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Issues and Pitfalls of Solid Waste Management in Municipalities of the Rajshahi Region in Bangladesh

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Abstract: *With rapid growth, the rural areas of Bangladesh are transforming into urban areas at a quick speed. As the living standard of the people is growing, their purchasing capability and consuming habit are also growing. The municipalities (locally known as Paurashava) of Bangladesh have already confronted with huge challenges of taking care of both domestic and commercial solid wastes, produced every day. Choosing the stakeholders and authorities of three of the municipalities of Bangladesh as the primary sources of data, this paper mostly used qualitative information both from the primary and secondary sources where quantitative information has mostly been gathered from secondary sources. Studying and observing the selected areas, this paper has sorted out the vulnerability and lack of concern among both the authorities and stakeholders to manage the generated wastes. This paper identifies the weak solid waste management capacity of the municipalities in Bangladesh and argues that current practice is nothing but a potential pitfall for the country. This study also felt the urgency of framing a contemporary, efficient, and accessible system of solid waste disposal.*

Keywords: Solid Waste; Urban Hazards; Municipality; Recycling; Collection and Disposal**.**

1.0 INTRODUCTION

Wastes are inevitable issues to take care of. It is true that, with the pace of development and growth, the amount of household and industrial wastes is increasing. Developing nations like Bangladesh who have already unleashed their journey towards growth and development have started to meet face to face the challenges of dealing with the waste as the byproduct of the development.

The annual growth rate of the urban population in Bangladesh is over 3.3%. Solid waste generation has also been increasing proportionately with the growth of the urban population. As such, urban governing institutions are facing difficulties to keep pace with the demand for adequate solid waste management and conservancy services as they lack developed adequate facilities, strong institutional and legal framework, adequate human capabilities, and improper practices of relevant policies. Consequently, urban solid waste management has become a major concern for the cities and towns of Bangladesh [1]. Along with the emerging civilization, the generation of waste is significantly increasing day by day. According to the World Bank Report, 2.01 billion tons of waste is generated by the cities every year. The report also says every person in a city generates 0.74 kilograms of waste. Within the year 2030, due to the rapid growth of population, it is expected that the generation of wastes will have risen to 3.40 billion tons, which is 70% more as compared to the present time [2]. Since the development is not concentrated but dispersed among the entire nation, all the city corporations and Municipalities (used as municipalities) are gaining this growth. According to Nawshad,

> With the high rate of urbanization in recent decades and the total urban population standing at 58 million today, the cities, Municipalities, and small urban centers produce a huge amount of solid waste every day. Besides, urbanization, improved living standards of the people, and increased economic activities also resulted in a higher amount of per capita waste in the country. Bangladesh, the eighth-most populous country in the world has 1,015 persons per square km of land area, is faced with an acute urban waste management problem. This is a threat to human health through pollution of surface and groundwater, the soil, and the air [3].

The total waste generation in Bangladesh is around 25,000 tons per year. According to this data, every citizen in Bangladesh generates 175 kilograms of waste every year. Dhaka as the biggest city of Bangladesh generates 25% of the total waste every year. In 1995, the per person average generation of waste was only 0.49 kg. In Bangladesh, the total waste generation is expected to grow 47,000 tons per year [4]. As the living standard of the urban people develops, the total consumption of commodities also increases alarmingly that extremely intensifies the situation in the urban areas. Since a huge portion of waste remains uncollected in the major cities of the country, therefore, the living standard of these cities is under threat.

In this current world, perusing Sustainable Development Goals (SDGs) is the primary mandate of every city. To attain sustainable development for the city, sustainable waste management is one of the key responsibilities for the cities. But effective and sustainable waste management costs 20%-50% budget of the municipalities. However, ensuring sustainable waste management takes more than financial backups. Operating this essential municipal service requires integrated systems, which are efficient, sustainable, and socially supported [5]. Devoid of a system alike may be disastrous. If the solid waste management

system of municipalities remains faulty and ineffective, it may turn into a pitfall that will create multiple hazards like, health hazards, environmental hazards, climate hazards, development adversities, growth withers, etc. Not only this, the threat will remain upon the habitat more substantially if the faulty practice remains for long. The following statement of the World Bank completely reflects the issue. In this regard, World Bank says,

> Compare to those in developed nations, residents in developing countries, especially the urban poor, are more severely impacted by unsustainably managed waste. In low-income countries, over 90% of waste is often disposed of in unregulated dumps or burned openly. These practices create serious health, safety, and environmental consequences. Poorly managed waste serves as a breeding ground for disease vectors, contributes to global climate change through methane generation, and can even promote urban violence [6].

2.0 CONCEPTUAL FRAMEWORK

Solid wastes are in fact those types of waste which are not easily compostable, discarded or abandoned materials. Solid wastes can be solid, liquid, semi-solid, containerized gaseous material. Solid waste includes garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants, or air pollution control facilities, and other discarded materials. Solid waste can come from industrial, commercial, mining, or agricultural operations, and from household and community activities [7]. Municipalities have comprehensive responsibility to take care of these wastes in a daily basis. Current circumstances forecast that the solid waste management systems of the urban area have a number of flaws and adversities. Since the emerging growth of the country doesn't seem to have any indication to slow down, it would be quite unlikely to expect the generation of waste would be slow. Therefore, a hazardous situation as a consequence of the faulty solid waste management system is inevitable. The impact of the potential disaster may make the entire urban residents vulnerable in terms of their health and finance. The entire concept of the paper can be understood according to Figure 1.

Figure 1: Conceptual Framework

3.0 METHODOLOGY

This paper is constructed on both qualitative and quantitative data. Quantitative data have been gathered mostly from secondary sources namely, online materials, newspaper features, articles, books, and other relevant supplements. For primary data, mostly three municipalities of the Rajshahi district named Katakhali, Naohata, and Puthia have been chosen. Nine officials from three municipalities (three from each) have been interviewed along with the 300 residents (100 from each municipality).

To collect data, a questionnaire survey was applied as a tool where two sets of questionnaires were developed, one for the municipality officials and another for the local residents. Three FGDs have also been conducted in three selected municipalities. Each FGD was conducted inviting eight members from each municipality considering their knowledge and expertise in local solid waste management issues. FGD members were chosen from different professions such as local influential persons, locally renowned businessmen, teachers, public representatives, etc. A checklist was made incorporating four agenda of solid waste management which were set by congesting the homogenous questions from the questionnaire. The FGD was moderated and opinions were recorded by two separated individuals. Each of the members was well participatory and cooperative and their statements were found highly efficient by which cross-check with the findings of the field survey has been done to understand their final opinion.

4.0 Results and Discussion

4.1 Solid Waste Management Issues in the Municipalities

Inadequate Service Coverage

Most of the urban areas of the developing countries had to struggle with several issues. Among them, habitats of urban and peri-urban areas often remain deprived of the solid waste collection and disposing of services offered by their town authority [8]. In Bangladesh, the scenery is no different. Three municipalities of Bangladesh namely, Naohata, Katakhali, and Puthia shared the same story. The following tables may depict the context:

Table 1: Basic information about three Municipalities

	Katakhali	**Naohata**	**Puthia**
Area	24.50 sq. km	46.10 sq. km	13.51 sq. km
Total Road	59.5 km	181.18 km	85 km
Soil Road	24 km	11.63 km	47 km
Concrete Road	22 km	100 km	38 km
Dustbin	Few	Few	Few
Pedal Van	3	3	3
Dump Truck	2	2	1
Market	2	5	3
Drain (Raw)	2 km	25.50 km	950 m
Drain (Concrete)	10 km	4.50 km	N/A
Frequency of cleaning drains	Frequently	Not frequently	Frequently

[**Source:** Field Survey 2019]

During the collection of data, dustbins were hardly found in any of the municipalities. When residents were asked separately about the services they received from their town authority regarding waste management, their responses were highly negative (Table 2). None of the municipalities receive any sort of direct services related to waste management in the study areas. Since the rendered service in the area is so bad, the satisfaction of the people is out of the question. Only two respondents were satisfied only in the Katakhali municipality, whereas no positive responses were found from the other municipalities. Therefore, on average, 92% of the total respondents were found dissatisfied with this service.

Table 2: Waste Management Service Coverage

Municipalities	**Receive waste management services**	**Satisfaction with the Waste Management Services**			
		Yes	***No***	***No Comments***	***Total***
Katakhali	00 (00%)	02 (02%)	93 (93%)	05 (05%)	100%
Naohata	00 (00%)	00 (00%)	100 (100%)	00 (00%)	100%
Puthia	00 (00%)	00 (00%)	84 (84%)	16 (16%)	100%
Average (%)	00 (00%)	0.66%	92.33%	07%	100%

[Source: Field Survey, 2019]

Although the entire population of these three places is existing out of waste management services, solid waste might be separated in the household individually. Since the solid waste has a market value, it is found that 42% in Katakhali, 65% in Naohata, and 90% in Puthia were found active in terms of the separation of the wastes at home (Table 3). It means that more than half (65%) of the respondents separate their solid wastes at home. However, it has a fatal flaw because the separation process of them is not proper. Respondents claim that they only separate the metal and plastics from their household wastes where other non-decomposable wastes i.e. poly bags are still dumped here and there.

Table 3: Household Waste Separation

Municipalities	**Yes (%)**	**No (%)**
Katakhali	42 (42%)	58 (58%)
Naohata	65 (65%)	35 (35%)

Puthia	90 (90%)	10 (10%)
Average (%)	65.66 %	34.33%

[**Source**: Field Survey, 2019]

Therefore, most of the people who live in peri-urban areas are out of any waste collection services. Lack of financial resources is the primary reason behind this which does not let the authorities pull more area under the coverage of the waste management system. Inadequate fees and taxes are not enough to render such a humongous service that suits the emerging growth in the cities. Another reason is described as:

> Furthermore, the available resources are often allocated to the high-income areas with higher tax yields where residents have more political influence, so leaving the poor in peri-urban areas unserved. However, not only financial problems affect the availability or sustainability of waste collection services. In many cases, it is also technical issues that hinder efficient service and higher population coverage [9].

Operational Inefficiencies of Services

The typical waste collection approach in the developed countries from the traditional collection system in the developing countries is different. Where a developed country uses a highly complicated and sophisticated system consists of heavy vehicles and types of machinery, a developing country on the other hand uses some soft vehicles and machinery is limited in number. In most cases, this limited number of equipment remains out of operation after a certain period due to malfunctioning. The same case is found in three municipalities which are the areas of this research. The waste collection system according to the municipalities is illustrated in Figure 2.

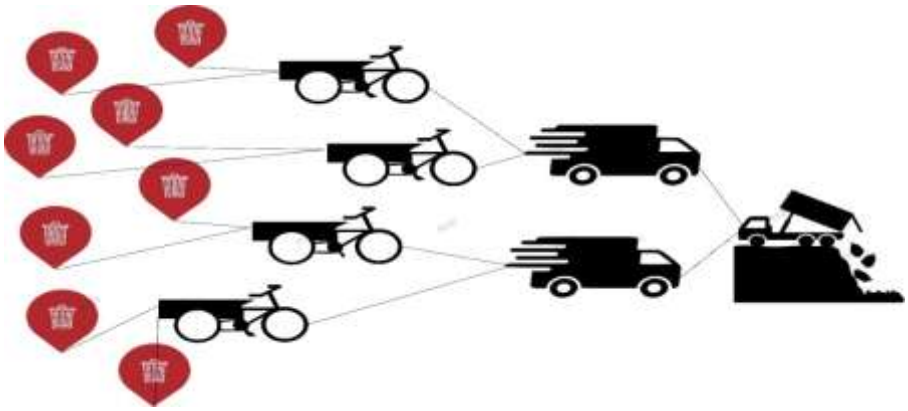

Figure 2: Conventional waste collection system in municipalities

The local residents opine that the conventional collection system is far worse. In Figure 2, it is seen that Paddle vans are taking the garbage from the dustbins across the city but in reality, dustbins are hardly found in the municipality area. In Katakhali municipality, there is no dustbin inside the city at all. In Naohata, the municipality officials claimed that they have 52 dustbins across the town but during observation, a few of them were found. Besides, residents also denied the fact of 52 dustbins. On the other hand, in Puthia, there are some dustbins and during the observation, the town was found cleaner than the other two municipalities.

Nevertheless, even with the fragile and traditional operational procedure of collecting waste, it is estimated that only a little portion of solid waste is collected with the expenditure of a major share of the municipality budget. In a study of developing countries waste management, it was found that:

> Municipal authorities in developing countries usually spend from 20 to 50 percent of the total municipal expenditure on solid waste services. However, even at such a level of expenditure, the level of service is low. Only 50% to 70 % of the solid waste is collected serving less than 50% of the population, and once collected, it is mostly disposed of inadequately in uncontrolled open dumps [10].

The real picture of the study area was far worse. Local authority spends a very little amount of their budget in terms of the service what they render. The amount of waste they collect is less than half. On the other hand, the scenario of dumping wastes is much more vulnerable. Katakhali municipality dumps its wastes only 4km away from the town where Puthia dumps two km away from the town. But Naohata shows a worse picture in terms of dumping the wastes. They dump wastes very much inside the town that create huge difficulties for the inhabitants. A kin investigation revealed that Katakhali is currently dumping wastes directly in

the river instead of any pit whereas Naohata on an open public place and Puthia dumps beside the main road. Essential issues e.g. treatment plant, composting system, and environmental and social impact assessment are still out of order (Table 4).

Table 4: Core Issues of Solid Waste Management

Core Issues of Waste Management	Katakhali	Naohata	Puthia
Dumping Station	Dumps the entire wastes in the River Padma	Dumps in the land (Public Property)	By the main road
Distance of dumping station from the city	4 km	Inside the town	2 km
Local residence around	No	Yes	No
Area	N/A	0.27 Hector	0.42 Hector
Treatment plant	No	No	No
Composting system	No	No	No
Environmental and Social Impact Assessment	Never	Never	Never

[**Source:** Field Survey, 2019]

Limited Utilization of Recycling Activities

The waste management system of a municipality must incorporate an integrated and effective recycling procedure otherwise it can hardly qualify as a sustainable system. A sustainable waste management system must incorporate core components: recycling, reuse, source control, landfilling, composting, and energy recovery. But in the studied municipalities, there is hardly found any planned or controlled waste minimization activities. Most of the recycling activities are done by a self-employed scavenger, locally known as *Tokai*. In this context, the municipality officials yet failed to recall any sort of cooperation with the scavengers.

Inadequate Management of Non-industrial and Hazardous Waste

Collected data (Table 5) from the field survey indicate that negligence of municipality is an obstacle in taking care of the municipality's solid waste management properly. Every source generates different types of waste. Authority should take different steps for different types of waste, such as wastes from the clinic are mainly hazardous wastes and they should be taken care of differently. Either the municipality or the clinic must dispose of the hazardous wastes on a regular basis. But data from Table 5 show that local residents do not have much knowledge about this vital issue. Among the 300 respondents of the three selected municipalities, only 03% from Katakhali and 01% from Naohata municipality responded positively. They replied that the authorities of their municipality collect the hazardous wastes from hospitals and clinics and they manage the hazardous wastes on a regular basis. By the way, more than 86% of the respondents from each of the municipalities failed to give us any information pertaining to this. In this regard, a high official from Katakhali municipality said:

> Yes, we know it is important to separate the hazardous and non-hazardous wastes. With this end in view, the hospital authority, at first, has to take a step to separate both hazardous and non-hazardous wastes and store these at the fixed point. After that, the municipality should collect both types of wastes in different ways, and then they should take necessary actions to manage these wastes following a sustainable waste management system. However, it is not important to us. The hospital authority doesn't pay us their taxes properly. Thus, we do not provide them this kind of supports from our sides [11].

The above-mentioned municipality official was further asked whether it is threatening the residents or not. In response to this question, he said that the responsible person of the hospital authority takes care of this issue properly. To get further information about this issue, the same question was raised in the FGD. But no particular information was found in its discussion. But an FGD member of Katakhali municipality said, he saw the clinic to dump wastes in the open places and another respondent from Naohata municipality expressed that he has seen the hospital authority to bury the wastes. By the way, it can be said that none of the above practices qualifies the conditions of sustainable solid waste management.

For other categories of wastes generated from the markets, restaurants, and butchers' shops, etc. there were some positive responses from the respondents but these were futile and not mentionable. 48% of the respondents from the Katakhali municipality held the view that wastes from the markets are removed irregularly, whereas 61% of respondents from the Naohata municipality stated so. But, when the same agendum was brought in FGD, one member opined that,

> Our market committee itself has appointed employees to clean the market. There are few sweepers who sweep the market regularly. It is not the Municipality who pays them but the shopkeepers do. The municipality hardly plays its role in this regard [12].

All FGD reports clearly revealed that each selected municipality is totally failed to take proper steps to ensure sustainable solid waste management under its respective jurisdiction.

Table 5: Managing Different Sorts of Solid Waste

Different Sorts of Waste		Variables		
		Regularly Managed (%)	***Irregularly Managed (%)***	***Not Known (%)***
Katakhali	Markets	10 (10%)	48 (48%)	42 (42%)
	Industries	03 (03%)	07 (07%)	90 (90%)
	Butchers' shops	02 (02%)	06 (06%)	92 (92%)
	Shops and restaurants	05 (05%)	29 (29%)	66 (66%)
	Hospitals and Clinics	03 (03%)	11 (11%)	86 (86%)
Naohata	Markets	00 (00%)	61 (61%)	39 (39%)
	Industries	00 (00%)	06 (06%)	94 (94%)
	Butchers' shops	00 (00%)	24 (24%)	76 (76%)
	Shops and restaurants	00 (00%)	62 (62%)	38 (38%)
	Hospital and Clinics	01 (01%)	00 (00%)	99 (99%)
Puthia	Markets	00 (00%)	67 (67%)	33 (33%)
	Industries	00 (00%)	00 (00%)	100 (100%)
	Butchers' shops	00 (00%)	11 (11%)	89 (89%)
	Shops and restaurants	00 (00%)	88 (88%)	12 (12%)
	Hospitals and Clinics	00 (00%)	00 (00%)	100 00%)

[**Source:** Field Survey, 2019]

4.2 Potential Pitfalls of Solid Waste Management

Health Hazard

The impact of solid waste on health could be fatal and may vary and/or depends on multiple factors like the types of the waste, the population exposed, duration of exposure, and the availability of prevention and mitigation of interventions. The impacts may range from mild psychological effects to severe morbidity, disability, or death. For better understanding, health impacts can be categorized [13].

a) Infection transmission can be bacterial, viral, and other diseases causing organisms.

b) Physical or bodily injury may include cuts, drowning, blunt trauma, and chemical or radiation injury. This may range from immediate skin or inhalation burns to longer terms effects.

c) Non-communicable diseases- long term exposure may lead to cellular damage and development of cancer while others might result in bodily organ injury and damage.

d) Emotional/psychological effects (strong smells, unsightly waste as human body parts).

Therefore, if the current practice discussed above continues, it may impose a severe threat upon the entire town residents' health. In this issue, a general question was asked to the local respondents, whether the existing practice of solid waste management is increasing health risk upon them or not? In response, 72% respondents from Katakhali municipality, 65% respondents from Naohata municipality, and 52% from Puthia municipality which means on average 63% of respondents held the view that they are at great risk of health hazards. As a matter of fact, the risk is even more vicious upon the cleaning workers who are directly involved in the services of waste management. Since their exposure rate is higher than the normal town dweller, they are more vulnerable in this context. As for the study area, the workers are found totally regardless in terms of following safety protocols. Unware and compelled to work as more exposed even in the time of collecting hazardous waste, they don't use safety equipment e.g. face masks, gumboots, hand globs, hand sanitizers, helmets, and so on. The rate of usage of safety equipment of the cleaning workers is presented in table 6. It appears that around 98% of workers don't use safety equipment during waste management. While interview, most of the respondents said that their town authority has a shortage of waste management equipment. The Municipality officials also confessed this limitation.

Table 6: Usage of Safety Equipment during Cleaning Works

Cleaners use safety equipment	Yes (%)	No (%)	Sometimes (%)	Total
Katakhali Municipality	00%	96%	04%	100%

Naohata Municipality	00%	100%	00%	100%
Puthia Municipality	00%	100%	00%	100%
Average (%)	**00%**	**98.67%**	**1.33%**	**100%**

[Source: Field Survey, 2019]

Environmental Hazard

A faulty waste management system can strike the environment directly. Due to the improper disposal of solid waste, environmental and health problems in urban areas are increasing day by day. Improper waste management is causing water, air, and soil pollution that in turn is also causing people's health and environment at risk in this study area [14]. Hazardous and non-hazardous wastes often stay compiled here and there exposed to the environment. As a result, it intensifies each of the components of the environment to a great extent. On the other hand, the loose system allows the unconscious residents to throw their waste in unprotected and unpreserved places such as ponds, rivers, canals, arable lands, roads, etc. The scenery in the study area is not different. Table 7 depicts that on average 95% of the respondents responded that wastes of the study area are left on the open ground that threatens the entire environment. Over 22% believe that wastes are thrown in the ponds and drains where a little fraction (only 6.66%) has assured that wastes are dumped safely in the personal trash cans. On the other hand, no functional waste disposal system has yet been introduced in the study area. The vehicles which are used for carting the wastes do not even use any cover while transporting the wastes.

Table 7: Local People's Waste Dumping Zone

	Katakhali (%)	**Naohata (%)**	**Puthia (%)**	**Average (%)**
Open Places	98 (98%)	98 (98%)	90 (90%)	95.33%
Specific Dustbin	03 (03%)	00 (00%)	00 (00%)	01%
Pond	28 (28%)	30 (30%)	10 (10%)	22.66%
Drain	28 (28%)	30 (30%)	10 (10%)	22.66%
Personal Trash Box	05 (05%)	10 (10%)	05 (05%)	6.66%

[**Source:** Field Survey, 2019]

In the context of hazardous wastes, there was a shortage of reliable data. Very limited data are available on the hazardous and toxic wastes in Bangladesh. According to the Asian Development Bank:

> The top toxic chemical polluters are the tanneries and leather industry, followed by pulp and paper, pharmaceuticals, fertilizer/pesticides, and industrial chemicals. In most cases, the chemicals are disposed of on land as part of the solid waste, parts of which are then collected and recycled. Exceptions are the pulp and paper and cement factories- these emit most of the chemicals into the air. However, it is quite likely that a significant part of land pollution eventually ends up in water through direct runoff and seepage [15].

However there is a shortage of industrial wastes in the area, but Naohata has a few sugar factories. These do not have any efficient waste management system. An unhealthy and traditional system leaves the surrounding rotten, damn, and smelly all the time. The same scenario is found in the other two municipalities as well. All the compiled wastes make the neighborhood dirty, unhygienic, smelly, and inhabitable. Therefore, these poor practices of waste management inevitably pollute the environment to a large extent.

Growth Hazard

Through the last decade, it has been witnessed that the rate of urbanization is much faster in developing countries than the developed ones. In the least developed countries, the rate is much higher. Rapid urbanization indicates rapid growth, it is true but, unplanned urbanization will ultimately stand as an impediment to the growth. This rapid growth will also result in complexity in the types of wastes generated on the daily basis. More hotels, restaurants, and diverse consuming habits of the residents generate various types of wastes causing a burden to the town authority. As the people's income and purchasing power grow, the quantity of daily produced wastes also grows [16].

The way through which current waste management policy is being implemented, it is proved through the discussion above that the environment, along with its all components like air, waste, soil, and livelihood everything is polluted. On the other hand, industrialization will eventually accelerate carbon emission which will create global warming. This paradox will trap the pace of current growth. One of the key assumptions here is that health hazards as a result of a fragile solid waste management system can result in both chronic, infectious, and mental illness. As a sufferer, every person has to spend a huge amount of money for treatment, it will create a severe financial hazard for him or her. Polluted water and land will extremely hamper the harvest in this

agriculture-based economy. Hence the wastes unmanaged in the city will impact the entire nation causing huge deformities in each sector.

5.0 CONCLUSIONS

As time goes, the task of ensuring coverage of waste management gets bigger and tougher. It is beyond any argument that the authorities of developing countries like Bangladesh pay heed to such unavoidable issues as taking care of the byproducts of development. Pursuing the development, ignoring all the latent effects will be disastrous. It is true that the current picture of the study area tells the story of the whole country apart from a few exceptions. Here the urgency of taking drastic measures centrally is clear. In this regard the following measures should be taken:

a) At first, the potential pitfall of the existing solid waste management system should be understood by both local and central authorities as well as the stakeholders.

b) An integrated solid waste management system incorporated with the stakeholders, NGOs, technologies, and authority can be a way out.

c) Contemporary and accessible policy, compatible with the concept of a sustainable city should be framed and implemented within a short time.

d) A considerable portion of the budget should be allocated to ensure infrastructural development in this regard.

e) Finally, all the policies and implementations should be made by concentrating on the 3Rs strategy.

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