

Assessment of Pollution Load from the Industrial Sector in Jordan

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Abstract

Industrial pollution is an area of growing environmental concern in Jordan. Although not a highly industrialized country, several major industries contribute to the pollution problem, especially in the central region. In this investigation, Industrial Pollution Projection System (IPPS), which was developed by the Infrastructure and Environment Team of the World Bank, was used to estimate annual pollution load, on mass basis, resulting from industrial activities in Jordan. To achieve such goal, on the national level, a detailed description and analysis of all industrial activities in Jordan are presented and discussed in this paper. The main outcome of this study is that the industrial enterprises' pollution pressures by far exceed those generated by the micro enterprises in all regions. The pollution caused by micro enterprises is the worst in Zarqa, which is mainly due to the concentration of such industries in this region and absence of sound environmental management as well as lack of enforcement of pertinent environmental regulations. From the cumulative ranking of the pollution load, it was found that Amman area, with the highest concentration of pollutants, ranked first and followed by Zarqa, and Irbid. But the issue of industries being registered in Amman Chamber of Industry and operating in other governorates caused some distortion in obtained results. Removing the effects of such industries, especially large ones, would reduce pollution indicators significantly within Amman region.

Keywords: *Environmental analysis, Industry, Pollution load, Pollutants projection, Environmental modeling*

1. Introduction

Jordan is classified by the World Bank as a "lower middle income country" which its main economic activities are agriculture; light manufacturing, mining and quarrying, commercial services and tourism. In 2006, the average gross domestic product per capita was about US\$ 2500; inflation rate was approximately 6.25%; and unemployment reached 12.5% of the total workforce [1].

Jordan's industrial sector has been affected the most by the economic and technological changes that the country has witnessed during the past three decades. For example, in 1970, the number of registered factories was less than 500, and most of these were small, family owned enterprises. Thirty years later, the total number of operating industrial firms exceeds 20,000 establishments, the majority of which are located in the central and northern regions of the Kingdom with large industries accounting for less than 2% of the total. The total labor force presently engaged in industrial activities is estimated to be about 190,000 employees, which represents approximately 15% of the total workforce in Jordan. The value added by this sector represents over 20% of the total GDP at market prices [2].

The industrial sector in Jordan consists of a heterogeneous mix of manufacturing and conversion activities. These ranges from transforming raw materials into refined raw products, such as phosphate, potash, cement, plastics and glass, to those with highly finished end-products, such as food processing and chemical industries. Unfortunately, many processes are employed, in order to produce various products, with insufficient technical understanding. Furthermore, most of the factories established during 1980s have production capacities far exceeding those required to satisfy the local market, because their prime aim was to export most of the production to neighboring Arab countries, mainly Iraq [3]. But due to armed conflicts in the region and the general instability in Iraq, and within the region, these industries are operating at a proportion of the original capacity. Equally important is the common practice, in Jordan, of importing used or written-off machinery, plants and even spare parts from Europe and Southeast Asia. Hence Jordan abounds with relatively inefficient equipment and vehicles. There is also ignorance among the management of companies and organizations, in various sectors, concerning the importance of clean production, energy thrift and environmental protection as well as the economy's vulnerability to the availability of commercial energy sources [4,5].

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