

# Environmental Effects of Landfill Sites on Biologic Environment; Case Study: Tehran City of Iran

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**ABSTRACT:** Population growth and increasing diversity of human needs lead to increasing production of waste. Increasing waste production and reducing waste landfill in Kahrizak reveal Tehran's need to determine the location of landfill waste more than before. To construct a landfill according to Environment High Council, a report on the environmental impact assessment in feasibility and location stage must be prepared. Therefore, Tehran Municipality has selected a sanitary waste landfill with an area of 1000 hectares in Hassan Abad – Hooshang Abad Road, Ray in Tehran province. This area is located in hydrologic units of Zarand - Save - Zaviyeh and 10 kilometres far away from Shoor River (Soroud). The soil of area is Bazarak soil. Flora and fauna, including endemic species that have been detected in field operation. Rare and Endangered Plants in and around of the project site are 12 species. Mentor 2001 is used to evaluate the proposed landfill. By using the mentioned method, the effects of each stage of the construction and operation have been predicted based on activities matrix and influences. Results indicate that the soil operation have the greatest effect on biological environment. Terrestrial ecosystem and rare species of plants have the most long-term influence in construction phase and the destruction of them is inevitable. The permanent, definite and direct negative effects of proposed landfill operation create 75.91% of total impacts.

**Keywords:** Environmental Impact Assessment, Proposed Landfill Site, Biological Environment of Ecosystems, Water Pollution

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## INTRODUCTION

Increase in consumption as a result of growing human population leads to more waste (Annual statistics of Waste Management, 2006). Production of waste threatens cleaning, public health and also environment, and the selection of appropriate solid waste landfill is the most important success factor in the optimal utilization of it (Monavari, 2002).

Therefore, measures to prevent environmental threats must be considered. Solid waste management is also formed for this purpose (Department of Natural Resources of Ray, 2002). In 2006, 2719250 tons of waste were collected in Tehran and surrounding towns, transported and disposed in Kahrizak in south of Tehran (Planning and Agricultural Economics Research Institute, 1999). Due to increasing production of waste in Tehran, a new landfill is required. This research according to the urgent need to the operation of a new location, attempts to predict probable effects of project implementation on biological environment by environmental assessment of proposed place and reduce adverse effects by providing applicable and possible environmental management program. The results will make smooth the achievement of sustainable development in the country.

## MATERIALS AND METHODS

Environmental impact assessment of the proposed landfill site in Tehran was carried out by Mentor 2001.

This method was introduced in project of capacity making and institutional strengthening of Iran environmental impact assessment by the United Nation development program and Environmental Protection Organization (Planning and Agricultural Economics Research Institute, 1999).

In this way, a matrix is considered for each stage of construction and operation. Prediction of outcomes is based on the encoding presented to determine effects, according to the results of surveys on the biological environment of the project site and surrounding area. Table 1 shows the parameters of effects in mentioned method.

The criteria used for the application of the above method are:

- 1- Positive
- 2- Negative
- 3- No Effect
- 4- Need more information
- 5- At the moment it's not possible to check

In this method, 19 types of effect is studied. For this study, two steps are considered that include:

- 1- Construction phase
- 2- Operation phase

After scoring matrix, results are summed by Excell software and displayed in the form of image. Incorporation and final conclusion of positive and negative effects in both phases of activities are comparative.

**Table 1.** types of effects (5)

Effect type	Code	Effect type	code	Effect type	code
Strategic	Q	unlikely	I	Too much	A
Important - Specify	R	reversible	J	High	B
Unimportant	S	irreversible	K	Average	C
Positive	1	Short-term	L	low	D
Negative	2	Long-term	M	sectional	E
No effect	3	Cumulative	N	permanant	F
Need more information	4	Direct	O	definite	G
Currently not possible to judge	5	indirect	P	probable	H

## RESULTS AND DISCUSSION

Range of research studies is located in hydrological unit of Zarand - Save - Zaviyeh in 51 degrees and six minutes and 11 seconds east longitude and 35 degrees and 17 minutes and 30 seconds north cross of Rey in Tehran province. This location is enclosed from north to Haft Tapeh Mountain, from south and east to Tehran-Qom highway and from west to Muhammad Khan castle and police station. Proposed landfill area with 5 km length and 2 km width is located in Hassan Abad road near Hooshang Abad and 11 km far away Imam Khomeini International Airport. Location is shown on Map 1. In terms of climate, the site is located in an area with 36 ° C dry and warm, 8 ° C average maximum temperature and precipitation of about 180 mm (Soil and Water Research Institute, 2001). Wind characterization also revealed that 87% wind conditions are West-East. The highest wind speed measured at 92 kilometers per hour. In the present situation, there is no source of air pollution in this area and only local dust, resulting in lack of vegetation indicates a large increase (Institute of Soil and Soil Fertility, 2001).

Noise of location is mainly affected by Tehran – Qom traffic road and also Hassan Abad because of heavy vehicles traffic. The nearest adjacent stream on the project site is Shoor seasonal river flowing in the northern and outside part of the project lands. Groundwater level is in depth of 120 meters and has salty quality. Big parts of land area consist mainly of gravel-bearing lands which are formed by alluvium and gravel banks and their slope changes from flat to gentle (Bermo, 1995). The soil of area is Bazarak soil which is dark yellowish brown with heavy dark texture and a little bit of limestone powder and in terms of classification is part of Brown soils group (Doe, 1995).

Topography of the study area with an altitude of 1428 meters includes Hasan Abad Mountain and in north-east, Hot Balls Mountain, Zire and Red Mountains that are prolonged from west to the southwest and south in sequence and the studied area is formed like a bowl (Tchobanoglous et al., 1993).

Biological environmental affected by proposed landfill site is divided into two groups of plants and animals that are listed below:

### Plants

In order to identify the plants in different parts of the land three stages of detection, sampling basic types, analysis and inventory have been done and unknown samples are collected before grouping.

Valuable and rare plant species of the area are:

#### a- Rare species

- Malcolmia Africana
- Astragalus glaucacanthos
- Acanthopyllum bracteatum
- Zygophyllum atriplicoides
- Callignnum sp
- Aeluropus Littoralis

#### b- Species at risk of extinction

- Eurotia ceratinides
- Lycium depressum
- Kochia prostrate

### Animals

Dir and Moreh district influenced by their surroundings and due to the vast plains and various heights and semi-desert vegetation provides a diverse habitat for wildlife; as a result, it's a suitable area for animals. But due to lack of security controls, populations of animals particularly mammals living in plain declined sharply and even some species vanished in the region.

#### a-Mammals

- Canis Lupus: abundantly
- Canis aureus:

These animals are very abundant in the Bndlykhan and Abdlykhan. Other mammals that live in the area in limited population include:

- Vulpes Vulpes
- Vulpes vuppelli
- Lepus capensis

#### b- Birds

In the area of the proposed site and surrounding area due to the presence of Moreh Mountains, various species native and migratory birds are present; the most important of them are identified as follows:

- |                        |                          |
|------------------------|--------------------------|
| -Milvus migrans        | - Pica Pica              |
| -Hawks                 | - Corvus frugilegus      |
| -Accipiter nisus       | - Passer hispaniol       |
| -Hieraetus fasciatus   | - Petronia brachydactyla |
| -Aguilla rapax         | - Petronia petronia      |
| -Agoila chrysaetos     | - Passer domesticus      |
| -Haliaeetus albici     | - Bubo bubo              |
| -Neophron percnopterus | - Asio flammeus          |
| -Aegypius monachu      | - Athene noctua          |
| -Falco pelegrinoide    | - Finch                  |
| -Alectoris chukar      | - Robin                  |

### Reptiles

This region is suitable for reptiles because of extent and rich diversity of habitat and the most important of species include:

- Varanus griseus
- Testudo graecaibera
- Clubber karelin
- Clubber rhodorhachis
- Agamura Persia

### Amphibian

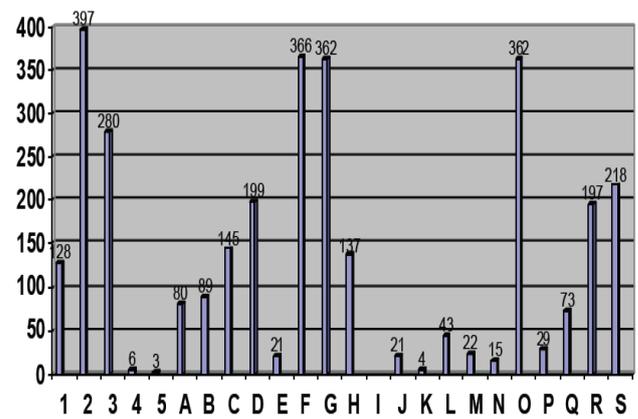
- Rana ridibunda

Other species that are currently existing in the region except Partridge are in the Appendix (II) of CITES convention that includes:

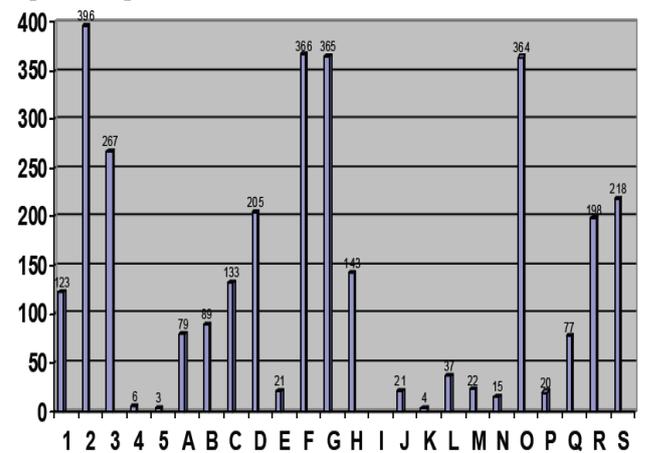
- Canis lupus
- Hawks
- Accipiter nisus
- Hievaetus fesciatus
- Aquila rapax
- Agoila chrysaetos
- Haliaeetus albicilla
- Neophron percnopterus
- Alectoris Chular
- Aegypius monachus
- Falco pelegrinoides

According to data analysis, assessment of alternatives in construction and operation phase has been performed. Interpretation of activities effect shows that negative consequences in construction phase are more than operation and it is anticipated as definite, permanent and direct effects. It should be noted that the non-significant effect in total shows more amount than strategic and important effects. Table 2 and Graph 1 indicate the total impact of activities in construction and operation phase. Interpreted results of the measurement results of influenced environmental parameters reveal that negative effects are greater than influenced positive effects parameters that are mainly permanent, definite and direct that also unimportance of them are significant. Table 3 and Graph 2 show measurement results of influenced environmental parameters in construction and operation phase.

- The lack of waste storage, expedite the collection and adhere 11 kilometers distance of proposed landfill site from (ICAO) International Civil Aviation Organization



Graph 1. Results of activities in the construction and operation phases



Graph 2. Measurement results of influenced environmental parameters in construction and operation phase

Table 2. Results of activities in the construction and operation phases

Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	5	4	3	2	1	Effect
53	15	183	7	11	24	2	12	-	59	181	185	12	77	89	31	54	-	-	96	226	31	Construction
20	14	180	8	11	19	2	8	-	78	181	181	8	122	56	58	26	3	6	184	171	97	Operation
197	73	29	363	15	22	43	4	21	-	137	366	21	199	145	89	80	3	6	280	397	127	Total

Table 3. Results of activities in the construction and operation phases

R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	5	4	3	2	1	Effect
91	24	15	181	7	11	19	2	8	-	81	182	182	8	128	57	58	25	2	6	182	170	98	Construction
107	53	5	183	8	11	18	2	13	-	62	183	184	13	77	76	31	54	-	-	84	226	25	Operation
198	77	20	264	15	22	27	4	21	-	143	265	266	21	205	13	89	79	3	6	267	296	123	Total

## CONCLUSION

Significant adverse environmental impacts of the proposed landfill site are reduced by possible actions. These measures are taken by engineering and management operations include:

- To prevent the devastating effects on Imam Khomeini airport:

As the Imam Khomeini airport is located at a distance of less than 10 km from the landfill, It should be kept in mind that one of the main problems in airports is

the collision of birds with airplanes. Intake of birds into the engine can cause blockage or disruption of air flow into the engine and severe damage to the compressor or turbine leading to the crash. The outcome of forced landing or crash could be exposed safety of employees, passengers, entourages or residents around airports to serious risks, therefore, it should be prepared to meet and repel the birds looking for food in landfills. To repel birds from Imam Khomeini International Airport and surrounding areas, doing the followings are seem to be effective:

- Remove all needed food sources of birds
- Use expulsion techniques, disperse and scare birds by sound deterrents, visual barriers and traps
- Drainage pits and water holes
- Clearing and dredging wetland and streams
- Installing mesh screen on pools
- Prevent egg laying and nests of birds in and around the airport area
- Keep herbaceous plants at a minimum height of 20 cm
- Give priority to cultivating plants without seeds to avoid capture and nesting of birds
- Spraying of collecting waste transfer stations to avoid capture and reproduction of insects, rodents, vermin and stray animals
- Tower installation in areas where migratory birds pass lesser
- Regular and periodic spraying of waste before and during disposal in order to avoid location proliferation and using by insects before burring. Even better to spray on landfill waste covered with soil by safe pesticides to destroy existed insects in the place and avoid them to migrate to a new location.
- Garbage transport trucks in transportation path use cover on their waste to avoid air and path pollution
- Use rare and endangered native plants in planting of greenery to preserve these species and create a place for enthusiasts visit.
- Create landfill gas control system to prevent the reduction or destruction of rooted plants because of gas production in landfill
- The waste collection does not occupy a large area and is segregated in minimum space
- Use herbicides in limited form or if it is possible use safer one for a variety of area plants and animals species
- If it's possible, the quantity of solid waste is minimized by producers or in processing stages
- Use access pavement paths in order to reduce air pollution and easy traffic of vehicles in different stages of operation
- Control the amount of landfill settlement
- Reduce the risk of fire
- Prevent release of gases to landfills
- Prevent construction of heavy structures within the site and surrounding area
- Prevent discharge of dangerous flammable and explosive materials in landfills
- Reduction of covered soil and use it in landfill to prevent aggregation, flourish and multiply insects and rodents
- Preventing the entry of domestic and wild animals and livestock into position
- Prevent illegal recyclers from presence and activity
- fencing of around position
- Use low-noise machinery within position in the construction and operation phase
- Use lightweight and portable fence to prevent the dispersion of light objects such as paper and plastics in space
- Establishment of a medical center within the position for medical emergencies

- The use of heavy machinery with suitable equipment in unfavorable climatic conditions
- Establishment of health washing facilities for waste site employees
- Separately buried of substances that have a deleterious effect when combined together
- Sampling and analysis of dangerous chemical waste entering the landfill to decide for the capacity and possibility of excretion in landfill.

Furthermore, it is essential to present the impact of landfill operations on plant and animal species after the end of operation for identification in other studies and optimal corrective actions.

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