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Environmental Impact Assessment of an Iron and Steel Factory in Kurdistan, Iran

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ABSTRACT

The environmental impact assessment (EIA) process, according to several international standards, should identify as many environmental aspects as possible in project appraisals. The Kurdistan Iron and Steel Factory (KISF) proposed to expand its existing plant to cater the higher demand of downstream industries. The total capacity of the expanded plant will exceed 650,000 tons/year, thus requiring an EIA. This paper describes relevant aspects of the KISF manufacturing process, and the steps taken to fulfill EIA requirements. In the first stage of the EIA, we collected qualitative and quantitative data with regard to the physical-chemical, biological, and socio-economic environments. Then, we assessed the impacts of different activities and considered a range of effective practical approaches that could be taken to prevent and control adverse impacts. We also describe the actions to be executed and the environmental monitoring plans adopted.

Introduction

The Environmental Impact Assessment (EIA) is a formal process for predicting how an industrial development or construction project will affect natural resources such as water, air, land, socioeconomic resources, and wildlife. The aim of an EIA is to ensure that all potential impacts are identified and addressed early in the project's planning and design stages. Having acquainted themselves with the conclusions of an environmental impact assessment, project planners and engineers can shape a project so that its benefits can be achieved and sustained without causing adverse impacts [1]. The environment impact assessment process was first introduced with the purpose of identifying and evaluating all potential beneficial and adverse environmental impacts of development projects by taking into account environmental, social, -cultural, and esthetic considerations. After predicting potential impacts, the EIA identifies measures for minimizing these impacts and suggests ways to improve the project's viability [1]. The iron and steel industry is a vital basic industry because of the high demand for iron and steel by downstream industries. Most iron and steel production uses steel scraps as the major raw material. Recycling steel scraps reduces use of imported pig iron produced from natural iron ore. However, the demand for iron and steel by downstream industries has increased in recent years and now far exceeds Iran's intermediate iron and steel production capacities, which has led to increased imports of intermediate products [2].

Project Description

The Kurdistan Iron and Steel Factory (KISF) for which we conducted this EIA is located on the 20 km-long Ghorveh-Sanandaj Road. The total steel

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production capacity of the plant is about 650,000 tons/year, a level for which an EIA is required. The

The project has two types of furnaces-blast furnaces (BFs) and basic oxygen furnaces (BOFs)-as well as bunkers, a cooling system, a materials handling system, and an air pollution control system.

Description of the Environment

Physical Environment

The KISF plant, located on the 20 km-long Ghorveh-Sanandaj Road, owns a property area of 100 hectares. In the surrounding area is a residential area with a small population and the nearest village (Karimabad) is 2.1 km away.

On the north side of the factory is the Telvar River. Kurdistan experiences the influence of southwest winds, the average temperature is 12 °C, the average rainfall is 341.5 millimeters, and the plant growing season varies from 6 to 7 months.

Biological Environment

The area studied includes planes, mountains, wetlands and riverine land, and supports a diversity of wildlife including mammals, birds, amphibians, and reptiles.

Socioeconomic Environment

Total population of Kurdistan is 1,441,803, half of which are women. The annual population growth rate is 3.3 percent and the unemployment rate is about 16 percent.

Material and Methods

In this project we used two methods for assessing impacts—the checklist and the matrix. Checklists are standard methods for organizing information and ensuring that no potential impact is overlooked. Matrix methods identify the potential interactions between various project actions and the environmental parameters and components. Our project activities list included 12 activities in the construction period and 12 in the exploitation period. new building and utility system will be constructed on company land adjacent to the existing plant.

Our list of environmental components included 12 physical parameters, 4 biological parameters, and 13 socioeconomic parameters that might be affected by these activities. Positive and negative impacts were scored from +1 to +5 and from −1 to −5, respectively.

We produced a matrix of potential interactions by combining these lists, placing one on the vertical axis and the other on the horizontal axis. First, we assessed the impacts using a checklist, then followed with the matrix method.

We chose two alternatives:

1 -No project

2 - Project

Finally, we selected the optimum alternative, based on the data shown in **Table 1**.

Results

Significant impacts and control measures

Air pollution

The predominant air pollution generated by the KISF is dust from different parts of the factory, which is generated during transportation processes, material loading and evacuation, agglomeration, operations of the BFs and BOFs, and the continuous casting machine that must be fitted with a dust collector such as a bag filter and cyclone. In order to assess the extent of dust dispersion, we prepared a Gaussian dispersion model for all dust-producing resources, which were designated as either having control equipment or having no control equipment. When we used dust control systems, dust settlement was about 1 μg/m^3, which is 35 times less than the ambient air standard. When we used no dust collector, dust settlement was about 700 μg/m^3, which is 9 times higher than the ambient air standard. It is obvious that the utilization of a control system is necessary.

Table 1. Optimum alternative

Alternative	Construction and exploitation period							
	No control measures				With control measures			
	Positive impacts	Negative impacts	Total score	Positive impacts relative to negative impacts	Positive impacts	Negative impacts	Total score	Positive impacts relative to negative impacts
With project	9581	7164	2415	1.34	9581	3698	5880	2.6
Without project	2396	9252	6857	0.26	2396	9253	6857	0.26

Water pollution

Water pollution resources in the KISF may be divided into two types-sanitary and industrial wastewater. Industrial wastewater (1450 m^3/hr) includes water from the furnace cooling activities, the continuous casting stage of operation, and the slag cooling recycling system prior to the water being purified. Sanitary wastewater (137.5 m^3/day), from the designed plant wastewater treatment plant, will be purified by the activated sludge method.

Solid wastes

As shown in **Table 2**, KISF-generated solid wastes can be divided into three types: residential, process, and slurry wastes."

Environmental mitigation can often result in reduced project costs and lower community costs when incorporated as a fundamental aspect of project design rather than as an add-on exercise. The mitigation and enhancement measures identified should be capable of being delivered in a cost effective manner and thus be fully justifiable.

Environmental Management Plan (EMP)

According to standards, an Environmental Management Plan (EMP) should be a fundamental aspect of all project specifications which sets out the actions for monitoring and evaluation of the project during implementation or construction and operation.

For the KISF, we adopted a comprehensive environmental management plan for the protection of the environment. In addition to pollution control, the plan consists of the measures described in the next section.

Conclusion

The Kurdistan Iron and Steel Factory proposed to enhance its plant production capacity of pig iron from 70,000 t/y to 570,000 t/y, as well as producing 650,000 t/y of steel.

1. The enhanced capacity will be achieved mainly by utilization of existing surplus capacity, as well as incorporating process improvements and modernizations.
2. The iron industry has been given a national priority to overcome shortages of iron throughout Iran. Higher production rates have the potential to curtail export levels of iron ore and steel.
3. This industry is committed to practicing the concept known as "reduce, reuse, and recycle". All cooling water is completely recycled in the system.
4. This industry does not produce any toxic products and has no significant adverse effect on the quality of the land, water, or air. The industry has taken all necessary preventive measures to mitigate even the smallest effects that may be caused by industrial activities.
5. There are no protected forests, archeologically important structures, or other sensitive locations in the vicinity of the factory except the Telvar River.
6. The environmental management plan is considered to have been adopted by the industry to protect the environment and the advantages of the industry.

Table 2: Types of Kurdistan Steel Factory solid wastes

Type of Solid waste	Amount	Landfill method
Residential Waste	500 kg/day	Sanitary landfill in northwest of factory
Pig iron wastes (developed phase)	190 ton/day	Usable in Melting Unit
Iron ore wastes (developed phase)	152 ton/day	Usable in Agglomeration Unit
Coke (developed phase)	163 ton/day	Usable in Agglomeration Unit
Slag (developed phase)	1276ton/day	Usable in Cement and Road Industry
Steel wastes (developed phase)	86/6ton/day	Usable in Steel Production Unit
Dust (developed phase)	280 ton/day	Usable in Agglomeration Unit and Sanitary Landfill
Iron ore wastes (existence phase)	27459 ton	Usable in Agglomeration Unit
Coke (existence phase)	29557 ton	Usable in Agglomeration Unit
Slag (existence phase)	113418 ton	Sell to Cement Factory
Pig iron wastes (existence phase)	34369/9 ton	Sell to Isfahan,Ghom, Tehran (melting unit)
Dust (existence phase)	792/5 ton	Usable in Agglomeration and Blast Furnace Unit
Wastewater treatment Sludge	30 kg/day	
Oil and Grease	130 kg/day	

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