

## **ASSESSING THE LEVEL OF ENVIRONMENTAL AWARENESS OF THE WORKERS ON ENVIRONMENT IN THE INDUSTRIAL CITIES OF RIYADH, KINGDOM OF SAUDI ARABIA<sup>1</sup>**

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### **Abstract**

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The industrial cities are one of the most important sources of environmental pollution in the Kingdom of Saudi Arabia. Chemical, cement, pesticides, steel mills and iron, lead smelters, tanning and other multiple hazardous industries exist in clusters in the industrial cities of Riyadh. In the general system of the kingdom, they have been classified as dangerous as they pose negative effects on the environment and human health. This study aims at assessing the level of the environmental awareness among the employees of industrial cities and their knowledge on the environment they work in. The ultimate objective of study is to help in preserving the environment and provide safe environment to the workers to avoid industrial risks and to ensure application of the occupational health and safety measures. Data was collected through personal interviews with a simple random sample of 321 workers, engaged in the multiple disciplines and they represent the real diversity existing in the industrial cities' workforce. The results showed that 31% of the respondents had good level of environmental awareness, while 60% were found with weak level of environmental awareness and 9% respondents had an average level of environmental awareness. The results of the study showed that there is a correlation between the educational level and age of the respondents and their level of environmental awareness. The study established the need for raising environmental awareness among the workers in the industrial cities through implementation of awareness campaigns. Initiatives on environmental education can be taken by organizing lectures, seminars and training courses. The development of signs and distribution of publications that could enhance the awareness level on environment among the workers should be used. It is important to make the workers aware of risks involved at their workplaces, risks of environmental hazards and health issues that may result from manufacturing processes.

*Key words:* industrial pollution, occupational health, safety, environmental issues, awareness, extension education.

### **Introduction**

Today in the kingdom of Saudi Arabia and rest of the world environment suffers from many ail-

ments and faces numerous problems that affect the lives of human beings. They live and rely on the sources of subsistence, survival and sustainability in the framework. The environmental pol-

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lution causes the most dangerous threats to life and prevents the ability of the environment to aid in the continuation of life and its renewal to meet human needs.

The twentieth century has witnessed an increasing awareness on human rights, problems of the environment, concerns over environmental pollution and strategies to limit the environmental degradation. Human activities disturbed the natural ecosystems and this in turn posed environmental threats to human life and survival, suggesting that the human is the primary contributor to disorder of nature (Elguban, 2006). Since the ambitious development over the past century started, the damage to the natural balance of the planet is equal to natural changes that occurred over millions of years. In addition, an increase in population coupled with an increased risk of environmental pollution, has lead to a major crisis towards agricultural production causing drought and hunger, as observed in the world in general, and third world countries or the so-called developing countries in particular.

Another problem linked to environmental pollution could be the release of energy, radioactive pollution and the erosion of the ozone layer, which arise as a result of the increased concentration of greenhouse gases (carbon, sulfur and nitrogen), which in turn led to the contamination of rain and snow falling on the ground, as well as the high temperature of the earth's crust, which threatens the melting of north ice poles (Yunis, 1999).

Right from the beginning of the human activities, a permanent conflict between environment and man remains. The environment in ancient times used to represent all that was unknown to man at that time. His main concern was his fears about the evil wind, volcanoes, earthquakes and predators so that he can sustain himself. However, with the passage of time, the situation changed where the human beings became the source of danger to the environment due to factors like: the technological and industrial progress and the increase in

population and the consequent depletion of natural resources (Aba Al-Khail et al., 2005).

Environmental problems prompted both the world's scientists and thinkers to warn mankind than to wait for the future dangers. Environmental scientists and activists stress upon the human beings to make radical changes in their activities on the earth and life on its surface (Elnajdi, 2002). They expect the global community to contribute to the diagnosis and treatment of the environmental crisis through the educational system. Education is an important tool to change human behavior and make the desired change in the reconstruction of environmental balance (Rabie, 2006). In spite of the presence of a strong relationship between environmental policy and laws; social change and development, yet their influence on the environmental awareness of the population in general and workers in the industry, in particular seems negligible. Environmental pollution has become of interest to all those interested in nature and natural resources (Elturaf, 2008). In the situation, it seems imperative to assess and measure the environmental awareness among the workers in the industrial cities, which is the subject of this study. The study aims at assessing the environmental awareness level of workers and to determine their knowledge on the occupational health and safety regulations followed at their work places. Present study is an endeavor to create awareness and ensure the working environment of workers safe and healthy as desired by the rules and regulations of the kingdom.

### ***Research Objectives***

The study aims at providing policy recommendations to raise environmental awareness among workers in the industrial cities, through the following objectives:

- To measure the level of environmental awareness among the workers in the industrial cities in the city of Riyadh.
- To assess the knowledge of the workers in

the industrial cities of the province on the working environment at their workplaces and occupational health and safety.

- To identify the personal qualities of workers in the industrial cities (age, educational level, nationality, previous work, training courses) and its relationship with their level of environmental awareness.

## Materials and Methods

### *The study area*

Industry in the city of Riyadh is one of the largest sectors, where the industrial parks in the short period of time and the city witnessed a revolution in institutions and corporations. Growth rates in the city of Riyadh are rising more than in other cities of the Kingdom due to the presence of political capital, trade and financial organizations. Several factors have contributed to the economic capacities of the city of Riyadh, including population growth and the growth of employment opportunities, which in turn support the demand for goods and services in addition to its location. It has become hub and center for the financial institutions including headquarters of the commercial banks operating in the country and the Saudi Arabian Monetary Agency, and Capital Market Authority, in addition to the general departments of the government lending funds etc. These factors and economic sectors of industry made the significant contributions towards the development of the city during the past three decades. The private sector played an effective role in the development of the industrial sector and increasing the number of factories.

### *An over view of the workforce in Riyadh*

The city of Riyadh has a reasonable size of the workforce of 1772833 individuals according to the indicators in 1430. About 996.3 thousand Saudis including 832 thousand males and about 164

thousand females of 15 or older were also the part of the kingdom's workforce in 1428. Out of the workforce, roughly, 1.5 million Saudis were with age 15 or more and about one million were males.

About 688 thousand, out of the population of Riyadh, are not the part of the labor force, are involved in domestic activities, educational institutions, and retirees and a significant and major portion of this population of Riyadh not making labor-force at the age of 15 years, and over were students.

As for the distribution of the Saudis in the Riyadh region is concerned, according to major groups of the profession, the top 2.1 million employees out of 668 thousand were employed in services and about 459 thousand working professionals were assisting in the basic engineering and about 215 thousand working professionals are associated with scientific and technical, humanitarian disciplines. About 211 thousand are working in the marketing business. The rest of the workforce is involved and distributed in other professions including management, businesspersons, clerical occupations, agriculture and animal husbandry, fish and chemical industries.

The impact of demographic changes in the city of Riyadh becomes clear due to an increase in population growth and the transition economies, traditional trade to the economies based, manufacturing industries, in addition to the growth and expansion in the services sector led to radical changes in the social sphere and in the structure and size of the labor force.

### *The study sample*

The population of the study consisted of the labor force in the first and the second industrial city of Riyadh. A stratified random sample consisting of 321 was drawn. Workers were clustered based on nationality, profession and nature of the work which was divided by occupation as follows: Owner of the factory; 2. Administrative position;

3. Technician; 4. Engineer; 5. Factory worker 6. Other (Tables 1 and 2).

### Data collection

Data were collected by conducting personal interviews using the questionnaire as a tool for gathering information that covered all the axes of the study. The questionnaire was designed to gather information on the behavior and environmental awareness among workers in the industrial cities. It consisted of 53 questions to illustrate the professional, economic aspects, and educational status, career of the respondents. It was designed to

**Table 1**  
**Division of workers according to their nationality**

Number	Nationality
1	Gulf
2	Arab-African
3	Arab Asian
4	African
5	Asian
6	European
7	US

**Table 2**  
**Division of workers according to their status of work in accordance with the map of the industrial city**

Number	Nature of the work
1	Food industry
2	Medical and health industries
3	Clothing industries, textiles and leather
4	Upholstery and furniture industries
5	Industries, paper and cardboard and advertising
6	Chemical industries
7	Building Materials Industries
8	Plastic Industries
9	Industries Nafisa (Jewelry)
10	Aluminum industries and household utensils
11	Industries, electrical appliances and accessories
12	Industries pipes, pumps and pipes
13	Metal industries, foundries and heavy vehicles

collect the general information about the environment and to measure the environmental awareness level; occupational health and safety of the worker at the work place, and how the work environment influences the workers. The questionnaires were distributed among the 321 workers engaged in the multiple disciplines and represent the real diversity existing in the workforce available in the industrial city.

### Analysis of data

Descriptive statistical methods such as frequency distribution, means and standard deviation as well as the simple correlation coefficient were employed for data analysis.

## Results and Discussion

### I. The Personal Qualities of Workers in the Industrial City

#### Ages of respondents

The study showed that out of the sample population of 321 workers, 26.8% were under the age of 30 years, and the workers with the ages from 30 to younger than 40 years, accounted for 45.2% of the total working population and this class represents the largest number of workers working as technicians, security guards and the administrators etc. Workers aged between 40 years to less than 50 years, accounted for 17.8% of the total workforce whereas only 10% of the workers are with the age over 50 years with the lowest proportion of the total workforce and most often factory owners and managers make up this group (Table 3).

#### Years of experience for workers

The study showed that workers with 10 to 20 years experience accounted for 45.6%; about 45.2% workers were with less than 10 years experience and only 9.3% workers had spent a period of 20 years or more at their workplaces (Table 4).

### ***Educational level of respondents***

As regards the educational level of respondents, the study revealed that 6.0 % workers were illiterate and only 6.0% could read write. Both of these categories accounted for the lowest in the industrial city. The workers with the middle-education are 43.9% being the highest in percentage. Workers with secondary education accounted for 25.5%. Workers with university education (undergraduates) in the industrial city are 18.1%, and only 5% are with higher education (postgraduate) and holding university degrees (Table 5).

### ***Nationality of the respondents***

The study also accessed the number of workers based on their nationality. The study revealed that the biggest proportion of workers comes from Asian (Indian, Bangladeshi, Pakistani, Afghani, Nepalese, and Filipino) origin and accounted for 78.8%. Arab African (Egypt, Sudan, Algeria, Somalia) were about 7.2%. Workers from Asian-Arab (Jordanian, Syrian, Lebanese, and Palestinian) origin make up 5.9% of the workforce. Workforce from gulf (Saudi Arabia, Kuwait, Qatar), occupies the fourth place being 5% of the total respondents; they were factory owners, investors and managers, and finally workers with African citizenship accounted for 10% (Table 6).

### ***The profession of the respondents***

Based upon their occupations, the workers have been placed in six categories. About 2.5% workers are the owners of factories, one person or group of partners can own the company and the Engineers compose 4% of workforce. The workers in the workforce holding the administrative positions are about 7.2%. Technicians make 9.7% of the workforce. Being the highest in the workforce, the workers accounted for 74.7%. The category includes the factory and the general workers associated with the wide range of industries (Table 7).

**Table 3**  
**The workers' age**

Age group	Frequency	Percent
Less than 30 years old	86	26.8
From 30 to younger than 40	145	45.2
From 40 to 50	57	17.8
50 and larger	33	10.3
Total	321	100.0

**Table 4**  
**The years of experience working in the industrial city**

Years of Experience	Frequency	Percent
From 10 to 20 years	146	45.5
Less than 10 years	145	45.2
More than 20 years	30	9.3
Total	321	100.0

**Table 5**  
**The educational level of workers**

	Education	Frequency	Percent	Cumulative percentage
1	Intermediate	141	43.9	4.51
2	Secondary	82	25.5	76.9
3	Academic	58	18.1	95
4	Primary	20	6.2	7.5
5	Post graduate	16	5	100
6	Illiterate	2	6	6.0
7	Reads and writes	2	6	1.2
	Total	321	100	

**Table 6**  
**The nationalities of the workers**

Nationality	Frequency	Percent	Cumulative percentage
Asian	253	78.8	100
Arab-African	23	7.2	12.1
Arab Asian	19	5.9	18.1
Gulf	16	5	5
African	10	3.1	21.2
Total	321	100	

### *Nature of the work*

The study revealed that industries have been set up systematically in the industrial cities and map of this division shows that industrial plants have been grouped depending on the activity of the plant, as shown in Table 8.

The division's approach is used in the public system for the environment and the classification of projects of various kinds based upon the level of environmental impacts expected from these projects and they are divided into three categories as follows:

- About 26 % Industrial Plants and Factories with limited environmental impacts;
- About 37% Industrial Plants and Factories with significant environmental impacts;
- Some 37% Industrial Plants and Factories with serious environmental impacts.

The study shows that 37% of the workers are employed by the factories, placed in the third category that causes a serious impact on environment and includes foundry iron and metal industries; factories for heavy pipes and pumps, factories; plants for chemicals cement, and building materials, etc. These industries hire 37% of the total number of employees. Significant but medium environmental impacts are caused by the second category of industries and factories. These industries deal in aluminum and plastic, clothing and textiles, furnishings, furniture and electrical appliances. Third category, accounts for 37% of the workforce. The factories placed in the first category pose limited impact on the environment and include light industries producing food, health and medical products employing 26% of the labor-force.

## **II. Commitment to Occupational Health and Safety Working Procedures**

The survey shows the commitment of staff and their knowledge on the procedures and principles of occupational health and safety. These features

**Table 7**  
**The respondents' career**

Profession	Frequency	Percent	Cumulative percentage
Factory workers	243	74.7	99.1
Technicians	31	9.7	19.3
Administrative	23	7.2	9.7
Engineers	13	4	23.4
Factory owners	8	2.5	2.5
Other	3	0.9	100
Total	321	100	

**Table 8**  
**The nature of the activity of plant**

Nature of the activity	Frequency	Percent	Cumulative percentage
Industries dealing with pumps and pipes	40	12.5	88.8
Medical and health industries	36	11.2	16.5
Metal industries, foundries and heavy vehicles	36	11.2	100
Plastic industries	34	10.6	57
Industries, electrical appliances and accessories	26	8.1	76.3
Chemical industries	25	7.8	40.8
Aluminum industries and household utensils	24	7.5	68.2
Upholstery and furniture industries	20	6.2	27.7
Building materials industries	18	5.6	46.4
Food industry	17	5.3	5.3
Industries, paper and cardboard and advertising	17	5.3	33
Apparel and textile industries	16	5.0	21.5
Industries nafisa (Jewelry)	12	3.7	60.7
Total	321	100	

lead to their protection, reduce the risks involved in using the equipment, and reduce the dangers of the machinery they work on. Such facilities prevent accidents, reduce the incidences and provide safe professional working environment, which helps workers remain safe at their workplaces. About 55% workers abide by the rules and regulations of occupational using protective clothing and safety devices being in the factory whereas 19% of workers do not follow occupational health and safety and use ways and means of safety; however, only 38% use protective clothing and follow the safety rules at the workplace at times when it necessary to do so. When staff and workers were asked about awareness about the safety and occupational health procedures, only about 48% were familiar with such procedures and principles while 20% of the respondents were quite ignorant; whereas 32% workers did not respond to this question.

#### ***Awareness about the risks of industrial environment***

In the study it was observed that 63% workers were eating their meals within the manufacturing area of the industry where as 18% were eating without the consent of their employers. It is very discouraging to note that 62% were washing their hands from the pond inside the industrial plant being the supporters of this idea whereas 29% workers did not support this idea. When workers were asked about washing hands from outside the industrial plant, about 52% workers were the supporters of this idea whereas 27% remained non-supporters. About 54% workers had the knowledge of alerts inside the plant whereas 18% workers were not familiar with the alerts. As regards the knowledge of all risks involved within the industrial plant, 50% knew about the risks and dangers whereas 26% were found ignorant. More than half (57%) of the workers knew about the safe places within the plant and emergency exits in case of any risk

or emergency, whereas 41% workers did not know about these.

### **III. Measuring the Risk of Workers Affected by Industrial**

The study showed that workers were affected by the risks of their surroundings in the industrial cities. The surroundings at the workplaces had effects on the workers' productivity. They did receive occupational injuries or were suffering from occupational diseases that could be chronic or temporary, including even workers were exposed to the disability in severe cases.

1. It is therefore important to know the influential and the degree of impact on the Group, and it will be recognized first on the most important influences and the proportion of affected workers in the industrial cities of where they are exposed to varying degrees of vulnerability, whether high, medium or low, for example, the proportion of those who are exposed to fall or slide and impact and untidiness among workers was 82%, while those not exposed to such dangers were 18%.

2. The respondents' exposure to volatile materials (sawdust, wood, dust) and heat.

Some 80% of respondents were exposed to volatile materials (sawdust, wood, dust) and heat whereas 20% remained safe.

3. As high as 79% of the respondents are exposed to dangers/risks when transferring and handling of hazardous materials and heavy stuff. This category also includes the workers who are exposed to pinching sounds, high-noise, and noise from machinery 79%, while 21% are not affected due to these harmful factors.

4. The percentage of those who are exposed to chemical hazards and currents, electric shocks was 77%, while the proportion of people who are not influenced was 22%.

5. The percentage of those who are affected by physical disorders due to the machinery and equip-

ment 73%, while the percentage that is not exposed to is 27%. Air pollution affects 72%, while 22% are not influenced by the Air pollution. The workers affected by toxic substances are 69%, while 31% not exposed to toxic substances. The workers affected by radioactive materials are about 56% while the proportion of workers who are not affected by radiation risks is about 44%.

6. The level of environmental awareness of workers in the industrial cities.

The level of environmental awareness among the employees was assessed by gathering information and by asking questions. A scale on environmental awareness of workers that consists of three categories was designed: Poor, average, and high. Workers with good environmental awareness represent 31% of respondents; while the percentage of workers with an average environmental awareness is about 60% and 9.7% respondents had poor awareness level (Table 9).

To ascertain the level of environmental awareness of the respondents, they were offered direct questions about the environment to answer them through selecting from various options, and the result was consistent with the results of the previous standard of environmental awareness, where the proportion who answered correctly was 40%, while 60% answered wrong answers.

The study showed that the correlation between personal characteristics of respondents and their level of environmental awareness is positive and statistically significant between each of the educational level and age of the subjects and the level of environmental awareness. On the other hand, the correlation between the respondents' years of experience and level of environmental awareness is statistically not significant (Table 10).

### Conclusions and Recommendations

Although creating environmental awareness is not an easy task, yet at the same time it is not im-

possible to accomplish. However, based on the results of the study, the following recommendations are made to improve the situation:

- A genuine commitment to raising environmental awareness among the public and especially employees of industrial establishments is needed. Awareness and environmental education programs have been stressed upon and required by the environmental executive regulations of the kingdom.
- Raising environmental awareness in the industrial cities by focusing on the development of faith among humans would prove more beneficial, as Islam stresses the importance of the human environment. Above all, faith recognizes the rights of the human beings and attaches great respect to the environment and its components, and strictly forbids the inappropriate and wasteful uses of natural resources.
- Every possible care should be taken to provide correct facts on environment and environmental issues. Such information in published form should be delivered by various ways and means of education. In addition, initiatives are needed to make sure environmental programs are available to all the employees in the industrial cities.

**Table 9**  
**The respondents' level of environmental awareness**

Level of environmental awareness	Frequency	Percent
Poor	31	9.7
Average	191	59.5
High	99	30.8
Total	321	100

**Table 10**  
**Correlation between the respondents' personal characteristics and the level of their environmental awareness (Pearson correlation) (n = 321)**

Personal qualities of the respondents	Level of environmental awareness	
	Correlation coefficient	Level of moral
Age	.133**	0.043
Education	.675**	0.000
Years of Experience	0.25	.661

- Facts about environment and environmental information should be incorporated in the curricula at all the educational levels. The curricula should at least contain brief information about the environment and its problems and how to deal positively with environmental issues. Awareness on the concepts of environment needs to be developed gradually.
- Industrial facilities are required to initiate and support the development of environmental education programs and first should be started for the workers.
- Environmental training courses are needed for the workers before launching any industrial project.
- Environmentalists within industrial establishments should ensure the safety of the employees and they need to follow up with the environmental aspects. They should also ensure the evaluation of environmental factors after every 3 months to see their effects on the efficiency of workers.
- Initiatives should be taken to conduct seminars and organize lectures to create awareness on environment in the industrial cities and how to maintain these cities environmentally friendly and safe.
- Industries should produce and provide publications to their employees and signboards be erected within the industrial cities to create awareness on the importance of environment and measures for its improvement.
- Industries should arrange medical examinations of the workers before the start of any project and then they be checked periodically every month.
- Factories must define and identify the risks that their workers may be exposed to by the plant and industries should equip their workers with the techniques and proper ways to mitigate risks.
- Factory employees be educated enough to define and identify hazardous chemical substances within the plant and where it is stored and how to deal with what are the risks and how to act when an accident occurs, God forbid.
- Factory workers should be aware of the alerts and ways to deal with the accidents. They should know the safe places and emergency exits in the factory.
- Launching of the courses on dealing with the machines for the education of the workers to make them aware on the risks involved with using the ma-

chines may seem quite essential.

- A dire need exists to implement, activate, and enforce the existing environmental laws and regulations that require industries to raise environmental awareness and the take into account all the environmental dimensions in the various sectors.
- Existing laws and legislation that require the preservation of the environment inside and outside the industrial city through the development of a system to curb pollutants emerging from industrial facilities need their implementation by letter and sprits. They deserve more efforts to elevate the levels of their effectiveness.
- Environmental feasibility along with the economic feasibility studies should be compulsory for any industrial project planned so that workers could stay healthy and safe.
- Maintaining the health of workers is extremely important; therefore, their residences should not be constructed in the neighborhood of the industrial areas.
- There is a need design and launch the programs by the competent authorities to ensure and maintain the safety of workers and monitor the risks and presence of the pollutants in the industrial city.

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