

Environmental impacts of improper solid waste management in developing countries: a case study of Rawalpindi City

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Abstract

Solid waste dumps are seriously spoiling the environmental conditions in developing countries. Negative environmental impacts from improper solid waste dumping can be easily observed everywhere in the developing world. In Pakistan, due to a lack of proper planning and funding, the solid waste management scenario is becoming worse day by day. To highlight the main causes of improper solid waste management in developing countries, Rawalpindi city is selected as a case study. This city is facing miserable solid waste management crises due to rapid industrialization, urbanization and insufficient funding. Improper solid waste dumps are spreading different diseases in the study area. It is investigated during the research that due to rapid growth in population, increments in solid waste generation rate, management deficiencies, lack of legislative implementation and funding, the solid waste management systems of Rawalpindi are not working effectively. The major causes for the inefficient municipal solid waste management systems in Rawalpindi are the unintended invasion of the city, severe weather conditions, lack of social awareness/community involvement, improper resources including improper equipment and lack of funds. An inefficient municipal solid waste management system may create serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains and loss of biodiversity.

Keywords: solid waste management, Rawalpindi City, environmental impacts, land pollution.



1 Solid waste management scenario in developing countries

Solid waste management systems cover all actions that seek to reduce the negative impacts on health, environment and economy. Developing countries are seriously facing the associated problems in collection, transportation and disposal of communal solid waste. In Pakistan, due to unplanned communities and developments in major cities, environmental and sanitary conditions are becoming very complex [1]. Due to a lack of awareness and low income sources, dwellers are forced to live with unhealthy and unhygienic conditions. An improper solid waste management system may contribute to a worsening environmental degradation of the community. Illegal dumping of communal solid waste is responsible for a number of diseases in Pakistan.

Per capita, solid waste generation in developing countries is increasing annually due to an urbanization trend. Prototype and density of metropolitan areas, the physical composition of waste, density of waste, temperature and precipitation, scavenger's activity for recyclable separation, treatment capacity, insufficiency and limited resources are making tasks very tough for the administration authority in developing countries. Due to diverse life styles in communities, development authorities are not able to offer analogous type of solid waste management system for different communities, therefore in Pakistan a lot of abnormal solid waste management systems are working. Collection efficiency of the existing solid waste systems in Pakistan is very low due to a lack of storage bins and improper management system. Open dumping, open burning and un-engineered sanitary landfills are common practice throughout the country. Due to improper solid waste disposal and collection systems dwellers are facing serious negative environmental impacts in developing countries [1]. In Pakistan, according to the Ministry of the Environment, about 54,850 tons of solid waste is being generated on daily basis in urban areas, less than 60 percent of this generated solid waste is being collected properly. According to the same department there is no city in Pakistan having proper waste collection and disposal system for municipal and hazardous wastes.

2 Solid waste management issues in Rawalpindi City

Many negative impacts due to improper solid waste management can be seen in Rawalpindi city. Insufficient funding and lack of solid waste management planning can be observed in the following figure 1. It can be observed from figure 1(a) that the collected solid waste is being transported in an open body tractor trolley and in figure 1(b) it is worth mentioning that in some areas of Rawalpindi city, collected solid waste is being dumped on the ground which is totally unhygienic. Masonry bins in the Rawalpindi city are also of great concern for the solid waste management authorities.





Figure 1: Transportation of collected waste through open body trucks.

2.1 Associated negative environmental impacts due to improper solid waste management in Rawalpindi City

During investigation it was concluded that improper solid waste management systems in Rawalpindi City are resulting following negative impacts on the environment:

- Dispersed solid waste from the illegal open dumps often blocks the drains and sewers as shown in figure 2. Ultimately these blockages are creating flooding and unhygienic conditions in the city.



Figure 2: Blocked drains due to solid waste dumps.

- Flies breeding are directly linked with open solid waste dumps. During the filed investigation it was observed that during summer the flies are increasing their population so rapidly due to these waste dumps and they are very effectual vectors that spread disease in the community.

- Associated to the above problems, blocked drains and wastewater flooding in the city due to blocked drains are greatly supporting the mosquitoes breed and they are spreading the malaria and dengue in the Rawalpindi City.
- Proportion of food waste in open dumps and waste drains are providing an attractive shelter for rats. It was also reported that these rats are spreading disease, damaging electrical cables and other materials in the study area.
- The open burning of collected solid waste causing air pollution issues in Rawalpindi city.
- Uncollected solid wastes from few locations in the city are degrading the urban environment and discouraging efforts to keep streets and open spaces clean.
- Discarded polythene bags in collected solid waste from Rawalpindi city are generating an aesthetic nuisance and they may also cause the death of grazing animals which eat them [2].
- Due to a lack of health and safety facilities to the waste collection crew in Rawalpindi city, they are specifically facing occupational hazards, including strains from lifting, injuries from sharp objects and traffic accidents.
- Open dumps on the roadside and heavily sized solid waste storage containers are also creating traffic blockage in the study area.
- The city government is not providing separate waste collection facilities. As a result, a lot of dangerous items (such as broken glass, razor blades, hypodermic needles and other healthcare wastes, aerosol cans and potentially explosive containers and chemicals from industries) may cause risks of injury or poisoning, particularly to scavengers and school going children [3].
- Open body trucks are being used for the collection of solid wastes in Rawalpindi city without covers. This practice is totally unhygienic.
- Heavy solid waste collection vehicles are causing significant damage to the road.
- Different segregated solid waste materials, such as plastic bottles and medical supplies, are not being properly cleaned or sterilized by local scavengers.
- During rainy seasons, produced leachate from the open dumped sites is causing serious pollution to water bodies in Rawalpindi city.
- A high percentage of collected solid waste from Rawalpindi city is being treated or disposed of in unsatisfactory ways, causing a severe aesthetic nuisance in terms of smell and manifestation.
- Liquids and fumes, escaping from deposits of chemical wastes are creating fatal or other serious effects to the community [4].
- Illegal burning of collected solid waste in Rawalpindi city is creating serious negative impacts on outdoor air quality. Furthermore, it is also causing illness and reducing visibility.



2.2 Solid waste collection practices in Rawalpindi City

In Rawalpindi city, solid waste is being collected through the deployment of sweepers and sanitary crew [5]. These workers are collecting the solid waste from the streets with the help of wheel barrows and hand carts. Solid waste is being temporarily collected in containers/dumpsites from where it is transported by the help of collection vehicles and carried out to final disposal sites. Solid waste collection efficiency is not uniform in remote areas of Rawalpindi city. It was also observed during field visits that collection bins, number of containers and collection vehicles are not sufficient to maintain the city solid waste management system properly.

In Pakistan, different solid waste collection systems are in practice [6]. Generated solid waste from the main cities is mostly collected by municipal authorities and representing diverse collection efficiency throughout the country, depending upon various factors [7]. Especially in remote areas of Pakistan, municipal authorities are not providing any facility for the collection and disposal of solid wastes [9, 10]. In these remote areas scavenging by people and animals, natural biodegradation of organic wastes, burning at the initial point of disposal, and local self-help are well known solid waste disposal practices [3, 11, 12].

In Rawalpindi city, the collection rate of generated solid waste ranges from 51% to 69% [5]. The remaining uncollected waste, approximately 30 to 50%, remains on streets and in open spaces. The high percentage of uncollected solid waste is seriously polluting the environment and causes the blockages of drains in the study area.

3 Exiting solid waste management systems for Rawalpindi and their drawbacks

The City District Government Rawalpindi, and Rawalpindi Development Authority are providing solid waste collection and disposal facilities through sanitation crews. The management staff of Rawalpindi municipal committee comprises sanitary inspectors and chief sanitary inspectors who supervise the collection and disposal of solid waste and offer guidelines to their junior staff. During the field visit it was also observed that the spaces near the communal storage facilities are completely littered around, as shown in figure 3.

From figure 3, it is clearly presenting that most of the people have a habit of throwing the solid waste from a distance to the communal storage bins that present a view of spilled over garbage. Total numbers of collection vehicles for the Rawalpindi City are not sufficient. Collected data from the municipal authorities is presenting that initially, 3 trips/vehicle/day were designed but at present due to traffic jamming and dense population trend in Rawalpindi city,





Figure 3: Unhygienic conditions around storage facilities.

these vehicles are not capable of achieving the design value. The City District Government has arranged 200 numbers of containers for 57 zones of Rawalpindi city. These municipal authorities are handling up to 50% of these allocated containers in a single day. The City District Government Rawalpindi is also supervising different solid waste management projects like Solid Waste Environmental Enhancement Project (SWEEP) for the betterment of the city [4]. This project is being sponsored by UNDP. The main objective of this project is to involve all the stakeholders to participate in various activities of primary collection of municipal solid waste. This practice may effectively improve the collection and management efficiency of municipal authorities. This project was aiming to enhance the solid waste collection efficiency and improvement of transportation and disposal system. It is also anticipated that the proper implementation of the SWEEP project will enhance community participation at a grassroots level, generating an additional source of income for low-income communities through segregation at source [5].

3.1 Disposal practices

Unfortunately, at present Rawalpindi Municipal Corporation have no appropriate landfill or waste disposal site. Open dumping, open burning and dumping of solid wastes to un-engineered landfill sites is being practiced in Rawalpindi city. Unhygienic open dump site in the vicinity of Rawalpindi city is shown in figure 4. Other types of dangerous wastes like chemical and hospital wastes are also not disposed of properly.



Figure 4: Open dumps of solid waste in the vicinity of Rawalpindi city.

3.2 Serious environmental issues in study area due to open dumping

Open dumps of municipal solid waste are creating serious negative impacts on environment in Rawalpindi city [8]. Following negative impacts are being observed in Rawalpindi city due to open dumping of solid waste:

- ✓ **Dust and Filthy Dirt:** Strong wind and storm are spreading dust and filth from the open dumps of solid waste to adjacent areas.
- ✓ **Odor:** Nearby areas to the open dump sites is being affected due to odor emitting from these dumps.
- ✓ **Rats and other Vermin:** Open dumps of communal solid waste are providing attractive habitat to rats and other vermin.
- ✓ **Toxic Gases:** Toxic gases are continuously exposed to the atmosphere.
- ✓ **Leachate:** Percolating rainwater through the open dump contaminating ground water resources.
- ✓ **Health and Sanitation:** Open dumps of solid waste are a serious threat to human health and sanitation.

3.3 Serious environmental issues in study area due to open burning

It was observed during the field visit that solid waste collected at the communal bins is burnt. The local dwellers were complaining that burning of dumped solid waste is a common practice and creating drastic air pollution as shown in figure 5.



Figure 5: Open burning of dumped solid waste.

4 Conclusions

Most of the developing countries are not able to provide proper facilities for collection and disposal of communal solid waste to whole population. In Rawalpindi city, solid waste is being dumped openly along roadsides. Like other cities of Pakistan, in Rawalpindi, diverse solid waste management systems are in practice. Open dumps are responsible for the blockage of drains, breeding of flies and spread of epidemic diseases. Due to lack of proper equipment and funding, the present solid waste management system is insufficient for Rawalpindi city. Remote areas of the city are mostly ignored and the collection efficiency is very low. Hospital and other hazardous waste materials are being treated as ordinary waste. Considering the overall negative impacts associated with open dumping and open burning, these practices must be strongly discharged.

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