

Environmental Effects of Brick Kilns Factories, Ghohab Area of Esfahan, Iran**Zahra Namdary^{*1}, Sahar Rezaian², Nematollah Jafarzadeh Haghighi Fard³**

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Abstract

The development activities would impose some risks to environment. These probable risks are different with respect to the nature of the project and vulnerabilities of the environment. The brick kilns factories have considerable potential effects on the environment. So, by assessing the environment and presenting a suitable management these negative potential effects can be decreased to a minimum to improve the affected area. The main goal of the present research is to check the environmental effects of the brick kilns factories of Isfahan (Mohammad Abad Ghohab zone). According to assumptions, the most important environmental effect of brick kilns is the suspending particles, and using the soil for brick factories would cause the erosion of soil in the areas. First, extensive data from 10 brick kilns located on Mohammed Abad Ghohab, in Isfahan, are collected and a sample of the air chimney for testing the (sound) Audio of the area was performed. Then, they are compared with environmental standards by using SPSS software and also using the techniques of testing checklist and counter balance to recognize the index of environmental effects. Analytical Hierarchy Method (AHP) has been used for giving value to the effects used in checklist, TOPSIS technique for grading the choices which had been used in the test. By noticing the consequences of the research, it was specified that the most negative disadvantages of these factories were suspending particles, destroying the soil and erosion of soil. The only advantage of these factories was employment. By paying attention to the obtained results, the most negative effects of brick factories are the suspending particles with the weight of 0.667 with regard to air pollution criterion. Degradation of soil gets the weight of 0.140 and the drift or thrust of the soil the weight of 0.123 and the hygiene is with weight of 0.133. The positive advantage of the burning kilns factories is employment with a weight of 0.101. The burning brick kilns factories are to be observed in terms of environmental regulations. The choice of execution with protection and modification allocates more weight to itself compared with an ideal solution. For the purpose of assessing the suggestive productivity of the modified actions and evaluating the unforeseen effects of the project, we need to establish environmental management system.

Introduction

This present research attempts to observe the specifications of factories and sensitivities of environment. It also contains the center of population in Ghohab zone and residential complex on the district of burning brick kilns factory as study area. The prevailing wind which is blowing from west to east would affect the residents of Ghohab area. This is one of the air pollution parameter. With this regard that Ghohab zone is a salt desert and dried area, any kind of air pollution would leave a double effect on the ecosystem of the region. Therefore, in study about the effects of these factories it is important to observe the topography and climate situation of the area. A research with the subject of regulate evaluation of the effects of diffusion from burning brick kilns on air in Thailand was done in 2009. In this research this was mentioned that a variety of air pollutants diffused during the period of burning bricks among the brick kilns. Spreading the amount of suspending particles diffusion inside the chimney was specified by using the cascade impactor. So₂ was the highest critical pollutant in this case. Ghohab area is located on 20 kilometer east of Isfahan. The total measurement of Ghohab area is 400 kilometer and total population of northern and southern of Ghohab is 9939. Number of brick kilns factories located in this area are 74 which they had been built gradually from 1356.

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Material and Methods:

In this phase, first we gathered extensive information about the project under research which is 10 factories of brick kilns on Ghohab area in Isfahan. The research investigate the geographical situation of brick kilns, recognition of their activities, the method of production, the kind of primary material, and regulations and principles which they observe about these factories that are on contrary with the rules and regulation of environment. This is conducted in two phases; in place activities and librarian studies, and also the test of air quality of the factories' s chimney and audio test have been performed to compare them with the environmental standards. Then, by using the software (SPSS), we did the comparison of each sample with the standards. We also used the counterbalance – checklist testing for recognition of the environmental index effects and using the AHP method for giving weight or value to the used effects. According to this technique, in the present research, first we specify the effective criterion in any environments (physical, chemical, biological, economical, social and aesthetical) by observing the importance and severity of effects and by using the cochran formula, which is one of the most popular method for measuring the capacity of statistic samples. To specify the capacity of samples by cochran formula, we need to know the capacity or the measurement of society. Here, a number of environment experts and some stationed experts in the site are known as statistical population (30 persons). Then, by employing the Delphi questionnaire, we specify the most important environmental effects of brick kilns. We submit the questionnaire to the respondents who was obtained by cochran formula. Subsequently, we specify the index of the environmental effects, with respect to the achieved responds from questionnaires. For giving value or weight to criteria or samples in this research, we first draw a hierarchy construction with the purpose to check the environmental effects of burning brick kilns. The criteria that are the environmental effects of the kilns are arranged and then the choices, each criterion is related to its corresponding choice and we connect them together on the graph to compare each level to its upper level. That would be the establishment of pairwise comparison matrix for each level. The weights are giving (proportional weight) to criteria by employing the AHP method on EC (expert choice) software by special graph. Therefore, by obtaining the weight of criteria and choices, the priority of each one is specified. For computing the scale of criteria in each choice (scaling), we divide the raw data of the choice to the most amount of the raw data in choices. In the next, we write the weight of each criterion in column weight in the chart of counterbalance checklist testing and the weight of each choice proportion to each criterion in the column of raw data. At the end, the total index is obtained by the total product of the criteria weight to criterion scale for each choice. Here, the indices or important criteria that have the highest weight are specified. After employing the two methods counterbalance checklist testing and AHP, we used the TOPSIS technique for certainty of the obtained results from the checklist method in comparison with the multiplication product of cleared scaling matrix by square matrix. The main diagonal elements are the indices weights obtained according to entropy and its other elements are zero. The symmetrical cleared scaling matrix was achieved. The subject of ideal positive and negative values of each index was determined and the distance of each choice from positive and negative ideal values was obtained by the TOPSIS method. The proportional closeness to ideal solution (CL) computed and consequently the grading of choices was done. The value of CL is between zero and one. The closer the sum to one is the closer is it to ideal answer or solution at the end. The conclusions are achieved from TOPSIS method in combination with checklist testing technique for grading the choices and determining the most important bio environmental outcomes of brick kiln factories.

Results

In the results section, first we present the area restriction that we had specified and done the research, and there is Mohammad Abad Ghohab in Isfahan. We obtained the air pollution results in winter. Those factories which use the petrol consumption, the amount of suspending particles and (CO₂) monoxide carbon in their chimney are higher. With respect to achieved results from the analysis by SPSS software it can be said that the degree of suspending particles is more than the standard and the amount of CO₂ is less than the standard and that by observing the results of (SPSS) software, the average of sound in all three stations in every factory is less than the standard value. With respect to the method phases mentioned in chapter three for specifying the effective criteria in environmental area by using the counterbalance checklist testing and cochran formula we determined the number of statistical population, the capacity of the statistic sample is around 27 persons. All of them are assigned to experienced experts for analyzing the effects. With respect to severity and importance, 15 effects were chosen as the most important. For specifying the environmental quality (EQ) and index effectiveness in counterbalance checklist testing method, we should give weights to them. This will be done by AHP technique. By concentration to chart and the weight of every sub criterion and proportional to considered criterion, about the norm of air pollution the sub criterion has the most amount of suspending particles for air pollution, and for the norm of soil pollution the sub criterion of residue has the highest weight. By checking each choice proportional to each norm the suspending particles and soil demolition has the highest weight in connection to executive choice plus protection and modification; and criterion of employment has the most weight for

executive choice without protection and amendment and also the production of materials in executive choice without protection and modification has more weight. In executive choice plus protection and modification the criterion of employment and materials production have less weight that shows little importance for executive choice with protection and amendment related to criteria and by concerning to obtained results from EC software. The first choice which is protection and modification has the highest weight. Among the criteria, air pollution, soil demolition, thrust of soil, employment and hygiene have the most weight or value related to aim or goal. Consequently, these norms have more environmental effects proportional to the rest of criteria, and they are more important environmental parameters. After employing two methods; the counterbalance checklist testing and AHP, they used the TOPSIS technique to become certain about the results obtained from above methods. First, the quantification of the criteria was performed. The entropy method is used for assigning weights. With respect to the norm of weights or values in entropy method for indices with negative aspect the suspending particles of the soil demolition and hygiene have the most weight. For the indices with positive aspect the production and employment have the most weight or value. Consequently, the choice 1 which is execution with protection modification is closer to ideal answer and is a better modification relative to the choice 2. Choice 2 is without protection and modification. According to above research or study, we must observe the choices of protection and modification particularly with respect to the norm of pollutants and soil demolition.

Discussion and Conclusion

The most important negative environmental effect from these factories is the soil demolition. In that, soil is the main primary material which is used in burning brick kilns. After demolition the soil the result would be erosion and drift of soil and by depleting the layer of the soil and the erosion begins. A negative outstanding effect of the burning brick kilns is air pollution. Suspending particles have also more negative effects than other air pollution factories because the burning consumption of these factories under checking in winter time is black petrol that causes more pollution in the region. Another problem of brick kilns is hygiene and breathing. If we do not observe the security and hygiene features in the area of these factories, we will face serious sickness and breathing problems. From the positive advantages of the burning brick kilns we can mention the employment which is the most positive one and also centralization of population and material production in the area. By establishing or setting up the burning brick kilns in an area, and the needs of workers, they cause employment, of course, providing that they employ the local workers.

Keywords: brick kiln, symmetrical examinational checklist method, AHP Technique, TOPSIS Technique