



Urban Waste Disposal and its Impact on City Dwellers: A Case Study of Patna

- **Kaushikee Chaubey** • **Shampa Shukla** • **Sakcchi**
- **Sister M. Rashmi A.C**

Received : November 2012
Accepted : March 2013
Corresponding Author : Sister M. Rashmi A.C

Abstract : Around most towns and cities in India, the roads are littered with multi-colored plastic bags and other garbage which are bio-degradable and non-bio degradable. The stench and ugly sight of garbage dumped on the roadside, sometimes overflowing from the drains or floating on the surface of open drains is not uncommon in most of the Indian towns and cities. The urban wastes collected from households, hospitals, industries, animal wastes etc. are not disposed off regularly.

This mismanaged disposal of urban wastes threatens the health and hygiene of the city dwellers.

Urban waste disposal has become one of the major problems in almost all the urban centres in India, more so in towns which have poor drainage and sewage facilities. Patna is no exception to this problem. Garbage scattered all over the town, denotes the low quality of management of its urban environment, government apathy and low community participation in keeping the environment clean and hygienic. It is to be noted that there is not a place even a kilometre's distance in Patna where there is no garbage found either on the sides of the roads, or in front of commercial complexes. Wastes are found everywhere in its various forms.

Kaushikee Chaubey

B.A. III year, Geography (Hons.), Session: 2010-2013,
Patna Women's College, Patna University, Patna,
Bihar, India

Shampa Shukla

B.A. III year, Geography (Hons.), Session: 2010-2013,
Patna Women's College, Patna University, Patna,
Bihar, India

Sakcchi

B.A. III year, Geography (Hons.), Session: 2010-2013,
Patna Women's College, Patna University, Patna,
Bihar, India

Sister M. Rashmi A.C.

Head, Department of Geography,
Patna Women's College, Bailey Road,
Patna – 800 001, Bihar, India
E-mail :

Key Words : Urban wastes, bio-degradable, non-bio degradable, mismanagement, health and hygiene.

Introduction :

The stench and ugly sight of garbage dumped on the roadside, sometimes overflowing from drains or floating on the surface of river, is not all uncommon in most of the Indian towns and cities. The urban waste collected from households, hospitals, industries, animal wastes etc. are not disposed of regularly. It is disgusting until we get used to it.

In general the word ‘urban waste’ or ‘garbage’ actually refers to the unwanted and waste material either discharged from industrial areas, commercial centres, houses which alter the physical, chemical or biological character of air, water and soil. It may harmfully affect the life or create a potential health hazard for any living organism. More over it also destroys the scenic beauty of the concerned area.

India’s waste generation stands at 0.2 to 0.6 kilogram per head per day. Patna’s per capita garbage generation is so high, that it creates a filthy surrounding if the garbage collectors do not visit a neighbourhood for a couple of days. All these factors combine to create really an unpleasant and unhealthy surrounding for the city dwellers. It is to be noted that there is not a place even a kilometer’s distance in Patna(UA) where there is no garbage found either on the sides of the roads, or in front of commercial complexes. Garbage is found everywhere in its various forms.

Improper Urban waste disposal causes various kinds of negative impact on city dwellers. It can be long lasting or short termed. Municipal solid waste (**garbage**) consists of household wastes, construction and demolition debris, sanitation residue and wastes from commercial complexes thrown on streets. With rise in urbanization and change in lifestyle and food habits, the amount of municipal solid wastes has been increasing rapidly and its composition changing.

Table-1 : Per Capita Quantity of Municipal Solid Wastes in Indian Urban Centres

Sl. No.	Population in lac	MSW (gram/person/day)
1.	1 - 5	210
2.	5 - 10	250
3.	10 - 20	270
4.	20 - 50	350
5.	Above 50	500

Source : EPTRI 2011(Environment Protection, Training and Research Institute, Hyderabad)

The above table shows the per capita generation of Municipal Solid wastes in Indian Towns as per population size and the following table shows the estimated MSW in five municipal corporations of Bihar.

Table-2 : MSW generation in five Municipal Corporations of Bihar (Estimated)

Municipal Corporations	Population 2001 Census	Estimated MSW Gen. Ton/day 2001	Estimated Population 2006	Estimated MSW Gen. Ton/day 2006
Bhagalpur	340769	78	404726	101
Darbhanga	267348	62	317525	79
Gaya	389192	90	462237	116
Muzaffarpur	305525	70	362867	91
Patna	1432209	417	1701015	534

Patna being the largest town with more than 10 lac population, the per capita waste generated is about 500gms/capita/day.

Garbage disposal in India simply involves rounding up the waste from different parts of the city, and dumping everything in a landfill. Once a landfill is completely occupied, a new landfill is created in the outskirts of the city.

Municipal solid waste contains a wide variety of materials. It can contain food waste (like vegetable and meat material, leftover food and eggshell etc.), which is classified as wet garbage as well as paper, plastic, tetra packs, plastic cans, newspaper, glass bottle, cardboard boxes,

aluminum foil, metal items, wood pieces etc., which is classified as dry garbage (Erach Bharucha et al 2005).

Objectives and Method of Study :

The main objectives of the study are : to **identify** the areas affected by dumping of urban waste and to **assess** the time and mode of garbage disposal, the satisfaction level of the city dwellers with regard to clearness of garbage by the municipality, the level of awareness among city dwellers with regard to health and hygiene, the role of municipality and the impact of improper garbage disposal on the urbanites in Patna.

For the present study, the researcher hypothetically assumed that Patna was severely affected by the improper dumping of urban waste, health and hygiene of the city dwellers were affected by non-clearance of garbage which was dumped around the immediate environment, the role of civic bodies were not effective and satisfactory, and that there was lack of awareness and community participation in solving the problem of garbage disposal in Patna.

The methodology used in this study was use of a structured questionnaire. 25 households in each of the study area were chosen for the study. The questionnaire method helped the researcher to interact with persons face to face. Empirical method also was used to identify localities affected by urban wastes which were unattended to by the competent authorities. The present study is done through compilation, tabulation, cartographic representation, analysis of the collected data and conclusions was drawn from it.

Area of Study :

Patna virtually situated in heart of south Bihar plain, has acted as the divisional headquarters and state capital since 1911. It is developing in all aspects and new residential colonies are coming up fast. **Sri Krishna Puri, Buddha colony, Boring Canal Road –East and West and Bankipur** areas

have experienced this growth .They are situated in the western zone of Patna (U.A) and East of Gandhi Maidan respectively. It is fully urbanized with clusters of various business activities too. Residential buildings and big dwelling complexes are a common feature of the areas of study. A micro level study has been conducted in the above urban pockets of Patna urban agglomeration and conclusions are drawn accordingly.

Scattered garbage was a common sight at every nook and corner of the study area. The mound of garbage/urban wastes and its stinking and filthy site forced the surveyor to interact with the people face to face with regard to the problems of garbage menace in the area.

Types of Garbage :

Urban waste consists of household waste, like food scraps, old newspapers, discarded papers, polythene bags, wood, worn out furniture, plastic containers and other items like old appliances, tyres, broken toys etc. which are thrown as junk. Garbage in general refers to the unwanted waste materials dumped from different sources. It is generally categorized as:-

1. Biodegradable waste
2. Non-Degradable waste

Bio-degradable waste are those which are easily degraded or broken down by living organisms. These are substances of natural origin such as paper, vegetable remains and sewage etc.

Non-biodegradable substances are those materials which cannot be easily broken down to less toxic substances. Aluminum cans, Plastics, DDT etc. are some of the fine examples of non-biodegradable substances. (Savinder Singh, 2011)

In this paper the main focus is on urban waste which includes domestic waste, construction waste, sanitation residue and waste from streets and roads in the form of cans, bottle, polythene bags, eggshells, vegetable peels, decayed flowers

etc. thus further dividing them into wet garbage and dry garbage.

In order to get a clearer view, a survey was conducted in Sri Krishna Puri, Buddha colony, East and West Boring Canal road and Bankipur areas under Patna (U.A)

Table-3 : Type of Garbage (Area wise)

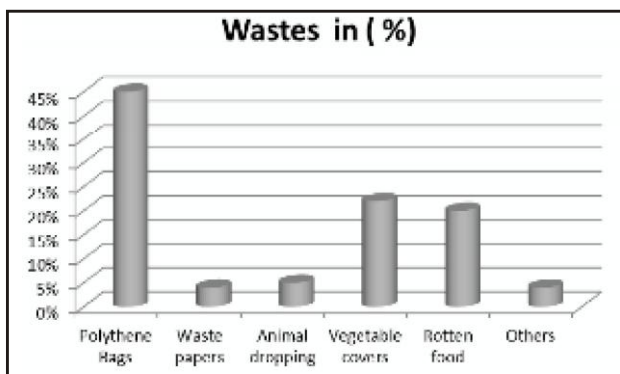
Area	Non-degradable (%)	Degradable (%)
S.K.Puri	40%	60%
Buddha Colony	30%	70%
East Boring Canal	45%	55%
West Boring Canal	30%	70%
Bankipur	50%	50%
Average	39%	61%

Source : Field Survey 2012.

From Table 3, it is clear that out of the 125 households surveyed, there were 39% of them generating non degradable waste, whereas 61% of households generated degradable waste, thus indicating that majority of the households generate degradable waste in the surveyed area. The area wise analysis also revealed that Bankipur area generated highest percentage of non–degradable waste, whereas West Boring Road and Buddha colony share 70% each of degradable waste.

Dominant Wastes

Fig. : 1 - Dominant wastes in the surroundings of the study area



Source : Field Survey 2012

Our technological and consumer culture gives us enormous varieties of products made of more synthetic materials much of which we use once and throw away. In contrast to the degradable wastes generated by the households in the study area, most of the wastes found scattered all over the town comprise of non-degradable wastes. It is because the degradable wastes get decomposed and the non-degradable wastes thus get exposed.

Table-4: Area–wise dominant urban waste

Area	Poly-thene	Waste Paper	Animal dropping	Vegetable remains	Rotten food	Other
S.K.Puri	50%	5%		25%	20%	
Buddha Colony	45%	10%	5%	10%	20%	10%
East Boring Canal	45%	-	-	30%	20%	-
West Boring Canal	35%	-	15%	30%	20%	-
Bankipur	50%	5%	5%	10%	20%	10%
Average	45%	4%	5%	22%	20%	4%

Source : Field Survey, 2012

Table 4 shows the most dominant waste in all surveyed areas is plastics with Bankipur and S.K. Puri (50%) having the highest share, followed by Buddha colony & East Boring Canal Road (45% each). The Plastic waste leads to serious consequences such as–Blocking of drainage, Hampering the plant growth, Reducing the fertility of soil, Causing water logging etc. around residential sites and market complexes. The second most dominant waste is vegetable remains having highest in East and West Boring Road. The least dominant waste is waste paper due to the awareness created with regard to recycling and reuse of waste paper.

Place and frequency of urban waste disposal

In ancient cities, food scraps and other wastes were simply thrown into the unpaved streets where they accumulated. Around 320 BC in Athens, the first known law forbidding this practice was established and a system of waste removal began to evolve in several eastern Mediterranean cities. The initial disposal methods were very crude and

were often just open pits outside the city walls. As population increased, efforts were made to transport the wastes out further away from cities, thus creating city dumps (Erach Bharucha 2005). It is important therefore, that the unwanted and wasteful materials be dumped/ disposed of at one specific place. It would serve two fold objectives.

- Prevention of spread of harmful diseases due to scattered Garbage.
- Ease in collecting the Garbage for further recycling process.

Domestic solid waste substances are generally thrown by the residents in specially enclosed masonry structures on road sides, on the roads, in the corners of the buildings, behind the boundary walls etc. The study revealed that about 60% of people had dumping facilities inside the house and just 10% found suitable place for garbage disposal outside the house. The remaining 30% of the families throw their domestic wastes downward, claiming to have no other alternative. This is prevalent mostly in the big apartments and multi-storied buildings. With regard to the frequency of urban waste disposal, it was found that 80% of the households clear their domestic garbage once a day and the remaining households once in two days.

It is seen that despite of all the court orders and presence of a huge organization known as Patna Municipal Corporation, Patna is one of the worst cities of India from the point of view of solid waste management. The city dwellers pay municipal taxes every year for services which are non-existent (Gosh A.K, Feb 21, 2011). The dead bodies of animals, food scraps, vegetable remains etc. are seen rotting on busy roads near commercial complexes. Waste is littered all over the town leading to unhygienic living conditions. The chief means of Garbage disposal adopted by municipal corporation authority are uncovered trucks and tractors, though it is a rare sight to see. It

is not only unscientific but also outdated and inefficient.

Impact of Garbage Disposal

Littered garbage in the market places spoil the beauty of the city, choke drains and make public places filthy. Garbage containing plastics, when burnt, may cause air pollution by emitting toxic gases. The present study revealed that the mismanaged wastes found scattered all over the town has a negative impact on the environment of the study area.

Table - 5 : Garbage with adverse effect on the Environment

Type of garbage	Garbage with Adverse effect in (%)
Polythene	89%
Vegetable covers	6%
Rotten food	5%
Other	10%
Total	100%

Source : Field Survey, 2012

Table 5 shows that the garbage which is affecting the environment adversely is plastic (89%) followed by others in all the surveyed areas thus, proving it to be very harmful because it blocks drainage, stops rainwater percolation, and reduces soil fertility.

It is often quoted ‘A healthy mind lives in a healthy body’ and in order to keep ourselves healthy our environment must be clean and hygienic. Garbage directly or indirectly causes threat to our health and the environment as well. The accumulation of garbage for several days in our surroundings not only pollutes the environment with foul smell and harmful gases but also helps in the growth of harmful insects, germs, viruses, microbes etc. which cause dreadful disease like malaria, skin rashes, respiratory problem affecting the health and hygiene of a place.

The harmful effects of urban wastes disposal on the environment are ground water pollution, surface water pollution, soil contamination, air pollution and health hazard.

Health and Hygiene

The present study revealed that there is a negative impact of improper waste management on health & hygiene as 93% of the surveyed households confirmed its effect on health. It is thus clear that mismanaged garbage affects health & hygiene as open dumping of garbage serves as breeding ground for disease vectors such as flies, mosquitoes, rats and other pests. This effect of waste dumped by industries, household and commercial centres become intolerable mainly during the rainy season.

Heaps of stinking garbage sites present somewhat awesome situation in the study area. The mound of municipal garbage and its unhygienic site badly affects the health of its residents. In Patna the urban wastes are commonly thrown along roadsides or in an open space near habitation. As a result the urban environment has a filthy and unhygienic appearance and the impact on the environment are ground and surface water pollution, soil contamination, air pollution etc. which affect the health of the city dwellers.

Garbage is one of the major sources of pollution at the local level. Due to accumulation of garbage our Air, Water and Soil act polluted which indirectly affect human health and hygiene. Dumps of domestic garbage remains at their places for several days and thus pollutes the environment by foul smell and releasing harmful gases.

Burning of plastic wastes and rotting of garbage release different harmful gases like- Carbon Monoxide, Carbon Dioxide, Nitrogen Oxide, Sulphur Dioxide, Methane etc. and have bad effect on the city dwellers. Carbon monoxide is

a major pollutant for human community which causes suffocation in spite of the presence of sufficient amount of oxygen in the air.

During rainy season the situation even worsens. Different types of chemicals dissolved in garbage leech and infiltrates into the soil through rainwater. People of the study area consider rainy season to be the worst season as the site of stinking heap of garbage coupled with waterlogging creates unhygienic condition and cause diseases.

In the study area it was found that about 70% of the people suffer from respiratory problem and 20% suffer from Malaria and Typhoid and 10% suffer from other diseases. Low quality of chemical pollutant present in garbage after reaching the soils can reach the human and animal bodies through food chains and cause various diseases and several deaths.

Pollution

In the general parlance the term pollution mainly refers to the lowering of Environment quality caused by human activities at local level with the aid of certain pollutants. A pollutant is defined as any form of energy or matter that causes degradation and pollution in the existing natural balance of Eco-Systems.

Pollution caused by urban waste disposal

Garbage is one of the major source of pollution at local level. Due to accumulation of urban wastes our air, water and soil are polluted which indirectly affect human health. When garbage is disposed of openly or not treated properly it causes serious damage to the environment. Air, water, and soil pollution are the major pollution caused by the improper garbage disposal

(a) Air pollution : Waste at landfill is usually compressed to save space. But the result is an almost oxygen-free environment when organic materials decompose in such anaerobic conditions

they produce methane, a greenhouse gas. Composting produce carbon dioxide, another greenhouse gas. According to the EPA, (Environment Protection Act) methane “remains in the atmosphere for 9-15 years” and is over 20 times more effective in trapping heat in the atmosphere than carbon dioxide. (www.composterconnection.com).

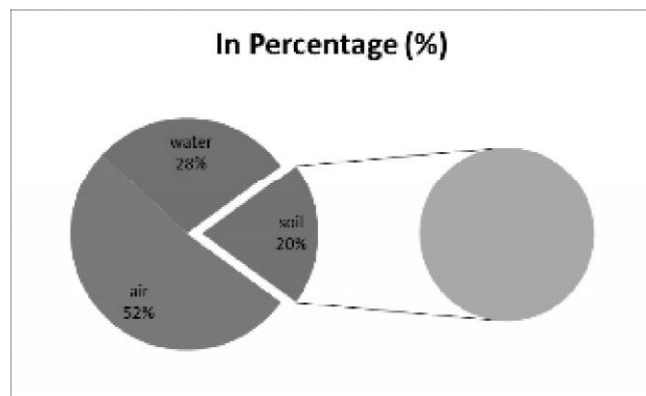
The air becomes stinky over the area where garbage is disposed. The garbage stinks so badly and strongly that a person standing at a great distance can also get that very smell. Several kinds of insects like bumblebee, mosquito and woodhouse etc. make garbage their permanent shelter. Often these insects sit over the edible items being sold nearby and hence contaminate those edible items and when people consume those items they are affected by several types of diseases.

(b) Water pollution : Wet garbage including yard waste which is 50% to 70% water, adds to the toxic stew of chemicals, household clearness, antiperspirants, nail polish, paint etc. which are dumped in landfills. These get diluted and are made more mobile by rainwater, which percolate down to the bottom of the fill. When it reaches the groundwater level it contaminates the ground water. Water pollution caused by the wet garbage cause scarcity of drinking water. In many of the Indian cities and towns drinking water crisis is on its peak. Most recently, Gaya district of Bihar is facing the problem of water contamination and scarcity.

(c) Soil pollution : The land over which garbage is disposed off gets polluted and reduces the fertility of the soil. Plastic wastes deteriorate the quality of soil as it remains in the soil for several years.

In the surveyed area of almost all the households including shop owners claim that the mismanaged Garbage pollutes and degrades the environment.

Figure 2 : Type of pollution



Source : Field Survey, 2012

Table – 6 : Type of pollution (Area wise)

Name of the surveyed area	Types of pollution in (%)		
	Air	Water	Soil
Bankipur	65%	20%	15%
West Boring canal	40%	30%	30%
East Boring canal	55%	40%	5%
S.K. Puri	55%	30%	15%
Buddha Colony	65%	20%	15%

Source : Field Survey, 2012

From the table and diagram it is clear that out of the total surveyed households 52% agreed that improper garbage disposal caused air pollution due to improper garbage disposal. As far as the area wise study is concerned, both in the Bankipur and Buddha colony area, 65% of the respondents agree that air is affected by foul smell and gas released from rotten garbage, while 20% of them are of the opinion that water is affected more through infiltration of liquid wastes and 15% of the total surveyed households in both the areas say that garbage causes soil pollution, as a consequence of improper garbage disposal. In the West Boring canal area 40% of the total surveyed households said that improper garbage disposal caused air pollution while in the East Boring canal area, it is 55%, and in S.K Puri area, more than half of the total surveyed households (55%) said that air is polluted more than water and soil as a consequence of improper garbage disposal.

There is no denying the fact that air, water and soil pollution cause adverse and negative effects on the environment and people in all the five surveyed areas. Majority of the people / households considered air pollution as the main pollution caused.

Sustainable Management of Urban Wastes

Technological developments and a rapid growing population in Indian cities and towns has seen the consumer market growing rapidly leading to products being packed in cans, aluminium foils, plastics and other such non-biodegradable items that cause incalculable harm to the environment. The shortage of dumpsites and the growing cost of transportation to collect and carry the wastes to distant sites compel the Municipalities to look for alternative methods that could be environmentally and economically sound. Solid wastes generated by domestic, commercial, including health care centres and industrial activities are often indiscriminately dumped/disposed of in an unscientific manner. In order to protect our health and environment from risks and adverse impacts of unscientific disposal of solid waste, it needs environmentally sound management of solid waste in an eco-friendly manner. Therefore for proper management, of Role of Municipal Corporation and community participation is very essential.

Role of Municipal Corporation

Municipal Corporation is one of the most important concerned Authorities entrusted with the work of cleaning the Garbage in any Locality and Sri Krishna Puri, Buddha colony, Boring canal road—East and West and Bankkipur areas are also beneficiaries, though rare. Due to improper and irregular clearing done by the PMC employees, the Patna High Court in December 2010, directed Patna Municipal Corporation(PMC) to implement *Solid Waste (Management and Handling) Rules 2000*, to remove garbage from the city, garbage segregation and dumping of solid wastes in proper

sites designed for the purpose. The directives as per this rule are:

1. Prohibit littering on the streets by ensuring storage of wastes at source in two bins; one for biodegradable waste and another for recyclable material
2. Primary collection of biodegradable and non-biodegradable waste from the doorstep, (including slums and waste and squatter areas) at pre-informed timings on a day –to-day basis using containerized tricycle/handcarts/pick up vans.
3. Street sweeping covering all the residential and commercial areas on all the days of the year irrespective of Sundays and public holidays.
4. Abolition of open waste storage depots and provision of covered containers or closed body wastes storage depots.
5. Transportation of waste in covered vehicles on a day to day basis.
6. Treatment of biodegradable waste using composting or waste to energy technologies meeting the standards laid down.
7. Minimize the waste going to the landfill and dispose of only rejects from the treatment plant and other inert material at the landfills as per the standards laid down in the rules.(www.bihardays.com/solid-waste-mismanagement-patna)

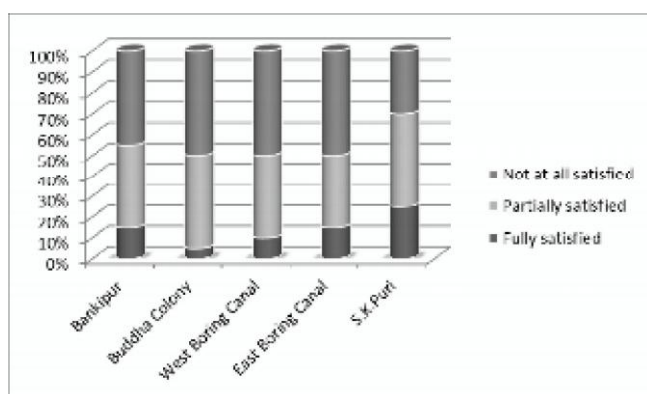
It is to be noted that the wastes generated by households, commercial complexes etc. are cleared by themselves from their homes or clinics or other institutions once a day, but the clearance by the municipality is not very regular.

Most often the city streets looked like trash bins specially when the employees were on strike. From the third week of July 2012 the firm- A2Z Infrastructure Private Limited stopped the garbage

collection work in the city compelling the residents to dribble the trash strewn along the streets and dumped near their home. The sanitation in the city was in a pathetic condition as the company used to cart trash from nine wards under Patna Municipal Corporation (PMC) was on strike. The company officials said they were not in a position to continue with the services after PMC failed to clear its outstanding dues. The civic body failed to pay a penny to the company since January 2011. The civic body owes 7.6 crore to the private company(A2Z) which has been working in the city for the past 20 months(newspaper reports of 6.8.2012- The Telegraph).

The stench of accumulated garbage make the residents live hellish, as the strike continued for 3 weeks. The strike had hit the residents hard who were forced to bear the stench and unhygienic conditions as about 200-300 tonnes of garbage was piling up daily. According to people’s opinion, the carting away of garbage from the dumping point opposite their houses had been erratic for several days. This posed a health hazard to thousands of residents but the administration did not seem bothered.

Figure 3: Area wise service satisfaction



Source: Field Survey, 2012

No doubt, the place and time of garbage disposal plays a significant role in solid waste management but it is also a important fact that proper place and regularity is required to achieve

the desirable level. The survey of 125 households in 5 areas namely East Boring Canal & West Boring Canal, S.K.Puri, Buddha colony and Bankipur revealed that people are not satisfied with the services provided by the PMC and they feel that they are at the mercy of the civic body in spite of paying municipal taxes regularly.

The present study revealed that about 45% of the people are not satisfied with the work of Municipal Corporation. About 41% of the people are partially satisfied. This reveals the passivity of the “Patna Municipal corporation” in fighting against this problem of garbage disposal.

Role of Community

The above mentioned negative impact of garbage disposal on the health and hygiene of the people could have been easily minimized to some extent through peoples active participation and their involvement in Community Development Projects.

Our study revealed that only 10% of people take active interests in keeping their environment clean and healthy through Development Committee in their locality. It appoints sweepers for collecting garbage disposal .

Conclusion and Findings:

A well-managed urban waste collection, disposal, treatment and recycling could benefit the entire stakeholders, i.e. consumers, manufacturers and local authorities. The benefits are- less environmental pollution of soil, water and air, conservation of raw materials, better coordination between local authorities and citizens, more active citizens who contribute to urban development, better image of the city, aesthetically more attractive urban space, fewer health hazards, and more income from tourism.

According to people’s opinion the main reasons for the increasing problem of waste disposal are:

- Urban population is growing in absolute numbers, and also as a share of the total population.
 - Per capita income in cities is rising. With it, urban lifestyle is changing, leading to higher per capita waste generation.
 - Increasing health consciousness and convenience would also lead to more packaged food consumption and thus increase waste generation
5. It was also found that the community participation in the surveyed area was negligible, it being only 10% of the total surveyed households. Mobilizing the community, providing them incentives is an important aspect of waste management.

PMC is also facing many types of problems with regard to land and employees. It has run short of space for dumping Garbage. At present, Garbage is being dumped in ditches near the Transport Nagar. According to a PMC authority, disposal of Garbage requires about 8000-9000 refuse handling employees, while Patna Municipal Corporation has only about 2000 of them. Although Garbage is being cleaned by Contract Labourers, they are scanty in number.

The findings from the study are as follows:

1. As per our findings, the surveyed area is severely affected by the improper dumping of the urban wastes as only 39% of the households dispose of their garbage in roadside dustbins while 61% of them dump garbage directly in open spaces close to their habitation which create adverse effect on environment. Plastic waste is the main component of the total waste generated.
2. Health and hygiene is affected by the improper dumping of the garbage as 93% of the families of the surveyed area confirmed that it creates health hazard and affect the hygiene of the environment. Garbage scattered all over the town spoils the beauty of the city and makes the place filthy.
3. According to the survey done in the 5 pockets of the city, it was clear that during rainy season the condition of the city is pathetic due to the improper disposal of garbage. Waterlogging is caused due to plastic wastes and demolition debris that choke drains which become breeding ground for disease vectors like mosquitoes, viruses etc.
4. The role of civic bodies are not satisfactory as 41% of the surveyed households are partially satisfied and 45% of them are not at all satisfied because of the irregularity of the PMC workers in clearing the urban wastes.

Measures:

We should *Refuse, Reduce, Replace, Reuse, Repair* and *Recycle* the Urban wastes in order to control the problems arising from Garbage Disposal. Control measures of urban wastes includes 3 main components:

1. Source reduction
2. Recycling
3. Disposal

On an individual level one can reduce the use of unnecessary items while shopping, items with minimal packaging etc.

The following concepts could be adopted by individuals :-

One should *reduce* mineral water bottles and carry our own water whenever we travel; *replace* polybags with cloth or jute bags; *reuse* glass and plastic containers for storing our things, outgrown clothes, unused toys by giving them to underprivileged children in our neighbourhood, one sided paper, envelopes for rough work, old calendar paper for covering books; *repair* or get repaired bicycles, watch, torches, music system,

furniture and use them longer instead of throwing them away; *recycle* paper, metal, glass, thermocol etc. by segregating and giving them to rag pickers or Kabaadiwala, and biodegradable waste of kitchen by composting.

More importantly individuals should set up a compost bin in the garden or terrace and use it to produce manure for your plants to reduce the use of fertilizers. These are some concepts that could help them contribute towards a better quality of our environment and human life. They can control, prevent and reduce by learning to value certain resources and use them sustainably.

References :

Baskar R, Baskar Sushmita (2007). *'Environmental Studies for Undergraduate Courses'*, Unicorn Books.

Erach Bharucha et al (2005) for UGC, 'A Text book of Environmental Studies- for Undergraduate Courses', Universities Press(India) Private Limited.

'Environmental Science: A Global Concern' 6th Edition, Published by McGraw-Hill Higher Education, 2001.

Gautam, Alka, (2010): *'Advanced Economic Geography'* Sharda Pustak Bhawan, Allahabad, U.P, India.

Gopalan R Raja,(2005) *'Environmental Studies : from crises to cure'*. published by Oxford University.

Ministry of Environment & Forests(MoEF), *'MSW (M&H) Rules,2000'*.

Websites :

www.bihardays.com/solid_waste-mismanagement-patna retrieved on 22.08.2012.

www.apnabihar.org/ retrieved on 22.08.2012

www.eptri.com retrieved on 06.09.2012

<http://www.composter.com/> retrieved on 2.10.2012