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The Use of the Leopold Matrix in Environment Assessing for Some Construction Factories in Al-Anbar Governorate

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Abstract: This study was conducted to assess the environmental impact of some cons traction factories in Al-Anbar governorate to demonstrate its effect on the soil properties and natural vegetation using the Leopold matrix. Three cement factories were chosen are Fallujah, Qubasi, and Al-Qaim, In addition to three plaster factories in Fallujah, Al- Ramadi, and Heet regions were selected observance at selecting the plaster factories to approach one another in establishing time addition to the ability to work. Results showed superiority plaster factories in negative impact in comparison to Cement industry by 79.1% about its effect on soil properties and 150.2% in negative effect on environmental natural visible. Also, the outcome about environment impact for these factories activities the results showed the two industrial cement and plaster have a negative effect on the ecosystem with values ranged between(-133and -498)at Qubasi cement factory and Fallujah plaster factory respectively, with superiority in the negative impact for plaster industry on cement by 296.1%.

Key words: Environment assessing ; Construction factories in Al-Anbar Governorate; Leopold matrix.

1.Introduction

Soil and water materials pollution is one of the most prominent environmental problems, the most complex, and the most difficult to solve, this pollution results from waste and emissions of factories, and the use of chemicals such as pesticides and industrial fertilizers in agriculture, in addition to what is thrown from household and other establishments waste [1]. The problem of pollution appeared long ago and is still growing rapidly in the countries of the Middle East as a result of the lack of careful planning for industrialization compared to its emergence in a less dangerous form in developed countries [2]. Human activity as a result of population growth has caused changes in the biodiversity and ecosystems of the earth as well as economic changes due to agricultural, industrial, and residential use[1]. Environmental pollution has been defined as all the chemical, physical and biological changes that occur to the environment, as a result of adding a substance to the environment that was not originally present, or an increase in the level of a substance in the soil from its existing natural level, so that it negatively affects the environment and causes a decrease in its productivity [3]. While the environmental impact assessment, is the systematic examination of the unintended effects resulting from a development project, to reduce or reduce the severity of the bad effects and enhancing the positive aspects of the project. The environmental impact assessment is a functional tool that must be conducted for the proposed activities that are likely to have a clear impact on the environment and are subject to the decision of the competent national authority. The environmental impact assessment has been defined as a tool for incorporating environmental considerations into the decision-making process and providing a legal framework and information basis for decision-making regarding activities affecting the environment, and that the ecosystem or spatial field in which living organisms live is affected by it and influenced by it [4]. So that the aim of studying the ecosystem in any location is to

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understand the interrelationships and interactions between Biota and its Aboita to identify its nature and preserve it from deterioration. Ecosystems in general can regulate themselves. Therefore, the science of control or cybernetics is of practical importance in environmental science[5]. By nature, humans are increasingly inclined to influence the Homeostasis of environmental systems through their negative interference in these systems. Environmentalists have agreed that any disturbance in the state of the Homeostasis of any ecosystem is a type of pollution [6]. Lohani et al [7] have indicated that the strategy aims to protect the environment in the initial stages of decision-making and checking the sustainability of various development activities. There are multiple methods of environment assessing the impact of industrial activities, including descriptive and quantitative methods. The description of Environment assessing as a planning tool is called the "technocratic model", and it makes Environment assessing a component of the "rational model" for planning and decision making. In the rational model, objectives and criteria are set for evaluating alternative projects at the outset. Hence, a planning tool, the environment assessing works mostly, to inform the concerned parties of the potential environmental impacts of the proposed project and the effects of alternatives to it [8].

The Leopold Matrix is one of the important quantitative methods that was developed by this scientist in 1971, as 100 environmental impacts were scheduled and classified against 90 environmental elements in principle, this method has dealt with the effects according to importance and value, and this has been described using numbers from 1-10, where each number has a value and importance, it looks geometrical divides into two halves pervert the first highlights the importance and the second highlights the value of the impact, and it helps to predict the extent of the deterioration of environmental elements in the future as a result of the projects and activities planned in the center of environmental under study. Barrow (4) was noted that the reason for the use of a matrix of Leopold to assess the environmental impact back to be used extensively by the European Union and the ease of application and comparison between different activities in addition to being a cover physical and biological aspects of the economic environment. Faisal [9] evaluated the ecosystem in Pakistan and the impacts of industrial activities using the Leopold Matrix and compared it with the regulations and laws in force in the European Union, where he demonstrated the success of this method in assessing the environmental impact. Muslim et al. [10] Used Leopold Matrix to assess the environmental impact of some industrial activities within the East Euphrates in Iraq, and they recorded a negative impact of the cement industry on air pollution of these ecosystems, with the superiority of the Kufa cement factory in terms of the negative impact, followed by the Karbala Cement Factory, and the least was the Najaf Cement Factory, with outcome values of the evaluation amounted to (158-, 108- and -92) for the three factories respectively. Josimovic et al. [6] was studied the potential environmental impact of wind farms created in the Kladova area in Serbia using a matrix of Leopold to conduct environmental impact assessment, as they were able to pinpoint potential environmental effects of the project and the possibility of removal of problems related to public opposition to the project. Therefore, this study was carried out, which aims to use the Leopold Matrix in Environment Assessing impact of some construction factories in the Anbar Governorate-Iraq, to demonstrate their effect on the characteristics of soil and natural vegetation in the surrounding areas.

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2.Materials and methods

To identify the positive or negative consequences of the changes that occur in the characteristics of the ecosystem as a result of some industrial activities existing within the Anbar governorate-Iraq, three cement factories were chosen, namely Fallujah, Kabisa, and Al-Qaim in addition to three plaster factories in the areas of Fallujah, Ramadi and Heet, when we choosing the plaster factories was keeping that these factories convergence at the same time of construction, in addition to the convergence of operating efficiency. The Leopold Matrix was used in Environmental Impact Assessment which include a display and highlight the environmental impact of the elements of the project and measure its strength and its importance as the following steps are summarized and contained in [6]:

1- Definition all activities and placing them at the top of the matrix, and they are titled columns. As for rows, current environmental conditions are written.
2. Each square is divided into two halves in the highest placed value of the effect, either below indicates the importance of the effect.
3- The numbers are placed so that they range from 1 to 10, where (1) is the lowest value and (10) the highest value, and the number zero is not placed.
4- The signal placed (+) if a positive influence and signal (-) if the effect was negative.
5-The two sides of the square are multiplied by each other and combined with the product of the next square, and so on, horizontally, to know the number of negative and positive points for each row of rows, and then know the total outcome of the activity.

3.Results And Discussion

The information which included in the tables (1-6) represents the environmental impact assessment of the factories under study. As for the negative effects of these industrial activities on the soil, they reached (80-, 88- and 88-) at Fallujah, Kabisa and Al-Qaim cement factories, respectively, and (144-, 144- and 152-) at Fallujah, Heet, and Ramadi plaster factories, respectively. Indicating that the plastering industry outperformed the cement industry by 71.9%. The reason for this is due to the nature of the manufacturing processes for each material in addition to the methods used to limit the spread of the materials emitted from the manufacturing process. The impact on the natural perspective, the highest rate recorded at plaster factories amounted to (48-, 56- and 56-) for each of the factories plastered Ramadi and Fallujah and Heet respectively. While it reached (16-, 24- and 24-) at Fallujah, Kabisa and Al-Qaim cement factories respectively. Which was pointing to the high negative impact of plaster factories on the natural perspective of the environment compared to the impact of cement factories, the plaster factories were outperformed the negative impact by 150.2% on the cement factories. As for the side effects of these construction industries, it is noticeable that their values ranged between (57+ and 144+) at Fallujah plaster factory and Kabisa and Qaim cement factories, respectively. As for the assessment of the outcome of the environmental impact of these activities, the results showed that both plaster and cement industries were had a negative impact on the environment and the amount ranging from (133-498-) when cement manufacturers leap factory plaster Fallujah respectively, and with a rate of the superiority of the negative impact of plaster factories on cement amounted to 296.1%, which indicates the need to take into account the modern means and technology that can be applied to reduce the negative impact of these industrial activities on the local environment while avoiding adding projects to produce plaster in this environment as much as possible for its harmful effects on Ecosystem in the surrounding areas.

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Table (1) Evaluation of the environmental impact of Fallujah plaster plant on soil characteristics and Landscape.

Elements of industrial activities and environmental conditions	Industrial waste	Gases	Dust and suspended matter	Heavy elements	Factory location	Noise	Dealing with raw materials	Factory facilities	Production process Production process	Total
Water			2 -							4-
			2							
Soil	4-		9-	5-						144-
	8		8	8						
Landscape (field of view)			7 -							56-
			8							
Agricultural lands	3-		5-	5-						86-
	2		8	8						
vegetarian life	2-		4 -							30-
	5		5							
Climate		2 -	2-							8-
		2	2							
Health and safety of appropriate business		8-	7 -	6-		5-	6-	2+		227-
		8	8	8		3	8	2-		
Demand for services					3+			2+	4+	57+
					7			2-	8	
					final result				498-	

Table (2) Assessment of the environmental impact of Fallujah Cement Factory on soil characteristics and Landscape.

Elements of industrial activities and environmental conditions	Industrial waste	Gases	Dust and suspended matter	Heavy elements	Factory location	Noise	Dealing with raw materials	Factory facilities	Production process Production process	Total
Water			2 -							4-
			2							
Soil	2-		4-	4-						80-
	8		8	8						
Landscape (field of view)			2-							16-
			8							
agricultural lands	3-		4-	5-						78-
	2		8	8						
vegetarian life	2-		3 -							25-
	5		5							
Climate		2 -	3-							8-
		2	2							
Health and safety of appropriate business		8-	8-	2-		2-	2-	6+		74-
		8	8	8		3	8	2		
Demand for services					8+			6+	7+	132+
					8			2	8	
					final result				153-	

Table (3) Evaluation of the environmental impact of the gray plaster plant on soil characteristics and Landscape.

Elements of industrial activities and environmental conditions	Industrial waste	Gases	Dust and suspended matter	Heavy elements	Factory location	Noise	Dealing with raw materials	Factory facilities	Production process Production process	Total
Water										-
Soil	5-		9-	5-						152-
	8		8	8						
Landscape (field of			6-							48-

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view)			8							
agricultural lands	5- 8		5- 8	5- 8						120-
vegetarian life			4- 5							30-
Climate		2 - 2	2- 2							8-
Health and safety of appropriate business		4- 8	4- 8	4- 8		5- 3	6- 3	3+ 2		121-
Demand for services					4+ 7			3+ 2	6+ 8	89+
					final result				390-	

Table (4) Assessment of the environmental impact of the Heet plaster plant on soil characteristics and Landscape.

Elements of industrial activities and environmental conditions	Industrial waste	Gases	Dust and suspended matter	Heavy elements	Factory location	Noise	Dealing with raw materials	Factory facilities	Production process Production process	Total
Water										-
Soil	4- 8		9- 8	5- 8						144-
Landscape (field of view)			7- 8							56-
agricultural lands	3- 8		4- 8	4- 8						88-
vegetarian life	2- 5		4- 5							30-
Climate		2 - 2	2- 2							8-
Health and safety of appropriate business		4- 8	5 - 8	5- 8		5- 3	5- 8	3+ 2		161-
Demand for services					6+ 7			3+ 2	6+ 8	96+
					final result				391-	

Table (5) Assessment of the environmental impact of Kabisa cement plant on soil characteristics and Landscape.

Elements of industrial activities and environmental conditions	Industrial waste	Gases	Dust and suspended matter	Heavy elements	Factory location	Noise	Dealing with raw materials	Factory facilities	Production process Production process	Total
Water										-
Soil	4- 8		3- 8	4- 8						88-
Landscape (field of view)			3- 8							24-
agricultural lands	2- 8		3- 8	3- 8						64-
vegetarian life	1- 5		3- 5							20-
Climate		2 - 2	2- 2							8-
Health and safety of appropriate business		2- 8	3- 8	3- 8		3- 3	2- 8	8+ 2		73-
Demand for services					8+ 8			8+ 2	8+ 8	144+
					final result				133-	

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Table (6) Evaluation of the environmental impact of the existing cement plant in the characteristics of the soil and Landscape.

Elements of industrial activities and environmental conditions	Industrial waste	Gases	Dust and suspended matter	Heavy elements	Factory location	Noise	Dealing with raw materials	Factory facilities	Production process Production process	Total
Water										-
Soil	4- 8		3- 8	4- 8						88-
Landscape (field of view)			3- 8							24-
agricultural lands	3- 8		5- 8	3- 8						64-
vegetarian life	1- 5		3- 5							20-
Climate		2 - 2	2- 2							8-
Health and safety of appropriate business		2- 8	2- 8	3- 8		3- 3	2- 8	8+ 2		62-
Demand for services					8+ 8			6+ 2	8+ 8	144+
					final result				133-	

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