



## ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF SOUTH PARS SPECIAL ZONE (ASSALOoyEH) IN CREATING A STABLE ENVIRONMENT USING THE LEOPOLD MATRIX

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### ABSTRACT

Because of the negative effects of human activities on the environment, particularly in industrial sectors, paying attention to the environmental considerations in designing, implementing, establishing and utilizing industrial and civil projects has particular importance. Accordingly, oil industry, due to its key role in the national economy and global exchanges, and its producing substantial emission from the production stage to the extraction and refining of crude petroleum and consumption of oil products, has a special place. South Pars Special Zone (Assalooyeh) was established in 1998 in Iran, and, according to estimations, the construction of 28 gas phases has been planned. The main part of these establishments has been or is being constructed in Assalooyeh region. In the present article, the effects of the activities in South Pars Special Zone in two marine and terrestrial environments were studied using Leopold Matrix. The results of the matrix of evaluation of the environmental effects indicate that waste oil, the burning of separated gases in burners, the displacement of crude oil, etc. are among the most environmental consequences of the region, paving the way for water, soil, noise, and air pollution and its subsequent consequences. To control and eliminate harmful effects due to petroleum activities in the region, it is necessary to have environmental considerations in the process and to do reforming measures.

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## 1. INTRODUCTION

The action and interaction of natural and man-made systems in an ecosystem can sometimes become a threat to the environment and people. Known as environmental problems, these threats are, wittingly or unwittingly, produced by human factors. Nowadays, the effect of industry and technology as factors of economic growth of every country in general, and growth and development of different regions, in particular, is clear for everyone. However, because each human activity takes place in a natural environment, manipulation of the nature and utilization of its Devine blessings should be accompanied by

thought and sustainable development so that besides rational, appropriate utilization, the ecological balance is preserved, too. Environmental Impact Assessment (EIA) is among the very efficient methods which, by identifying environment and understanding its importance, evaluates the effects of different sections and activities of a project on the environmental components, and, eventually, by taking the results into consideration, suggests some strategies for achieving greater compatibility. This method was devised and explained the late 1960s after the introduction of the matrix method by Leopold as a technique which considers all environmental consequences of every project in a systemic structure, and, after being passed by the National Environmental Policy Act (NEPA), it was explained in the global arena (Hester, 2002; Elgueta, et al, 2018).

Conducting environmental impact assessment for projects is one of the acceptable ways for accessing the objectives of sustainable development. It can serve managers, planners, and decision-makers as a planning tool based on which potential environmental impacts produced due to the implementation of civil and industrial projects are identified and solved by different measures. In the present study, after reviewing different methods of evaluation and comparing different methods using quality assessment criteria, an optimal method was selected for evaluating environmental impacts (Shariat, 1996). The Leopold Matrix method, due to its flexibility, repeatability, multi-dimensionality, the possibility for comparing alternatives and possibility of application in this research, was selected as the most appropriate method to evaluate the environmental impacts in the present research.

## **2. METHODOLOGY**

The present study was conducted using field study and library research in the South Pars Special Zone (Assalooeyeh). The ideas of experts, professors, and the elite were used in conducting the study. As mentioned, for investigating the effects of petroleum activities on the environment and surrounding population centers, the matrix method was employed. In the Leopold Matrix, the list of activities of the project is put in the columns of the matrix, and the list of environmental factors influenced by the project is put in the rows. This list is explicated in two marine and terrestrial environments and is composed of the following steps:

1. Explaining the environment of the region (identifying the environment surrounding the project economically, socially and ecologically).
2. Explaining the activities of the project (attentively and completely identifying the project).
3. Identifying environmental features and effective activities.
4. Identifying different outcomes due to industrial activities.
5. Determining the suggested scenarios and comparing effects.
6. Selecting optimal scenarios.

## **3. RESEARCH FINDINGS**

### **3.1 FIRST STEP: EXPLANATION OF THE INFLUENCED ENVIRONMENT**

The region is placed in a coastal basin and the only surface river of the region is the Gavbandi River of which the water is salty and brine. It contains high levels of chlorine and

sulfate and is very corrosive and depositional. The Special Economic Zone is located in Dashti region, the general flow of groundwater is toward the sea, and its depth in the northern territory is at least 2.5 to 5 meters and in the southern territory is 0.5 meters. In terms of capacity, the territory of the region is placed in 6 main mountain, hill, floodplain, alluvial fan, gravel-bearing plain-range, plateaus, and upper terraces types (Institute of Soil and Water, 1996).

In terms of geological structure, Assalooyeh region is placed in the northern flank of the formations and has the outcrop from young to old and Bakhtiari Formation to Fahlian Formation. The only active fault in the region is the Gavbandi Fault which is placed at a distance less than 5 km northeast of Nayband National Park (Mobaraki, 2000).

In terms of vegetation, the plants of the region are from Leguminous, Palmaceae, Cactaceae, Polygonaceae families, and are categorized in some groups of weeds and some categories of grass and bushes, shrubs, trees, ornamental trees, and fruit trees. It should be noted that the establishment of industries in these regions gradually causes grasslands to face severe loss of quality and degradation. In the plain part, the entering of organic materials from plants of the South Pars, the greater number of individuals working at sea, marine and coastal pollution, and flow of pollutants into the Persian Gulf, oil pollution from tankers, and other activities related to it in Assalooyeh and its surroundings are the main factors leading to the destruction of vegetation (Lar Consulting Engineers, 2005). Studies on the birds of the region indicate that in the target scope, the community of birds has an acceptable diversity. The existence of different habitats on land and water enables a high level of diversity of birds to live in the region (Mansouri, 2000). Located beside one of the most valuable marine habitats of the Persian Gulf, i.e. Nayband Marine National Park and Basatin and Bidkhun Estuaries which serve as biological reserves and favorite places for the spawning of aquatics and their nursery, the South Pars region is an important site.

Sensitive habitats of the region are marked with legal bans and natural constraints. Sea warming; oil pollution; the entering of industrial, agricultural and urban wastewater; diseases; overfishing; habitat destruction, etc. can be among the factors threatening water species in the region adjacent to oil and gas facilities in the region (Owfi, 2004). Assalooyeh can be threatening in two ways. One indirectly occurs due to developmental activities in the region, including coastal construction and the other directly occurs due to the possibility of the spilling of oil, gas and their derivatives into the water of the region (Shaeikhi Narani, 2007). Economically and socially speaking, although before exploring oil and mining operations the study area had only a native population, with the start of the activities of refineries, individuals from different parts of Iran migrated to this region.

### **3.2 SECOND STEP: EXPLANATION OF THE PROJECT ACTIVITIES (INVESTIGATION ON THE STATUS OF THE POLLUTANTS RELATED TO PROJECTS)**

Identifying the pollutants is in fact a primary step for environmental management and provision of them, principally, a quantitative estimation of this pollutants in such projects is

so difficult and a real scope of them cannot be presented, but with a general investigation about predicted activities in the project, the effects of these pollutants on the environment can be predicted.

### 3.2.1 EXPLOITATION PHASE POLLUTANTS

Identifying the pollutants is, in fact, the first step to provide environmental management and measures for tackling the pollutants. It should be noted that oil and gas industries are international ones, and, in the industrial classification, in terms of pollution, they are categorized into the group of large industries with severe pollution. Paying attention to the factors decreasing and removing different pollutions, and also preventing their production in different stages of production, extraction, and refining of oil and gas are possible only by identifying them attentively and planning and managing them appropriately. The pollutants related to utilization phase are explained as follows:

### 3.2.2 AIR POLLUTANTS

In the process of utilizing the projects of gas and oil industries, in different units, air pollutions in many cases cause irreversible dangers. Table 1 briefly mentions air pollutions during the utilization process of oil and gas industries.

**Table 1:** air and gas pollutant emissions during the utilization process

(Source: HSE agenda, General Directorate of Health, Safety and Environment, Ministry of Petroleum, 2005)

Sources of pollution	Available components and emitted pollution	Reason of occurrence
Burners	H <sub>2</sub> S SO <sub>2</sub> NO <sub>x</sub> CO <sub>2</sub> Unburned hydrocarbons aerosols	Due to sour gas burning in the burners
Thermal Oxidizer	H <sub>2</sub> S SO <sub>2</sub> NO <sub>x</sub> CO <sub>2</sub> Unburned hydrocarbons aerosols	Pressure reinforcing stations
Boiler	H <sub>2</sub> S SO <sub>2</sub> NO <sub>x</sub> CO <sub>2</sub> Unburned hydrocarbons aerosols	Due to fuel consumption for thermal power generation) exploitation process(
Gas Turbine	H <sub>2</sub> S SO <sub>2</sub> NO <sub>x</sub> CO <sub>2</sub> Unburned hydrocarbons aerosols	Gas turbines use gas to provide the driving force (in pressure reinforcing stations)
Volatile gases	hydrocarbons HCS	From storage volumes and resources

### 3.2.3 NOISE POLLUTION

Different units of industries, whether in refineries or in petrochemical industries, have noise pollution. In these units, the amount of noise produced is higher than standard levels in such a way that in some units, noise pollution is greater than 80 DB. Considering that the produced noise is higher than standard levels, the safety precautions for the staff, such as the use of safety devices, should be observed. In addition, it should be stated that producing noise pollution in coastal regions prevents aquatics such as fish and sea turtles from approaching shores for spawning.

### 3.2.4 WASTEWATER

Wastewater is one of the most important pollutants in the oil and gas industries. One type of wastewater in different units is the sludge resulting from refinery operations. In a visit to phase I, it was observed that the final wastewater ready to be discharged to surface water contained a lot of oily materials. Heavy metals which are used in the different processes of refineries and petrochemical plants, whether in the form of refinery feedstock

or in the form of products, are among the dangerous pollutants of surface water and groundwater. The high temperature of wastewater compared to water to which wastewater is discharged leads to the lowering of the level of oxygen dissolved in water, and, consequently, results in the reduction of the number of coastal aquatics including Zooplanktons and Indicolars.

The wastewater produced in the process of projects was not a factor distinct from the projects and in fact, it is the consequence of utilization. Not controlling them and not collecting, storing, transporting and disposing of wastewater will cause serious damages to the environment. These damages result in the reduction of the quality of water, air, soil, and biologic resources and human environments.

**Table 2:** producing wastewater and waste products in the utilization phase

Components of environmental pollution	Main sources	Type of waste products
Amines Glucose filtered Sludge, metal sulfides H <sub>2</sub> S metals filters salts and caustics	Bath, and WC wastewater	
Detergents solids BOD Coliform bacteria	Package of wastewater treatment	Domestic wastewater and its sludge
Types of waste BOD	Catering Kitchen and it's martial	food waste
construction and installation of solid material	Construction Waste	Waste products resulting from repair and maintenance
Pathogenic microorganisms Plastics Drug bottles different injection drugs	Clinical and hospital cleaning materials -Blood samples ,etc.	Pharmaceutical and hospital waste
heavy materials and metals· Solvents· Hydrocarbons	Paint, thinner and coatings	painting and coloring materials
CFC,HCFC	Air Conditioning	Coolers and ice makers
Scrap metal· used plastic materials and ...	Used pieces of pipe, Used and useless equipment, Used electronic Cables, Empty storage containers, Second-hand Materials, Second-hand pipes and metals Aluminum cans Used boxes and pallets The remaining wire lines during repairing	Crumbs and waste left
Mineral salts, heavy metals and chemicals· Hydrocarbons· NORMs Polycyclic aromatic hydrocarbons	Separation and sedimentation tanks Storage tanks Drainage and water storage tanks	The residue of the tanks and storage containers
Metals and acids	Transportation	machinery battery

### 3.2.5 HUMAN WASTE

According to the statistics retrieved from gas and oil and petrochemical projects, similar experiences, expert inferences and studies mentioned in the site of equipment of the workshop of the plan of land use in the Pars Special Economic Energy Zone, it is estimated that in the time of utilization, about 60000 workers work in the Special Zone (Rah Shahr Consulting Engineers, Assaloooyeh Comprehensive Project). Considering Iran's per capita waste (0.75-0.80 kg per person per day), the total amount of human waste produced in the Zone will be 45 tons per day. Table 2 displays waste products in the utilization phase and

Table 3 illustrates different kinds of environmental pollutions due to industrial activities based on the degree of importance.

**Table 3:** different kinds of environmental pollution resulting from industrial activities (Torkianfar, 2006)

Kinds of industries	Air pollution	Water pollution	Noise pollution	Wastage
Petrochemical industries	Very high	Very high	High	High
Food Industries	Moderate	Low	Moderate	Moderate
Gas industries	High	High	High	High
Wood Industries	Moderate	Low	Low	High
Paper industries	Low	High	Low	High
Non-metallic minerals industries	High	Moderate	High	High and dangerous
Heavy metals industries	Very high	Very high	Moderate	High
Metal machinery and products	Low	Low	Moderate	Low

### 3.3 THIRD STEP: ENVIRONMENTAL IDENTIFICATION AND EVALUATION

To evaluate the environmental effects, regarding the activities done in the region, two sections of land and sea environments were considered and for each, a matrix was made separately.

#### 3.3.1 IDENTIFYING ENVIRONMENTAL ATTRIBUTES AND ACTIVITIES INFLUENCING AND BEING INFLUENCED BY THE MARINE ENVIRONMENT

In the matrix of the marine environment, considering oil and gas drilling operations and extraction, a set of factors including seawater pollution, air pollution, soil pollution, noise pollution, (in physical factors group), aquatic plants, sensitive habitats (coral reef), the diversity of plant and animal species (biological factors group), and project income, direct and affiliated employment, facilities and equipment, and beauty of landscape (economic-social factors group) are considered as the rows of the matrix in the list of environmental factors, and, to complete the columns of the matrix (the activities done in the sea), oil and gas extraction from wells, separation of oil from gas and water, burning gas, discharging sanitary and gas sewage into the sea, transition of oil and gas onshore, excavation, oil spill, storage and use of chemicals and fuels, and the risk of fire and explosion are considered.

#### 3.3.2 IDENTIFYING THE ENVIRONMENTAL ATTRIBUTES AND ACTIVITIES INFLUENCING AND INFLUENCED BY LAND ENVIRONMENT

In this stage, a list of activities likely to influence and be influenced by environmental attributes and a list of environmental attribute likely to change in the utilization phase are identified using the list of activities and variables of the Leopold Matrix as follows:

##### 3.3.2.1 List of activities in the utilization phase in South Pars Special Economic Zone

The list of activities in the utilization phase in South Pars Special Economic Zone includes food industries, petrochemical industries, wood, and paper industries, metal industries, non-metallic mineral industries, electrical and electronic industries, marine industries, transportation networks, sewerage network, business utilities, and welfare services, and green space.

**Table 4:** effects of industrial activities on the environment

Activity factors	Artificial activities		Natural activities	
	Negative	Positive	Negative	Positive
Food industries		Job creation Population attraction Public welfare	Water pollution Waste and residues Noise pollution	
Petrochemical industries	Negative Vision Noise pollution	Job creation Public welfare Population attraction	Unpleasant odor Creation of waste Air pollution Water pollution	
Paper and wood industries	Flammability stored materials	Job creation Public welfare	Unpleasant odor Creation of waste Noise pollution Water pollution	
Gas industries	Noise pollution Air pollution Soil pollution Water pollution	Job creation Developing chemical industry of the Zone National and local economic development Increase in migration	Severe air pollution Water physical and chemical pollution Hazardous liquid waste Unpleasant odor Destruction of vegetation and agricultural lands	
Metal industries	Noise pollution Unfavorable vision	Job creation Increase in migration Public welfare	Section of hydrocarbons Physical pollution of water Noise pollution Production of solid waste	
non-metallic mineral industries		Job creation Local economic development	Producing dust Disturbing for industries and welfare services Destruction of the natural environment Producing and stockpiling waste	
electrical and electronic industries	Air pollution	Job creation Industry development Public welfare	Noise pollution	
transportation networks	Density of vehicles	Increase in the employment rate	Air pollution Dust Noise pollution	
Sewerage network	Producing unpleasant odor The decrease in land prices	Water supply for green spaces	Reduction of water quality Soil pollution Chemical and toxic water pollution	The flow of surface water
business utilities and welfare services		Job creation Public welfare Increase in land values	Water consumption	
Green space		Increase in public welfare Improving visions flood risk reduction The relative reduction of air pollution and dust Reduction of noise pollution		Stylizing temperature Increase in relative humidity Relative influence of wind blowing Reduction of air pollution Increase in soil permeability Proper drainage of soil Soil quality

### 3.3.2.2 List of environmental factors

The list of environmental factors are

- Water resources: groundwater storage, water balance, water quality;
- Vegetation: pasture, agriculture, woodland;
- Types of pollution include (air pollution, water pollution, noise pollution, and soil pollution);
- Air pollution: carbon monoxide, sulfur oxide, aerosols, nitrogen oxides, hydrocarbons, unpleasant odor;
- Water pollution: biological, chemical, physical and toxics;
- Soil pollution: wastewater, chemicals, waste;
- Noise pollution: physical and psychological ones.
- Man-made environmental factors include socio-economic features, employment structure, industry development, public welfare and income distribution, social structure, vision, and infrastructure.

### 3.3.3 IDENTIFY THE EFFECTS OF INDUSTRIAL ACTIVITIES ON NATURAL AND ARTIFICIAL ENVIRONMENTS

In this stage, using environmental factors and different kinds of activities in the utilization phase of South Pars Special Economic Zone identified in the previous stage, the positive and negative effects of activities of South Pars Special Economic Zone are identified and determined in two natural and artificial environments (Table 4).

### 3.4 FOURTH STEP: ANALYSIS THE CONSEQUENCES RESULTING FROM ESTABLISHMENT OF SOUTH PARS SPECIAL ZONE

In this stage, the evaluation results were identified as indicated in Tables 5 and 6 after scoring, concluding and qualifying the results of the matrix of the most important environmental effects of the Zone in marine and terrestrial environments:

**Table 5:** identifying the degree of importance of the effects of the activities on the environmental factors in the marine environment

Environmental factors	Ranking mean	Importance of positive effects	Importance of negative effects
Soil pollution	-2.1		Highly important
Increasing water in oil	-2.1		Highly important
Seawater pollution	-2.4		Highly important
Unpleasant odor	-2.5		Highly important
Noise pollution	-2.6		Highly important
Aquatics	-1.8		Important
Water plants	-1.7		Important
The value of Aquatics	-1.5		Important
The diversity of plant and animal species	-1.5		Important
Direct employment	0.5	Less important	
Indirect employment	0.3	Less important	
The beauty of the landscape	-1.6		Important
Utilities and equipment	1	Important	

The results obtained from the Leopold Matrix method in evaluating the environmental effects of the activities in South Pars Zone indicate that considering the very important role of the Zone in national economy, it is impossible to stop the industrial activities of the Zone; However, due to the zone's being located in a very sensitive environment with very rare and endangered species, paying attention to environmental considerations is necessary. According



to the results of the Leopold Matrix, the most important negative effects of South Pars Special Industrial Zone on the region are as follows:

- Seawater pollution
- Air pollution
- Noise pollution
- Region's soil pollution
- Threats to the lives of the plant and animal species, and reduction of biological diversity

**Table 6:** Identify the degree of importance of the effects of activities on environmental factors

Environmental factors	Ranking mean	Importance of positive effects	Importance of negative effects
Underground storage	-1.5		Important
Water balance	-0.7		Less important
Water quality	-0.2		Less important
Pasture	-0.7		Less important
Agriculture	-1.5		Important
Woodlands	-0.7		Less important
Carbon monoxide	-0.2		Less important
Sulfur oxide	-1.5		Important
Aerosols	-0.4		Less important
Nitrogen oxide	-0.3		Less important
Hydrocarbons	-1.8		Important
Odors	-2.5		Highly important
Biology	-1.8		Important
Chemical	-2.3		Highly important
Physical	-0.8		Less important
Psychological	-0.7		Less important
Wastewater	-3.3		Highly important
Chemicals	-2.3		Highly important
Waste	-2.5		Highly important
Employment	4.7	Highly important	
Industry development	2	Highly important	
Public welfare	3.2	Highly important	
Social structure	1.8	Important	
Infrastructure	1.7	Important	
Vision	0.4	Less important	

### 3.5 FIFTH STEP: DEVELOPMENT OF EVALUATION SCENARIOS FOR THE EFFECTS OF SOUTH PARS SPECIAL ECONOMIC ZONE

After evaluations in the previous steps regarding the effects of the Zone on environmental factors, in this step, using the results of the investigations, three alternatives are selected and investigated for comparing the effects of establishing the Zone in each of them. These alternatives are compared to one another based on different criteria such as effects on air condition, quality, and quantity of water, effects on employment structure and economic dimensions, population structure and social-population dimensions, industry development in the region, etc. The three scenarios are as follows:

The first scenario: The Special Economic Zone Development Plan should be executed completely.

The second scenario: The Special Economic Zone Development Plan should remain in the status quo, it should be executed deficiently.

The third scenario: The Special Economic Zone Development Plan should be executed based on reformative suggestions.

### 3.6 SIXTH STEP: SELECTION FOR THE OPTIMAL SCENARIO

After evaluating and comparing the effects of the Zone in each of the three alternatives, in the sixth step, the best alternative is selected. Among the alternatives, the reformative plan is selected as the optimal alternative considering the positive effects it can exert on employment structure and public welfare as well as the least degree of effects and negative variations it may impose on the environment. Some suggestions are selected and mentioned in the conclusion section of the article.

**Table 7:** Evaluation of the effects of the South Pars Special Economic Zone Development Plan (based on the results of the evaluation of matrices).

Items	Completely executing South Pars Special Economic Zone Development Plan	Deficiently executing South Pars Special Economic Zone Development Plan	Reformative Development Plan
Emissions of air pollutants	High	High	Moderate
Creation of unpleasant odor	Very high	High	Moderate
Changes in plant diversity and decreases in pastures	Moderate	Low	Low
Reduction in groundwater reserves	Very high	Moderate	Low
Reduction in water quality	Very high	High	Moderate
Reduction water used in industries	High	High	Moderate
Increase toxic hazardous materials	High	High	Moderate
Physical pollution of water	High	High	Moderate
Accumulation of solid waste	Very high	High	Moderate
Noise pollution	Moderate	Moderate	Low
Increase in employment levels through new opportunities in the region	Moderate	Low	High
Changes in the public welfare of the region	Moderate	Low	High
Changes in the population density or growth in the region	Very high	Moderate	High
Increase in housing demands	High	Moderate	Moderate
Optimal use of space	Moderate	Low	Very high

## 4. CONCLUSION

The introduction of industry into Assaloooyeh Region has caused serious damages to the environment including damages to the soil, water, and air. Considering the very important role of the region in the national economy, it is impossible to stop the industrial activities of the region; however, due to its establishment in a very sensitive environment with very rare and endangered species, it is vital to pay attention to the environmental considerations. In addition, due to air, soil and water pollution resulting from the establishment of the Zone and considering the direction of wind blow which is toward the villages of Akhanad and Chah Mobarak, the windflaw drives the pollution resulting from this installation toward villages, and this causes damages to the gardens and farms of these villages, in such a way that according to the people of these villages as well as the statistics issued by the Agricultural Jihad of the region, tomato production which is the main agricultural activity of the region has reduced from 32 tons per hectare in the years before the establishment of the Zone (1996) to 5 tons per hectare at the

present time.

According to the results of the evaluation of the environment, the most important petroleum activities resulting in negative consequences are as follows:

- Risk of fire and explosion;
- Oil and gas spill;
- Burning excess gas at the burner;
- Radioactive substances evaporated from heavy metals which are produced or used during extraction and refining gases as the feedstock of the petrochemical industry are among the factors affecting aquatics and humans.

Accordingly, the most important negative consequences of South Pars Industrial Zone are as follows:

- Seawater pollution
- Air pollution
- Noise pollution
- Region's soil pollution
- Threats to the lives of plant and animal species and the reduction in biological diversity

Considering that the environmental effects resulting from industrial activities are directly related to industrial activities and are not considered as dependent effects, and as mentioned in the documents of the principle of environmental protection, now, considering the degree of environmental pollution in the region (the results of the Leopold Matrix), after 10 years since the beginning of industrial activities in this area, not only have the principles of environmental protection not been followed, but the process was also reverse and destructive. The results of evaluation of the environmental effects indicate that considering the fact the reformative plans can have positive effects on employment structure and public welfare while exerting the lowest degree of effects and negative changes in the environment, such plans can reduce the environmental consequences of the region.

Finally, considering the shared role of different Persian Gulf countries in creating pollution in the Gulf, and the environmental protection of the region, it seems necessary to implement coordinated measures including study and research activities, protection, and implementation, cleaning, etc. to solve environmental issues. Therefore, by adopting the aforementioned environmental considerations, in addition to realization of the objectives of national development, job creation, and the establishment of infrastructures, the implementation of the project can follow other objectives the most important of which are as follows:

- Preventing improper distribution of industrial plants in natural environments and agricultural fields, and preventing the disturbing of environmental balances, expansion of pollution, destruction of natural resources and land use transformation in urban and rural regions.

Logical establishment of different industrial groups in proper spaces for each group of industry and proper utilization of lands with the purpose of achieving an optimal model of land use and infrastructural facilities in line with the purpose of sustainable development.

## 5. SUGGESTION

The approach suggested in this project is creating a cleaner product-based environmental management system. According to a definition of this system, the continuous application of the

comprehensive environmental strategy of preventing in processes, products, and services are identified as three continuous, preventing and comprehensive parts for increasing efficiency and reducing human and environmental threats.

The priorities of this type of management considered as the merged section of production and process are suggested and advised as follows:

- Preventing pollution through sources of pollution
- Recovery and recycling of lesions and waste
- Proper and principled waste disposal
- Filtration of pollutants

The environmental management system must be continuously promoted and improved, and, in some parts of the system, some measures must always be considered to eliminate the weaknesses and improve the status quo of project activities. Attempts must be made to use the best available technologies with the objective of using technical knowledge; improving technology; reducing waste; achieving high productivity; and having less energy consumption, less emission of pollutants, optimal methods of wastewaters and optimal methods of waste disposal.

To realize the environmental management system with the aforementioned objectives, the following measures should be prioritized:

- Protecting and monitoring the quality of surface water resources in identified stations.
- Protecting and monitoring the quality of underground water resources in identified stations.
- Monitoring noise pollution in the described area.
- Monitoring soil pollution and comparing it to the state of soil before performing the project.
- Specialized, semi-specialized and general training program.
- Developing a Comprehensive Solid Waste Management Plan in the industrialized area of the region.
- Conducting painstaking studies about the region's environment including:
  - Precise identification of the aquatic communities around the region and determination of the situation of marine animal and plant colonies;
  - Evaluation of the degree of sensitivity of the marine environment to marine activities;
  - Studying the native and immigrant birds of the region and its wildlife and vegetation.
- Reinforcing the natural environment of the region with expansion of green space by planting native species and compatible ones

The environmental management system should be consistently improving and advancing, and some measures should always be applied in some parts of the system to improve the status quo and sub-activities of the project.

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