Industrial Waste Management in Pakistan: Problems and Prospects

Abstract

The disposal of industrial waste is a serious issue in almost every developed and underdeveloped nation. Fast-growing industrialization and urbanization have severely affected the environment and water quality. The developed states have developed techniques to dispose of industrial waste. However, as it is very expensive, so underdeveloped states are lacking behind in the technology of industrial waste disposal. This paper will explore different aspects of Industrial waste, such as the causes of industrial waste and its effects on the population. This research is supported by the survey from the around 300 people of Multan to know about the perception of the general public about industrial waste management. The paper concludes with the recommendations that government, industrialists and civil society can jointly resolve the issue of industrial waste by taking different measures on their part.

Key Words: Environment, Industry, Multan, Pakistan, Industrial Waste Management

Introduction

Industrial waste is a global problem. Rapid growth in industrialization and business activities in the recent past has increased the challenge to the environment due to industrial waste. Waste management is a term that is used for processing, gathering, reusing and recycling wastage goods to make them usable again. A large number of researches have been conducted to address the issue of industrial waste management. Both developed and underdeveloped countries are facing serious challenges and issues due to industrial waste. Industrial waste is not only degrading the environment but also endangering the drinking water in many states of the world (Lars et al., 2000). Although some of the developed states have developed an efficient solution to the problem yet, it is very expensive, so underdeveloped states are still unable to manage the industrial waste efficiently. The states can get not only environmental benefits but also economic progress by adopting a proper industrial waste management system (Hogland and Stenis, 2000). Many states who are getting economic benefit but not making any planning about their industrial waste can no longer sustain that development in future (El-Fadel et al., 2001). Different governments are continuously monitoring industrial waste management due to serious repercussions on health and the environment. The global committee of nations is committed to taking strict measures regarding industrial waste management to make their states eco-friendly. The developed States have imposed heavy taxes on the industries for their industrial waste management so that these additional taxes can be used for the restoration of a clean environment. The international market of

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recyclable material is growing very fast, most 1.5 million people employed in this industry, having revenue of around 160 billion per annum (BIR, 2009).

The United States of America has developed a special technique to dispose of its hazardous industrial waste that is called deep well injection. In this method, the liquid waste is thrown into a rock shaped well that keeps the liquid waste separate from groundwater. Furthermore, United States have developed different techniques to dispose of industrial solid waste as well to avoid its negative consequences on environmental pollution and water degradation (Doifode and Ashok, 2015). Many European states are using their industrial waste to get energy by utilizing waste heat technologies (Jouhara and Abdul, 2018).

Industrial waste and rapid growth in population has caused not only pollution problems but also has severely damaged the coastal marine water environment. The lack of infrastructure and availability of modern facilities and slackness of industries for the disposal of industrial solid waste are the most important problems faced by most states in disposing of the waste (Shah, 2014, 88).

**Industrial Waste issue in Pakistan**

Solid waste management is a serious concern for the people of Pakistan because, according to an estimate, more than 5 million people die every year because of waste-related diseases. Pakistan is almost projected to producing 70,715 tons of solid waste every day that also includes industrial solid waste. However, despite modern development, Pakistan has not established any such spot where the weight of disposal for dumping can be measured (Shah, 2014, 89). According to DAE Report (1993), “Pakistan solid waste generation ranges from 0.283 to 0.612 kg/capita/day and the waste generation growth rate is 2.4 % per year”. Solid waste in Pakistan has been increasing at a rate of almost 2% annually. In Pakistan, only 60 to 70% of solid waste is collected in cities (Waste Management, 2019). The common types of solid waste of Pakistan are agricultural waste, solid waste, industrial waste and hazardous waste. The dumps of such waste have become a center of child labour (Zaidi, 2014).

The people of Pakistan in almost every city are suffering from environmental pollution and water degradation. Heavy metal waste of industries is disturbing the ecosystem and affecting the quality of groundwater that are affecting human health in industrial cities of Pakistan (Ullah et al., 2009; Azeem, 2009). It is not only industrial waste but also the non-reusable products of daily routine such as plastic, diapers and shopping bags of plastic are also posing a serious challenge to waste management in Pakistan (GOP, 1996). No city in Pakistan has any proper mechanism of solid waste management in general and industrial waste in particular. There are no proper sites in cities where such industrial solid waste can be thrown away. These industrial waste are responsible for choking the drainage system and providing a breeding ground for flies and mosquitoes that can cause diseases such as cholera and malaria (Khajuria et al., 2008).

Although Pakistan environmental protection agency (PEPA) was formed in Pakistan to deal with the issues of industrial waste yet, it is unable to meet the challenges to date. Asian Development Bank has provided 400 million dollars to these end cities for the improvement of waste management services in almost 20 cities of Sindh (waste management, 2019). Both medium and heavy industries are contributing to increasing the industrial solid waste in Pakistan. However, medium and heavy industries have to some extent working on a solution to get rid of industrial waste. Whereas the small industries still are unable to overcome the challenge of their industrial solid waste. The local governments are responsible for or dealing with day industrial waste of small scale industries in towns and cities.

Pakistan Environmental Protection Agency (2005), in its draft guideline for Solid Waste Management, reports that industrial pollution is one of the major problems of Pakistan. Sincere efforts have not been made to resolve that issue.
Lack of information about technological development, the poor performance of the industrial sector and high investment are the major reasons due to which the industries are unable to manage their industrial waste. Moreover, small and medium-sized industries such as textiles, food processing, leather, marble polishing and chemicals are contributing to industrial waste. The report claims that industries which are located around major cities of Pakistan are increasingly polluting the rivers, canal small streams through their untreated hazardous industrial waste. The report identifies different methods to treat industrial waste, such as physical treatment, chemical treatment and biological treatment.

**Literature Review**

Swachhcoin (2018), in its report, mentions that industrial waste is one of the major contributors to modern global annual waste. The reports point out that industrial waste is a byproduct of the manufacturing process, and it is very vital to make proper strategy to manage the industrial wastage. The report points out that the industry should segregate the different type of waste such as paper plastic and glass are recyclable so that can be separated from other solid waste.

Nemerow and Dasgupta (1991) point out the harmful and dangerous effects of industrial waste. In this book, they have provided different theoretical framework regarding the management of waste, such as conservation and neutralization. Different case studies are described in this book regarding the problem of waste management and its solution.

Abduli (1996), in his research paper entitled industrial waste management in Iran, has written the issue of industrial waste management in Tehran. He has described different methods of handling and disposing of industrial solid waste in metropolitan areas of Iran through field study. He collected the quantitative data by using the questionnaire to know about the ground realities of industrial waste management system in those areas. The author found in his study that a large number of the industry as dumping their waste material in improper and illegal ways such as dumping on the roadside, open burning or throwing at any available area near to the factory.

Thai (2009) has conducted research on industrial waste management in Vietnam. In his study, he found that deindustrialization in Vietnam had also posed a serious challenge for the industrial waste management system. He found that Vietnam I was also having a problem of inadequate facilities of industrial waste management due to the unavailability of strong legal laws regarding environmental protection. However, the Vietnamese government has initiated many regional and international steps regarding environmental protection with the help of global cooperation.

Shah (2014), in his article industrial solid waste management practices in Pakistan, has study de practices adopted by different industries regarding industrial waste management and its socio-economic intact on the local people living in the vicinity of that area. The researchers concluded that the industrial area in Qatar industrial estate of Pakistan is cycling day industrial waste that is not only helping the population economically but also saving them from polluted environment. However, these practices are not as per International standards. He emphasized the awareness campaign regarding the effects of industrial waste on the population.

Javed et al., (1998) India article claimed that there was no systematic approach by the domestic as well as the industrial user for or management of solid waste and industrial waste. A large number of industries are used to discharge their industrial waste without any proper planning. Industries mostly used to discharge their solid waste into open land or nearby areas. Thermal power plants, brick kilns, cement factories and chemical industries in Pakistan are the main source of emission of poisonous gases and pollution into the air. The author of the opinion that use of proper wastage treatment it technology is urgently needed in Pakistan to safeguard the environmental degradation.
Survey Results and Discussion

The results of survey conducted by the researchers regarding the public opinion and perception about industrial waste are described in this section.

Table 1. There is no proper Industrial Waste Management in Multan.

| Scale      | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency  | 87             | 161   | 24      | 36       | 2                 | 310   |
| Percentage | 28.1           | 51.9  | 7.7     | 11.6     | 0.6               | 100   |

Figure 1: Responses (%) against various scales for question 1

In response to the first question, most of the respondents, almost 88%, agreed that no proper industrial waste management practice exists by the local industries in Multan. Whereas only 12.2% of respondents showed disagreement with this question. Industrial waste management is a very serious issue that is directly linked with the collective benefits of society in terms of environmental issues and public health. It should be carefully and properly handled by the trained staff from industries.

Table 2. Industrial waste is a major cause of pollution in Multan.

| Scale      | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency  | 154            | 119   | 5       | 32       | 0                 | 310   |
| Percentage | 49.7           | 38.4  | 1.6     | 10.3     | 0                 | 100   |

Figure 2: Responses (%) against various scales for question 2

In response to the second question, most of the respondents, almost 88.1%, agreed that industrial waste is one of the major causes of pollution. Management practice exists by the local industries in Multan. Whereas only 10.3% of respondents are of the opinion that industrial
waste is not a major cause of pollution. In the light of the above findings, the management of industrial waste in Multan is very vital to providing a pollution-free environment to the people of Multan.

Table 3. Government is taking Measures for Industrial waste Management in Multan.

| Scale       | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|-------------|---------------|-------|---------|----------|-------------------|-------|
| Frequency   | 0             | 12    | 28      | 92       | 168               | 300   |
| Percentage  | 0.0           | 3.9   | 9.0     | 29.7     | 54.2              | 96.7419 |

Figure 3: Responses (%) against various scales for question 3

In response to the third question, an overwhelming majority of the respondents, almost 86.7%, are of the view that the government is not taking any measure for industrial waste management in Multan. Whereas only 3.9% agrees that the government is taking measures to resolve this issue. These results show that the government is not taking this issue seriously that can endanger the quality of life of people living in Multan.

Table 4. Government is failed to make policy on disposal of Industrial waste Management.

| Scale       | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|-------------|---------------|-------|---------|----------|-------------------|-------|
| Frequency   | 123           | 87    | 36      | 53       | 11                | 310   |
| Percentage  | 39.7          | 28.1  | 11.6    | 17.1     | 3.5               | 100   |

Figure 4: Responses (%) against various scales for question 4

In response to a question regarding the failure of the government in making policy regarding industrial waste management, 67.8% are convinced about the failure of the government on this issue. Whereas 20.6% thinks that the government has not failed in making policies to dispose of industrial waste.
Table 5. The issue of Industrial waste management can be handled with proper planning.

| Scale  | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|--------|----------------|-------|---------|----------|-------------------|-------|
| Frequency | 160            | 145   | 5       | 0        | 0                 | 310   |
| Percentage | 51.6            | 46.8  | 1.6     | 0.0      | 0.0               | 100   |

![Figure 5: Responses (%) against various scales for question 5](image1)

In response to a question, 98.4% of respondents are of the opinion that this serious issue of industrial waste can be managed only by proper planning. So a comprehensive planning is direly needed to resolve this issue.

Table 6. Industrialists are well aware from the issue of Industrial waste management.

| Scale  | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|--------|----------------|-------|---------|----------|-------------------|-------|
| Frequency | 48             | 76    | 34      | 88       | 64                | 310   |
| Percentage | 15.5            | 24.5  | 11.0    | 28.4     | 20.6              | 100   |

![Figure 6: Responses (%) against various scales for question 6](image2)

In response to a question regarding the awareness of industrialists about the problem of industrial waste management, most of the respondents, almost 40% people opine that industrialists are well aware of the issue, whereas 49% of people opine that industrialists are not aware of the issue of industrial waste. These results show a division among the public regarding industrialist awareness. This division shows that either they are unaware hence not taking any steps, or they are aware of the issue but yet not taking any action to solve this issue.

Table 7. Civil society is playing an effective role in creating awareness about industrial waste management in Multan.

| Scale  | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|--------|----------------|-------|---------|----------|-------------------|-------|
| Frequency | 15             | 54    | 28      | 125      | 88                | 310   |
In response to a question regarding the role of civil society in creating awareness about industrial waste management, the majority of the respondents, almost 68.7%, admits that civil society is not playing an effective role to resolve this issue. Whereas only 22.2% are of the opinion that civil society is playing an effective role. These results show that civil society needs to adopt a proactive approach in resolving this issue as the main stakeholder.

**Table 8.** Industrial waste is leading towards environment degradation in Multan.

| Scale    | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|----------|----------------|-------|---------|----------|-------------------|-------|
| Frequency| 134            | 156   | 3       | 17       | 0                 | 310   |
| Percentage| 43.2        | 50.3  | 1.0     | 5.5      | 0.0               | 100   |

An overwhelming majority, 93.5% of the respondents, are of the opinion that industrial waste is leading towards environmental degradation in Multan. So it is very necessary to manage the industrial waste to provide a clean environment to the people of Multan.

**Table 9.** Poor industrial waste management is affecting the quality of drinking water in many areas of Multan.

| Scale    | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|----------|----------------|-------|---------|----------|-------------------|-------|
| Frequency| 143            | 148   | 6       | 13       | 0                 | 310   |
| Percentage| 46.1        | 47.7  | 1.9     | 4.2      | 0.0               | 100.0 |

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*Figure 7: Responses (%) against various scales for question 7*

*Figure 8: Responses (%) against various scales for question 8*
According to the survey, 93.8% of people are of the opinion that the quality of drinking water is negatively affected due to poor industrial waste management. Whereas only 4.2% are of the view that it is not affecting the quality of drinking water at all. Many water-borne diseases can be caused due to poor quality of water, such as typhoid and cholera. So there is an urgent response required for proper disposal of industrial water waste to save people from such diseases.

Table 10. There is no proper mechanism for recycling in Multan area.

| Scale         | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|---------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency     | 154            | 119   | 5       | 32       | 0                 | 310   |
| Percentage    | 49.7           | 38.4  | 1.6     | 10.3     | 0.0               | 100   |

In response to a question regarding the recycling facilities in Multan, 88.1% of the respondents claim that there is no proper mechanism for recycling in Multan. Whereas only 10.3% disagrees with this notion. Recycling reusable material is very vital for a clean and green environment in the modern day world. To meet the international environmental standards, recycling must be introduced at the local level to save the environment.

Table 11. There is dire need of legislation for industrial waste management.

| Scale         | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|---------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency     | 205            | 102   | 3       | 0        | 0                 | 310   |
| Percentage    | 66.1           | 32.9  | 1.0     | 0.0      | 0.0               | 100   |
Figure 11: Responses (%) against various scales for question 11

In response to a question regarding making legislation with respect to industrial waste, 99% of people are of the opinion that there is a dire need for legislation for industrial waste management. It is hoped that in the presence of such legislation, it will be easy to punish the industrial sector that will not implement the proper mechanism to dispose of the industrial waste.

Table 12. Factories are using reusable items from Industrial Waste.

| Scale  | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|--------|----------------|-------|---------|----------|-------------------|-------|
| Frequency | 53             | 98    | 47      | 66       | 46                | 310   |
| Percentage| 17.1           | 31.6  | 15.2    | 21.3     | 14.8              | 100   |

Figure 12: Responses (%) against various scales for question 12

In response to a question regarding the use of reusable items by the industries, the opinion of the respondents is divided. 48.7% agrees, 15.2% are neutral, and 36.1% disagrees regarding the use of reusable items. This division is either because industries are not disclosing their policy of using reusable industrial waste or the industries are not using reusable waste at all. The absence of such policy is creating division among the public regarding this issue.

Table 13. Industrial waste is affecting the landscape of Multan City.

| Scale  | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|--------|----------------|-------|---------|----------|-------------------|-------|
| Frequency | 46             | 127   | 5       | 97       | 35                | 310   |
The respondents are also divided on the issue of landscape in Multan due to industrial waste. 55.8% of the respondents agree that industrial waste is affecting the landscape of Multan city. Whereas 42.6% of people are of the opinion that industrial waste is not affecting the landscape of Multan. This division clearly shows that the landscape is not an important concern for the people of Multan with respect to industrial waste as compared to other concerns such as air pollution and drinking water.

Table 14. Industries are using new technologies for Industrial waste management.

| Scale    | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|----------|----------------|-------|---------|----------|-------------------|-------|
| Frequency| 0              | 0     | 15      | 87       | 198               | 300   |
| Percentage| 0.0            | 0.0   | 4.8     | 28.1     | 63.9              | 96.77419 |

In response to a question regarding the use of new technologies for industrial waste management by the industrial sector, awareness of industrialists about the problem of industrial waste management, 92% of the respondents opine that industrialists are not using new technologies for industrial waste management. This trend shows a serious concern as the industrialists are not taking care of environmental factors by ignoring the new technologies and by adopting traditional methods of disposing of industrial waste.
Table 15. There is proper mechanism for industrial waste collection in Multan.

| Scale         | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|---------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency     | 0              | 13    | 18      | 112      | 167               | 310   |
| Percentage    | 0.0            | 4.2   | 5.8     | 36.1     | 53.9              | 100   |

![Figure 15: Responses (%) against various scales for question 15](image1)

In response to a question regarding the mechanism for industrial waste collection in Multan, 90% of the respondents believe that there is no proper mechanism for industrial wastes collection, whereas only 4.2% thinks that the mechanism is there. In fact, it is the responsibility of the government to devise a proper mechanism for industrial waste, whether it is solid waste or liquid waste. Even if the industries are responsible for the disposal of waste material, the government should ensure that the industrial sector is disposing of such wastage properly or not.

Table 16. There are proper sites for disposal of Industrial waste in Multan.

| Scale         | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|---------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency     | 31             | 46    | 4       | 123      | 106               | 310   |
| Percentage    | 10.0           | 14.8  | 1.3     | 39.7     | 34.2              | 100   |

![Figure 16: Responses (%) against various scales for question 16](image2)

The respondents are divided on the issue of the availability of proper sites for the disposal of industrial waste. 24.8% agrees that there are proper sites for the disposal of industrial waste, whereas a large number of the respondents, 73.9%, disagrees with this notion, and they are of the opinion that there are no proper sites for industrial waste management. This division
clearly shows that even there is no awareness among the public about proper sites to dispose of the industrial waste in Multan. The different type of waste must be disposed of on different sites dedicated by the industrialists or by the government for a particular type of industrial waste.

Table 17. Industrial waste is a problem of common man.

| Scale | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|-------|----------------|-------|---------|----------|-------------------|-------|
| Frequency | 156            | 142   | 0       | 12       | 0                 | 310   |
| Percentage | 50.3           | 45.8  | 0.0     | 3.9      | 0.0               | 100   |

Figure 17: Responses (%) against various scales for question 17

While answering the question regarding industrial waste as a problem of the common man, 96.1% of the respondents are of the opinion that industrial waste is a problem of the common man. Their perception about the industrial waste problem clearly shows that it is the common man that is suffering from this issue due to the polluted environment and polluted drinking water. The life of the common man has been affected much due to different diseases that are byproducts of such industrial waste disposal.

Table 18. Industrial waste is a problem of only Industrialists.

| Scale | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|-------|----------------|-------|---------|----------|-------------------|-------|
| Frequency | 5              | 56    | 3       | 115      | 131               | 310   |
| Percentage | 1.6            | 18.1  | 1.0     | 37.1     | 42.3              | 100   |

Figure 18: Responses (%) against various scales for question 18
In response to a question of whether industrial waste is a problem of only industrialists, only 19.7% agrees with this statement, whereas 79.4% disagrees with this statement. So it clearly shows that industrial waste is a problem of civil society; rather, it is more pertaining to the common man as compared to industrialists because it has degraded the quality of life of the common man.

Table 19. Industrial waste is more hazardous than Municipal solid waste.

| Scale       | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|-------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency   | 192            | 87    | 5       | 12       | 4                 | 300   |
| Percentage  | 61.9           | 28.1  | 1.6     | 3.9      | 1.3               | 96.8  |

Figure 19: Responses (%) against various scales for question 19

While comparing Municipal solid waste with industrial waste through a question in the survey, most respondents consider industrial waste more hazardous than municipal waste. 90% of the people are of the opinion that industrial waste is more dangerous than municipal waste, whereas only 5.2% of people disagree with this notion.

Table 20. There is no proper mechanism for the implementation of existing laws regarding Industrial Waste Management in Multan.

| Scale       | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total |
|-------------|----------------|-------|---------|----------|-------------------|-------|
| Frequency   | 136            | 111   | 26      | 25       | 12                | 310   |
| Percentage  | 43.9           | 35.8  | 8.4     | 8.1      | 3.9               | 100   |

Figure 20: Responses (%) against various scales for question 20
In response to a question regarding the absence of a proper mechanism for implementation of existing laws regarding industrial waste management in Multan, 79.7% of people agree with this notion, whereas 8.4% of the respondents are neutral, and 12% of respondents disagree with this statement. This means that there is no effective mechanism for implementation of existing laws regarding industrial waste management, and unless there is no mechanism is evolved, the existing laws will be ineffective.

**Conclusion**

The civil society is of the opinion in the light of the survey by the researchers that all common man, industrialists and government are responsible for the mismanagement of solid waste. The problem only can be resolved by making effective legislative measures regarding industrial waste management. The situation responsible for the implementation of laws regarding waste management must be strengthened. Some industries in Pakistan have adopted the practices of recycling their waste, but they still need some improvement to meet the standard at the international level. People should be encouraged to reuse the used waste if possible instead of throwing it. Proper legislation must be enforced regarding the recycling of the used industrial waste in Pakistan. Local government and local bodies must play their role in managing industrial waste management at the local level. A proper mechanism to measure the quantity of industrial waste must be established. The industries in Pakistan should make legally bound to install recyclable plants for their industrial wastes. Industries to manufacture good from recyclable waste must be established, and they must be given incentives such as tax relaxation and other rewards. Some solid waste material can even be used for energy generation by using the latest technology that can also help in addressing the energy crisis of Pakistan to some extent. A comprehensive strategy can be adopted for solid waste management by adopting three policies: firstly, to reduce the material that can increase pollution; secondly, to reuse the material and thirdly, to recycle the recyclable material.
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