmental concerns may not be the overriding motivation in most cases, India's corporate world is increasingly beginning to see the money in wastes. Whereas some companies are motivated by increasing profits, others are looking at wastes primarily as a mechanism to stay afloat in an increasingly competitive environment. The Indian Organic Chemicals (IOC) for example, is making up its losses because of waste (Muckerjee and Halan, 1993). By importing 500,000 tonnes of plastic bottles from PepsiCo in the United States, for free, and using them as raw material in the production of polyester fibre, the company enjoys a 40 percent cost advantage over its rivals.

Rama Newsprint similarly, by importing old newspapers from the United States, has cut its input costs for a Rs 600 crores recycled paper project by half (ibid).

Venkateshwara Hatcheries is using Uday Bhawalkar's vermiculture technology to save Rs 1500 per day on garbage disposal. By allowing earthworms to feed on the waste at the slaughterhouse, not only does the company manage to dispose off its waste, but it exports the manure produced by earthworm castings at Rs 31, 310 per tonne (ibid). Similarly, Alfa-Laval is converting wastes from distilleries into organic manure and exporting it (ibid).

Not stopping at such products, companies are also generating energy from non conventional sources. Weston Paques uses distillery effluent - spent wash - for generating power which it then sells right back to the distillery spewing the waste (ibid). Vam Organic Chemicals similarly, uses the methane generated by anaerobic digestion to replace kerosene and coal in its production activities, saving Rs 4.46 crores per annum (ibid). Ashok Organics is using biogas to light the streets around its factory.

Clearly the opportunities in wastes are tremendous and it may not be long before private industry begins to look seriously at household waste for business opportunities. Some, like Thermax India, are looking in that direction, by hoping to convert household waste into energy, based on the claims that an individual can generate fuel equal to four gas cylinders every year (ibid).

## CONCLUSION

Development priorities in India, as also in many other developing nations across the world, have over the last few decades, resulted in an unflinching urban growth associated with increasing rural-urban migration. Over 25 percent of the country's total population is currently estimated to live in urban centres and rural-urban migration is estimated to account for 40 percent of urban growth. Whereas these development processes have on the one hand led to an overwhelming growth of urban centres, they have not simultaneously created the capacity to deal with this growth: in turn creating a situation which has threatened the very development of urban centres.

Increasing population has implied a severe pressure on basic infrastructure and amenities; creating the existence of large pockets of areas unserved by public services. The municipal authorities are unable to deliver the different sectoral services, for want of funds, manpower, technology or efficiency in systems. The labour market, whether it be the formal or informal sectors of employment, similarly finds itself increasingly pressurised by the consistent inflow of migrants into urban centres. While industrialisation has created jobs, the increase in employment opportunities has failed to strike a balance with the additions to the labour force, and even the informal sectors are often unable to engage substantial sections of the urban population in gainful employment. Employment opportunities and basic services then emerge as the most prominent and immediate needs of most urban centres today.

The thrust of urban policies however has largely been directed towards a compartmentalised approach whereby each distinct issue is dealt with in isolation, rather than adopting an integrated approach. As NIUA (1990) points out, no systematic attempt has thus been made to assess the employment potential of sectors such as shelter, physical infrastructure and services.

### **Solid wastes and the Informal sector**

Management of solid wastes is a case in point: large amounts of uncollected municipal wastes lie scattered in most urban centres today, estimated at an average at 30 percent of the total waste generated. At the same time there exists a significant proportion of the urban population, mostly migrants from rural areas living on the margins of society, who from want of any other economic option for survival, collect recyclable items from this waste for

further sale. Yet no effort is made to integrate the two; that is, to recognise and exploit, in a systematic and formalised manner, the employment potential of waste management.

Waste picking remains an invisible occupation with abysmal working conditions and an associated low status even within the informal sector. Despite this, it is commonly adopted as a means to survival. Born out of two distinct needs, viz needs of income and employment and the need to conserve and recover in a resource scarce economy, waste picking simultaneously links with a third need arising out of the existing development process, viz. basic service delivery needs relating to management of wastes.

Given the resource poor status of India and the need for making available cheaper products, recycling is an extensive industry producing a wide range of different products. This then creates the scope for adopting waste picking as an economic activity, where items collected from waste constitute the raw material for various recycling industries.

In the process of this activity, the needs of waste removal are also simultaneously addressed, although not consciously; the waste pickers remove a substantial amount of waste from the waste stream, reducing the amount of uncollected waste, saving on municipal expenditure and reducing the environmental impacts of uncollected wastes. This then constitutes a case where informally, the process of fulfilling the needs of one sector, is also simultaneously addressing the needs of another.

#### The waste pickers

Unfortunately however, this escapes recognition. Instead, the socio-economic conditions of waste pickers, and specially the conditions under which they work, remain abysmal. Quite apart from the demeaning nature of the work, the occupation entails enormous health risks, constant harassment from the police, municipal workers and the general population and gives low returns under insecure conditions. Moreover, despite the contribution of the waste pickers to the economy in terms of waste management and resource conservation, they are perceived by the public at large as having nothing other than 'nuisance value'.

Significantly, the waste picking population consists predominantly of children and women who undertake waste picking either to support themselves (specially in the case of children living alone) or their families. The economic contribution of women and children, from waste picking activities,

contrary to being marginal as is often believed, has in fact been found to be crucial to the survival of such households. For the large proportion of women headed households in urban India, the absence of social security systems additionally constitutes a key determinant for adopting such occupations.

#### Need for a holistic approach

Given the direction of development processes in the last few decades, the existing trends in urbanisation are likely to continue with an even greater force. With projections of urban population exceeding 30 per cent of the total population by the turn of the century, the existing pressures on urban employment and basic services are expected to get compounded. This reinforces the need to adopt an integrated, holistic approach in addressing urban development.

Solid waste management then, needs to be viewed in a much larger context, as playing a vital role in environmental conservation and improvement (Furedy, 1987) and also in addressing social issues. Clearly the needs of waste collection and disposal on the one hand as also employment needs of the urban poor on the other highlight the potential of integrating the two; whereby fulfilling the needs of one simultaneously addresses the needs of the other. That waste pickers already serve a distinct, although invisible, role within the waste economy is slowly beginning to get recognised. Their existing role however, combined with the potential contribution they can further make, highlights the need to enhance this role in waste management even further.

Not only do waste pickers already affect waste management by removing waste and contributing to savings in municipal expenditure, but supply raw material to the recycling industries and play a role in reducing environmental pollution. Clearly, the need for recycled products, in a resource scarce, low income economy, cannot be overstressed. The supply of recycled products however, is often constrained by availability of raw material in the production of such products. The waste paper based paper mills are a case in point where availability of waste paper as raw material constitutes one of the prime constraints in production of recycled paper. It is estimated that only 15 percent to 20 percent of paper production gets recycled. This then points to the urgent need to optimise resource recovery from waste. Clearly, waste pickers could constitute one possible channel for optimising resource recovery.

Additionally, the resource scarce nature of India's economy coupled with mounting waste disposal problems, points to the need for alternate management of the country's organic waste, which constitutes a very high proportion of the total waste generated in the country, but currently only marginally exploited for resource recovery. Despite being host to several experiments in resource recovery from organic waste, no long term solution has till now emerged in this area. Most of the composting plants built are currently out of function for a variety of reasons such as inattention to daily operational details and lack of funding for equipment and maintenance (Fritz, 1990). Since official experiences in composting have been less than successful, waste pickers could provide a potential mechanism through which this concept could be promoted successfully, as has been demonstrated in micro experiments through NGOs. Such a system of decentralised composting would simultaneously address issues of decreasing land availability for waste disposal.

Now whereas waste pickers are already linked with, and contribute to, waste management, in view of the abysmal conditions of their work, poor returns, exploitation and harassment, and the potential contribution they can further make within the waste economy, the need to legitimise and enhance their role in waste management stands out. While at present their work is carried out informally, surrounded by a range of constraints, there is a strong case to institutionalise their activities. This would not only create better conditions of work but provide the possibilities for enhancing the scope of their work; by say, organising the waste pickers around micro enterprises relating to recycling. Importantly moreover, institutionalising their work would provide them a staying power which may soon begin to be threatened by private industries increasingly demonstrating an interest in waste. Although restricted considerably to industrial waste at present, it may not be long before such companies look at domestic waste in terms of business opportunities. This then may threaten the very survival of waste pickers.

**The possible mechanisms for an integrated approach to waste management: Partnerships in municipal service deliveries**

Legitimising or institutionalising the role of waste pickers within the waste economy would necessarily entail a change in orientation of the systems of waste management as well as an overall change in the public perceptions on waste. Social and environmental awareness on waste management, which is already gaining ground, would need to be introduced on a much larger scale. This awareness would bring an acceptance of the contribution

of waste pickers to the urban economy which would in turn constitute the basis for legitimising their role.

In this context it becomes imperative to initiate overall awareness and education to the public on various aspects of waste: the environmental implications of disposal as it is carried out at present, the different forms of recycling and their potential, the value of and need to recycle and the activities of the waste pickers in this overall context. This awareness would then form a basis for changed refuse handling habits, such as separation of waste at source, which would be essential not only to streamline and optimise the entire process of waste collection but also to exploit the maximum out of such waste. Such changed habits on waste handling at an individual level offer the scope for considerable improvement in the working conditions of waste pickers.

That NGOs have initiated such interventions to varying extents demonstrates the feasibility of such an approach. Of course most such interventions have been carried out on a small scale, and may not with the same ease be replicated on a larger scale. NGOs usually find themselves limited by various constraints such as person power, finances, outreach etc.

The municipal authorities on the other hand have been preoccupied with the mere removal of waste from the streets and continue to view it in a managerial context rather than in a social and ecological context. In fact, the position of waste management in the hierarchy of priorities amongst other basic services and government attitude towards it, is reflected by the absence of key information that could provide an input into environmentally, economically and socially sound decisions. In Delhi for example, the municipal authorities have made no efforts to ascertain the quantum of waste generated daily (as distinct from waste disposed) or the composition of such waste.

Were waste management to become interdisciplinary rather than remain the domain of engineers and technocrats (Furedy, 1987) the scope for a participatory approach within the municipal waste management systems would be created. Not only would this enable the participation of waste pickers and the general community on a much larger scale as compared to similar efforts initiated through NGOs but such an approach would also address some of the constraints faced by the local authorities in their collection and disposal activities. Absenteeism of staff, lack of motivation, lack of appropriate systems for collection from low income settlements are some of the constraints

that can be addressed by initiating a participatory approach. Additionally of course, this could offer opportunities for cost reduction and optimisation of resource recovery from waste.

The need that hence stands out is one of spreading new ideas which would examine and introduce alternate waste management systems; where the focus would change from merely "clearing the streets of waste" to an interdisciplinary approach addressing the myriad issues involved.

An approach built around changed waste dealing habits and a partnership of municipal authorities and waste pickers thus needs to be adopted. Waste segregation at source leading to selling of recyclables and decentralised composting of organic waste could form the basis of such an approach. An extension of the services of waste pickers to other areas, specially low income settlements, as in the case of the Zabbaleen Environmental and Development programme in Cairo, could be explored whereby the organic waste (the prime constituent of waste in low income areas) could be composted locally. Payment mechanisms, for the collectors and/or residents providing the waste could be worked out, based on similar experiences in other countries.

The waste pickers, through such an approach, would not only gain acceptance, but a legitimisation of their work. The conditions surrounding their work could improve substantially and through their association with the local authorities, their exploitation is likely to decrease considerably. Streamlining them into the municipal waste management systems would also facilitate the availability of other resources and/or services, as for example the availability of land for composting.

Some cities in the country are already witnessing a display of interest in this direction. In Bangalore for example, the local authorities are working through NGOs in the process of organising waste pickers. In Bombay similarly, efforts are underway by local groups to introduce this approach in the workings of the municipal authorities. A word of caution on this approach however, would be in place in this context. Furedy (1987) has highlighted the concerns that have been shown on beaurocratising the process of waste picking through the involvement of the government. It has been pointed out that official schemes may be selective in recruitment of waste pickers for specific activities and in the process exclude many who formerly earned a living in this manner. If a municipal monopoly is asserted (or rather reinforced) over city refuse, she points out, the income earning opportunities

for many poor households may be further reduced. Whereas this could be a real threat, the involvement of NGOs in such programmes could work towards reducing such concerns considerably.

If the need to search for waste on the streets is eliminated or even reduced considerably, as is likely to happen with organised collections, the total time taken up by this activity may reduce significantly. This then would create the scope for educational opportunities for the children along with their work.

In the case of women similarly, specially divorced, separated or widowed women in whose case the absence of social security systems gains special relevance, any such organisation and recognition would not only provide them with economic security but simultaneously act as a source of empowerment through the building of confidence and self esteem, as has been found through experiences of SEWA.

Hence altering the current systems of waste management would address not only the social and economic upgradation of waste pickers, who comprise predominantly of the most vulnerable of the urban poor - women and children, but simultaneously the economic and environmental issues faced by the municipal authorities. Given the important, although invisible, role played by the waste pickers, an enhancement of this role would then yield benefits to the waste pickers, the municipal corporations and the larger public.

## REFERENCES

- Advani, Sangita P.** 1989. 'Rags that are riches'. *The Indian Post*. April 2. Bombay.
- Ali, Sabir.** 1993. 'Sanitation Situation and Garbage Management in Delhi Slums' in *Urbanisation in Developing Countries-Basic Services and Community Participation*. Ed. Bidyut Mohanty. Institute of Social Sciences, New Delhi.
- Asnani, P U.** 1990. Supplementary Background Document. Prepared for Consultation on Solid Waste Management in South East Asia Region. New Delhi. October 1990. World Health Organisation.
- Bentley, Elizabeth.** 1990. 'In Defence of their Livelihood. Hirabehn Parmar and Waste Pickers of Ahmedabad'. *Manushi*. Number 60. New Delhi.
- Bhide, A D.** 1990. Regional Overview on Solid Waste Management in South East Asia Region. World Health organisation. New Delhi.
- Bhide, A.D.** 1990b. 'Resource Recovery from Municipal Solid Waste Through Composting and Biogas Recovery'. Paper prepared for International Workshop on Waste Management and Resource Recovery. Kathmandu. October 27 - November 4.
- Bhide, A.D. and B.B. Sundaresan,** 1984. 'Street cleansing and waste storage and collection in India' in John R. Holmes (Ed.) *Managing Solid Wastes in Developing Countries*. John Wiley and Sons Ltd.
- CAPE.** 1993. *Analytical and Evaluative Case Studies on Urban Environment/Poverty Innovations in Nine Mega Cities, Cairo - Egypt*. Case Study Presented to Mega Cities Project. Central Association for the protection of the Environment.
- Castellanos, Angela.** 1993. 'Rich pickings from garbage'. *Business Standard*. September 14. Calcutta.
- Cointreau, Sandra J.** 1982. *Environmental Management of Urban Solid Wastes in Developing Countries. A Project Guide*. The World Bank. Washington D C. June.

- De Souza, Asha. 1991. *The Waste That People Want*. The Concerned for Working Children. Bangalore. Unpublished.
- Fritz, Jack. 1990. 'Comparative Issues in Solid Waste Management in India and China'. Paper prepared for International Workshop on Waste Management and Resource Recovery. Kathmandu. October 27 - November 4.
- Furedy, Christine. 1987. *Environmental Perspectives on Urban Solid Waste Management in India*. Unpublished. Division of Social Sciences, York University. Toronto. Canada.
- Furedy, Christine. 1989. 'Appropriate technology for urban wastes in Asia'. *Biocycle*. July.
- Furedy, Christine. 1993. 'Working with the Waste Pickers. Asian Approaches to Urban Solid Waste Management'. *Alternatives* Vol. 19 No. 2.
- Galloway, Nancy. 1993. *Recycling - A Natural Response to India's Solid Waste Problem*. Development Alternatives. New Delhi.
- Giroult, E. Not dated. *The Health Impact of Solid Wastes*. WHO contribution on wastes. UNCED Prep- Com IV.
- Holmes, John R. 1984. 'Solid Waste Management Decisions in Developing Countries' in (Ed.) John R. Holmes. *Managing Solid Wastes in Developing Countries*. John Wiley and Sons Ltd.
- ICFTU-APRO. Not dated. *Pilot study of child labour in Sivakasi* (Tamil Nadu-India). Child Labour project-south Asia. International Confederation of Free Trade Unions. Asian and Pacific Regional Organisation. New Delhi.
- ICICI. Not dated. *A Sectoral Study of the Paper Industry*. Market Research Department. Industrial Credit and Investment Corporation of India. New Delhi.
- ILO-ARTEP and NIUA. 1990. *Proceedings of the regional technical workshop on employment generation in the Asian megalopolis*. National Institute of urban Affairs and International Labour Organisation- Asian Regional Team for Employment promotion. New Delhi. December 6-7.
- Jain, R C. 1990. 'Compost Production in Delhi'. Paper prepared for International Workshop on Waste Management and Resource Recovery. Kathmandu. October 27 - November 4.
- Jain, R C. 1993. Personal communication.
- Kumar, S.P. Sumathi, 1989. 'Ragpickers enrich scrap trade' *Indian Post*. August 16. Bombay.
- Mukherjee, Biman and Monika Halan. 1993. 'Say Yes to Refuse'. *Business Today*. June 7-21. New Delhi.
- NIPCCD, Not dated. *A Study of Working and Living Conditions of Ragpicker Children of Bangalore Metropolis*. National Institute of Public Cooperation and Child Development. Bangalore.
- NIUA. 1988. *State of India's Urbanisation*. National Institute of Urban Affairs. New Delhi.
- NIUA. 1989. *Upgrading Municipal Services. Norms and Financial Implications*. Vol I. National Institute of Urban Affairs. New Delhi.
- NIUA. 1990. *Employment Issues and Urban Policy*. Research Study Series no 44. National Institute of Urban Affairs. New Delhi.
- NIUA. 1991. *Women in the Urban Informal Sector*. Research Study Series no 49. National Institute of Urban Affairs. New Delhi.
- NIUA. 1991b. *Basic Services and the Urban Poor*. Study Series no 46. National Institute of Urban Affairs. New Delhi.
- NIUA. 1993. *Handbook of Urban Statistics*. National Institute of Urban Affairs. New Delhi. May.
- NLI. 1992. *Working and Street Children of Delhi*. National Labour Institute (Child Labour Cell), NOIDA.
- NLI. 1992a. *Street Children of Madras*. A Situation Analysis. National Labour Institute. NOIDA. June.
- NLI. 1992b. *Street Children of Hyderabad*. A Situation Analysis. National Labour Institute. NOIDA. September.
- NLI. 1992c. *Street Children of Bangalore*. A situation Analysis. National Labour Institute. NOIDA. July.

- Naik, Meera.** 1986. 'Welfare Programmes for Ragpicker Children- Experiences of Karnataka Council for Child Welfare' in *Welfare of Ragpicker Children* Report of the Workshop. National Institute of Public Cooperation and Child Development. New Delhi. August.
- Nath, K J.** 1984. 'Metropolitan Solid Waste Management in India' in *Managing Solid Wastes in Developing Countries*. Ed. John R Holmes. John Wiley and Sons Ltd.
- PNB.** 1988. *An Evaluation Study of SEPUP in Saharanpur*. Punjab National Bank. New Delhi.
- Palnitkar, Sneha and Viji Srinivasan.** 1993. *Women Ragpickers in Bombay*. All India Institute of Local Self Government. Bombay.
- Palnitkar, Sneha.** 1993a. *Innovative Approaches to Waste Recycling*. WEDC Solid Waste Management in India 1993. Loughborough University of Technology.
- Pienvichitr, Vithya.** 1990. 'An Overview of Solid Waste Management in South East Asia Region'. Paper prepared for International Workshop on Waste Management and Resource Recovery. Kathmandu. October 27 - November 4.
- Ramachandran, C R.** 1986. 'Impact of Occupation of Ragpicking on Health of Children' in *Welfare of Ragpicker Children* Report of the Workshop. National Institute of Public Cooperation and Child Development. New Delhi. August.
- Rao, H V N.** 1990. 'A study of management of Solid Wastes in Bangalore City' in *Health of the Metropolis-Bangalore. A Guide to Health Planning and Development of Urban Cities in India*. Indian Society of Health Administrators. Bangalore.
- Rosario, Anselm.** 1992. *Solid Waste Management - An Alternative*. Economic and Social Commission for Asia and the Pacific. Regional seminar cum study visit on solid waste management. Indonesia. July.
- Rosario, Anselm.** 1993. Personal Communication.
- Rosario, Anselm and Asha Von Der Weid.** 1990. 'Towards Socially and Environmentally Sound Solid Waste Management in Bangalore'. Paper prepared for International Workshop on Waste Management and Resource Recovery. Kathmandu. October 27 - November 4.
- Sanon, C G.** 1986. 'Working and Living Conditions of Ragpicker Children - Findings of a research study' in *Welfare of Ragpicker Children*. Report of the Workshop. National Institute of Public Cooperation and Child Development. New Delhi. August.
- Seth, Raj Kumar.** 1990. 'Solid Waste Management-Issues Involved'. Paper prepared for International Workshop on Waste Management and Resource Recovery. Kathmandu. October 27 - November 4.
- Shunglu, Prabhat.** 1993. 'Garbage's Potential Overlooked'. *The Times of India*. November 3. New Delhi.
- TCPO.** 1985. *A compendium of Indian Slums*. Town and Country Planning Organisation. New Delhi. September.
- TECSOK, STEM and ORG.** 1989. *Municipal Services Bangalore, Hubli-Dharwad and Gulbarga*. Technical Consultancy Services Organisation of Karnataka, Centre for Symbiosis of Technology, Environment and Management and Operations Research Group. Housing and Urban Development Department, Government of Karnataka.
- Vogler, J A.** 1984. 'Waste Recycling in Developing Countries. A review of the social, technological and market forces' in John R Holmes (Ed.) *Managing Solid Wastes in Developing Countries*. John Wiley and Sons Ltd.
- WHO.** 1991. *Regional Overview of Solid Waste Management in South East Asian Region*. New Delhi.



## **FES Publications**

**Women Entrepreneurs Challenges and Strategies (1991),**

Lalitha Iyer.

**Bank Credit and Poverty Alleviation (1991),**

Chandra Kesavan.

**Women in Politics Forms and Processes (1992),**

FES.

**Living on the Edge Women and Environment (1992),**

Sandhya Venkateswaran.

**A Pressing Matter Women in Press, (1993)**

Nandini Prasad.

**Guidlines for Field Workers on Management of Self-Help  
Savings and Credit Groups (1993),**

R. C. Gupta