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SUSTAINABLE APPROACH FOR DEVELOPMENT OF AN ECOCITY

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Abstract – *As India is a developing country so path of development is raising towards development of urban area. This path of development has taken to increased quantity of waste results in greenhouse gas emissions. This leads to rise in unsustainability in respect of management of waste or urban transportation etc. This research paper aspires to make a trial for hypothetically applying the 'Eco City' concept in developing city of India with respect to waste management. The Eco city concept has been executed in several cities of developing countries to create them achieve more sustainability. According to SWM rules, 2016 in India, we have followed six essential steps under solid waste management such as generation, segregation, collection, transportation, treatment & disposal. To achieve reuse, reduce, recycle etc. i.e. 5 R's of waste management. Thus, concept of sustainability or eco strategy might be able to conquer hurdles that may appreciate developing towns with their limitations and characteristics.*

Keywords: Primary Collection, Waste Minimize, Zero Waste, Re-use in Waste, Waste Separation, Modes of Public Transportation Systems, Carbon Emissions, Low Carbon, Eco-friendly or Sustainable Transportation.

1. INTRODUCTION

In India, urban areas generate about 43 tons of solid waste per year. In 2050, population in a country reaches to a level of 50% that is projected to be in an urban area and along with quantity of wastes will be increased. According to 12th Schedule of Constitution of India, it is mandatory measure to keep cities green and clean. Under that the ULBs have to deal with wastes in both practical and environmental method for effective management of waste.

Fig 01: *Statistics of Solid Waste Generation in India*

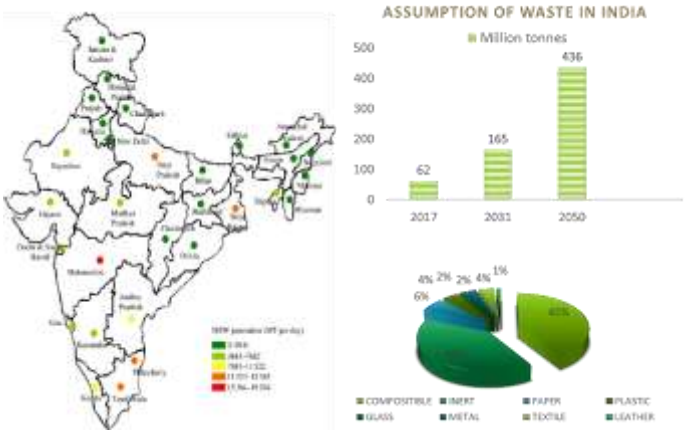


Fig 02: *Statistics of Solid Waste Share in India*

Fig 03: *Classification of Solid Waste in India*

2. NEED

2.1 CONCEPT

An eco-city is type of city that is built through principles of living with methods of environment. An outmost goal of many eco-cities is to abolish all carbon waste, by which energy can be produce entirely through renewable sources, and to integrate environment into city; so, eco-cities have purpose of restorative economic growth, reducing poverty, organizing cities that can attain within larger population densities, which also encourages larger efficiency and improvement of health.

2.2 FEATURES OF AN IDEAL ECO CITY

- Inside an urban ecosystem that sounds environmentally by reducing obstructive effect of evolution on environment.
- Depletion of ecological footprint, management in waste and its usage.
- Achievement of environmental sustainability by reducing green gas discharge, employ of renewable energy also through sustainable transportation.
- By help in an environment-friendly production, creation of vigorous economy & industry which provides high capita GDP level.
- Maintenance of air and water quality and above or average proportion of green space /capita.
- Rain water harvesting systems, minimum use of fossil fuels.
- Preservation of ecologically tactful habitats, physical and nonphysical inheritances and stimulation of green lifestyle and assimilation.

2.3 PARAMETERS OF ECOCITY

a. Waste Management for Ecocity

- It is defined as collection, transport, handling, recycling or disposing of waste material.
- It involves solid, liquid or gaseous substances.
- Eco-city will make residential and business purpose easier in reduction and management of their waste in supportable way while provision of mechanisms, facilities and services.

b. Concept of Zero Waste for Eco-City

- Reforming current system of managing waste to value recuperation culture.
- Motivates to adopt new way of thinking.
- Move from linear resource use and disposal cultural through 'closed-loop' system.
- Increase in use of recycling, reducing waste, consumption and ensuring that products which are made can be re-used, repaired or recycled back into nature.

Fig 04: *Principles of Zero Waste City*

3. STUDY AREA

Hoshangabad is the 18th largest district of the state in respect of area which is 2.17% of the total area 308,244 Sq.km. of Madhya Pradesh and the district may be divided under two natural divisions, i.e., *Satpura Plateau* and the *Narmada valley*. City is well known for its cultural heritage. It is the headquarters of both Hoshangabad district and *Narmadapuram* division. It is located in central India, on the southern bank of Narmada River. It is 70km away from Bhopal presently population of city is calculated to be 117988 as per Census of Population 2011.

Fig 05*: Location of Study Area (Hoshangabad) (Source: HNPP)*

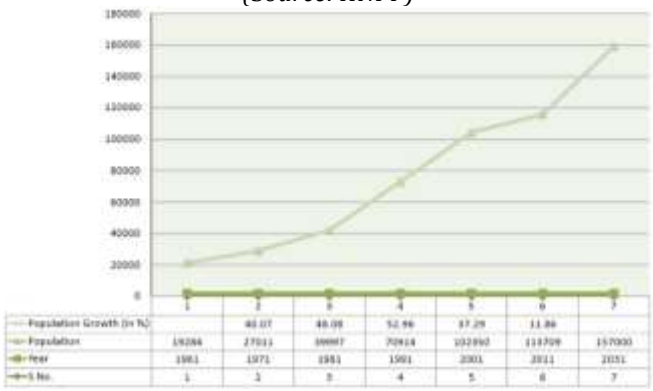


Chart 01: *Decadal Population Growth*

(Source: Hoshangabad Development Plan, Hoshangabad)

Hoshangabad Nagar Pallika Parishad	
Location	22.75°N 77.72°E
Average Elevation	278m (912 Feet)
Municipal Corporation Area	24.27 km^2
Planning Area	5,408 km^2
Total Wards	33
Number of Households	2,57,199
Total Population (2011)	117,988
Present Population	120510
Population Density	185 per Sq.Km

Table -01: *HNPP Highlights*
(Source: Hoshangabad Development Plan)

4. PROMINENT PROCEDURE OF SOLID WASTE MANAGEMENT

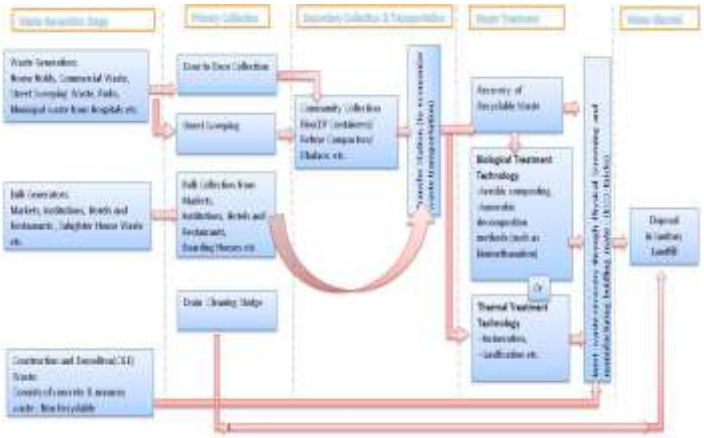
4.1 INTRODUCTION –

- The solid waste production has risen because of fast economic and population development, etc. Broadly, it has produced in urban , municipal and industrial zones of country , except rural areas
- India is fast moving from agriculture-based nation to industrial and services-intended country.
- Even though only 31 % population resides in urban sector, this population of 377million generates a gigantic 1, 43, 449 metric tons per day of municipal solid waste, as per CPCB.
- There is an equal pattern of treating solid waste from the administration and inactive approach from weaker sections of the society.
- MSWM, an evaluative component in regard to sustainable metropolitan development, constitutes separation, storage, collection, rearrangement, carry-age, handling, and decomposition of solid waste to lower down its adverse effect on environment. Chaotic MSW becomes a factor for promulgation of countless ailments.

4.2 TYPES OF SOLID WASTE MANAGEMENT

- RESIDENTIAL – Batteries, Food Waste, Plastic, Paper, Glass, Leather Cardboard, Metal & ashes etc.
- COMMERCIAL – It includes plastics, food waste, metal, paper, glass, wood, cardboard, hazardous waste etc.
- BIOLOGICAL – human parts, bones, flesh etc.
- AGRICULTURAL – pesticide, plants, wood, dry glass
- INSTITUTIONAL – It includes rubber waste, food waste, plastics, wood, paper, metal cardboard etc.
- INDUSTRIAL – housekeeping wastes, food waste, packaging waste, ashes, chemical waste etc.
- CONSTRUCTION & DEMOLITION – plastic, metal, ceramic, concrete, bricks, packaging material etc.

4.3 PROCEDURE OF SOLID WASTE MANAGEMENT



5. PROBLEMS OF SOLID WASTE MANAGEMENT IN INDIA

- ***Socio-Economic Conditions***
  Quantity of waste produced in rural and urban areas which depends upon population and its economic background. Rising usage of new technologies like various electronic apparatus such as laptop, mobile phones etc. which causes flooding of e-waste. There is lower amount people that utilizes their electronics in their full life stretch, concept of promoting is considered as a problem nowadays. Consuming large amount of packed products plays an important reason in heavy growth of plastic generates.
  Since, wealth grows, income in city is also growing that in turn increasing rise of purchase of people. This has been considered as essential cause of increase in garbage produced/ person.

- ***Waste Categorization & Segregation***
  Wastes has gathered from distinct origins that includes sewage, agricultural wastes, industrial wastes, etc. Sewage or domestic wastes were composed using sewage channels set across streets. Major categorization of waste are simply in biodegradable and non-biodegradable.

Biodegradable are decayed easily that does not need big managing and also deployed for processing power or gas that can be taken as origin of green energy. Non-biodegradable include plastics and toxic material. There are several types or class of recyclable material such as paper and glass that is further rephrase after managing.

- ***Difficulties of Imperfect Waste Management***
  There is no proper segregation of wasted that is dumped in dumping yards. Organic and Inorganic wastes are treated, that foremost to loss of potential energy produced by make use of organic waste. Plastic sacks that were not cured properly fester water on them which provides an opportunity for menace parasites such as mosquitoes or flies that grows.
  Exposed burning of waste material through of environmental aging that considered to be another problem which has to be labeled. Poisonous gases such as ammonia generates from domestic dumps can cause innumerable amount of problems for air intake.
  Animal such as cattle suckle plastic spurn that can be serious warning to health of consumers that consumes milk and put human lives of 'life stocks' in danger

6. PRESENT SCENARIO OF SOLID WASTE MANAGEMENT IN STUDY AREA

According to HNPP, 50 metric tons of domestic waste this includes 44 MT garbage from households, 4 MT garbage from vegetable markets and 2 MT from other areas. Households are responsible for disposing waste at designated solid waste collection points. HNPP reports that there are 74 designated collection points, 54 of which are masonry bins and 20 are open collection points that get cleared up with help of Lorries and Tractors. The garbage is then dumped at designated sites. The present status of waste management scenario is listed below:

Steps of SWM	Processes or Technologies used
Collection	D to D (some areas), Community bins
Sort out	Junk dealer, Sale of reusable materials such as newspapers and plastics
Transport	Close Vehicle
Separation	No Separation
Processing	Processing through Composting only.
Destruction	Throwing of wastes without separation at Baikheda disposal site
Observing	Manual observation.

Table 02: Existing Solid Waste Management process in Hoshangabad
(Source: Field observation by author)

DESCRIPTION	COLLECTION DETAILS
Waste Generated per day (Tons)	50
Waste Collected per day (Tons)	35
Major Sources of Waste Generation (as per collection) (Tons)	
• Domestic	45
• Commercial/Markets	5
• Industrial	0
• Hazardous Waste	0
Number of Dustbins in Town	152
Average Capacity per Bin	5
Frequency of Waste Collection	
• Domestic	Daily
• Commercial/Markets	Daily
• Industrial	Daily
Area of Dump yard	9 Acres

Table 03: Existing Solid Waste Management process in Hoshangabad
(Source: Hoshangabad Municipality)

A **Household Survey** has been conducted within 20 households that belongs to different income groups with in residential colony of Anand Nagar, Banjara Hills Colony (Hoshangabad) for inspecting present scenario situation of waste management in the locality. On the basis of analysis from list of questions, that people in locality store waste in the form of varieties of Metals or Plastics. So, people in locality separate varieties of newspaper and plastic materials which are sold to *Kabadiwala.* The people in locality have no separate containers for liquid and solid waste collection. Process of D to D collection of waste is done in moreover localities; some localities threw either in covered containers or on road just prior to brooming when workers in a particular area do not come for collecting wastes. Moreover, the people in locality feel absence of instructions or awareness regarding handling and managing waste.

	near Anand Nagar	*near Banjara Hills Colony*	*near Banjara Hills Colony*
Housing types	Ground Floor (R)	Ground Floor (R)	Two Floor (Mixed Use)
No of household	6 members	4 members	4 members

members			
Family Income	Less than 1lac	Less than 1lac	More than 3 lacs
Waste produce kg	6	3	6
Collection from further disposal	HNPP person	NO Info	HNPP person
Current collection procedure	Curbside container	Curbside container	D to D collection
Preference type	Door to Door	Door to Door	D to D
Bothers you in collection	Infrequent collection	Infrequent collection	Infrequent collection
Charges by HNPP	Nil	Nil	Nil
Prefer To Pay	Up to 50	Up to 50	More than 50

Table 04: Solid Waste Management Survey Report

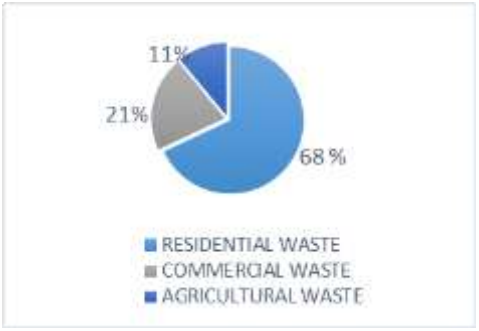


Chart 02: Source of Waste in Hoshangabad (Source: HNPP, Hoshangabad)

7. Process adopted for Waste Management in Hoshangabad

The method for achieving zero waste management in the city works under a certain procedure such as:

7.1 Generation of Waste: Since as mentioned above that the generation of waste is mostly through *Residential, Commercial & Agricultural* and the data analysis of the study area illustrates that most of the waste generating is in the form of organic waste.

The data analysis mentioned below give us the information regarding the typology of waste generation within municipal area during *Regular Basis* & *Festival Time.*

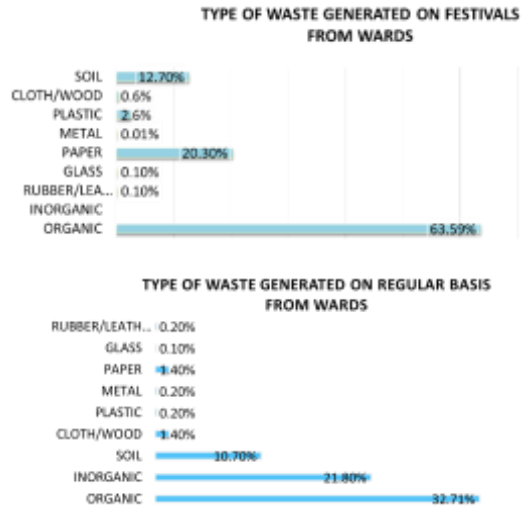


Chart 03: Typology of Waste Generated in Hoshangabad (Source: HNPP, Hoshangabad)

7.2 Collection of Waste: collection is done on basis of under two divisions such as:

- *Primary Collection*: it comprises of waste collection through *D to D collection of waste* and *street brooming.* This type of method is used mainly for *Residential* purposes.
- Secondary Collection: it comprises of waste collection through *community bins* and *bulk collectors.* This type of method is used mainly for *Commercial & Agricultural* purposes.

7.3 Separation of Waste: The separation of waste is done by separating the waste materials into *Kitchen waste, Hazardous Waste, Inert Waste, Recyclable waste.*

7.4 Transfer & Transportation of Waste: Further process to transfer waste for treatment and disposal is done on a weekly basis with the help of typological basis.

7.5 Treatment of Waste: Method adopted for treatment of waste is Biological Treatment that provides various processes through waste can be treated and recycled or reuse such as *Aerobic Treatment, Anaerobic Treatment*

7.6 Disposal of Waste: Since, through process of Zero Waste most of the waste is recycled, reuse or refuse. So, we get a lesser amount of waste that needs to be dumped in landfills. So, we have proposed Engineered Landfill site for the leftover waste to get dumped in landfills.

8. CONCLUSIONS

Research study aims to convert concept of zero waste city into a reality, as by fulfilling needs of zero waste city there should be a certain way that has to be given a thought that how to prepare, produce, prolong and recycling of products within the city. By understanding the difficulties of city revitalizing within urban management, concept of zero waste has formulated 5 R's principle such as *refuse,*

reduce, reuse, recycle and rot. It is essential to accept development of managing waste that rely upon various factors. A balanced planning recommendations of 5 R's principle that is important to attain zero waste city as a target.

Similarly, for purpose of green transportation in the city is to overcome the effect of pollution or emission of carbon in the planning as well as municipal area. The concept is to promote public transportation, walking, cycling etc. effectively by implementing the schemes introduce by government. Since, the study area has so many natural reserves which is to be conserved. So, for conservation of these reserves we are making an effort to convert the current transportation to effective green transportation to attain sustainable economy, health and fewer environmental pollution.

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