

## Investigation about the Environmental Effects of Mehr Housing Project in Mahmoodabad, Mazandaran

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### Expanded Abstract

#### Introduction

Mahmoodabad county is located at the coastal region of the country, and it is neighbor of coastal areas where are full of tourism and entertainment applications. This has led to intense development towards suburbs and human domiciles in this county. The 432-unit of Mehr Housing project in the Mahmoodabad, Mazandaran Province, Iran, is located at the 52° 11' to 52° 29' east and 36° 31' to 36° 41' north at the southern coast of the Caspian Sea. This project is bounded to the Caspian Sea in the vicinity of road and in the most equipped touristic-entertainment region (the Sarzamin Royaha funfair). But, perhaps the main reason for calling this project “the diamond of the all under-constructing project” is the divine endowment, i.e. the sea in the northern border a position which differentiates it from all other Mehr projects across the country.

#### Materials and Methods

Collecting library information: looking for library evidence in the library of Environment Protection Organization of Mazandaran located in Sari city, the library of the Faculty of Environment, Tarbiat Modaress University, the library of environment in Azad University (Science and research branch). Collecting valid reports, documents, evidences and magazines related to the subject matter. The internet searching, conducting field study in the region and on this project. The experts and academics in the main institutes including Environment Organization in Sari city, Housing and Urbanization Organization of the Mahmoodabad County, and the professors of Azad University, the Science and Research Branch have also been interviewed. Sound-level measuring equipments “LSI” for measuring CO, NOX and SO<sub>2</sub>, and measuring the floating suspended particles have been carried out in four seasons and three stations. Measuring sound level has been conducted across four seasons and in three stations to measure Lmax, Leq, and SPL. The resulted LEQ from noise measuring has been compared with the Iranian Noise Standards, using the SPSS application. The resulted parameters of Air pollution sampling (Co, NO<sub>2</sub>, SO<sub>2</sub>, and PM10) have been compared with the Clean Air table, using the SPSS. The Pastakia has been employed to evaluate the effects of two phases: construction and commissioning. AHP method has been applied for weighting and prioritizing the criteria and evaluation of checklist.

#### Results

The operation effects on the environment were studied across two phases, using the Pastakia Matrix. One of the advantages of this method is time-efficiency. Presenting the results graphically facilitates comparison of the results.

Identifying the negative and positive effects and proposing the correction approaches were evaluated using the Pastakia matrix on the environmental effects of the project. In this project sub-operations and their effects on physical, biological, economic, social, cultural and technical aspects of the environment were determined. This indicates that the negative and positive effects of the construction phase scores were 19 and 8 respectively; and the negative and positive effects of the commissioning phase scores were 21 and 14 respectively. But, because the effects of the construction are temporary and short term, so their effects is negligible; but, on the other hand, the commissioning phase effects are standing and long term, so cause specific effects on the environment. According to the scores it can be stated that the construction phase of the project affect the environment slightly, but its effects are more extensive and impressive in its commissioning phase, which can be amended by observing environmental measures. Then, the data for the primary criteria were collected for the pretest, through studying the references and analyzing the retrospective studies. Determining the criteria, the developed list was

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transformed into a questionnaire and it was administrated to a group of the experts of different fields related to environment including environment, urban development, civil construction and etc.

In this regard, at the first stage, the hierarchy process was constructed, analyzing the environmental effects of the Mehr housing Project in Mahmoodabad County. Physicochemical, biological, economic, social and technical effects on the environment of the county were selected as the criteria of the second level of the hierarchy process. The sub-criteria of the three spheres were placed in the third level, and factors of the selected sub-criteria are placed in the last level. At the second stage, the hierarchy process was constructed by analyzing the environmental effects. Three spheres including physicochemical, biological-economic, and social were selected as the main criteria for analyzing the environmental effects of the Mehr housing Project on the environment of Mahmoodabad. Then, the sub-criteria of the hierarchy process in the physicochemical sphere are classified into pollution factors and hydrology; biological sphere was classified as wild life; and the economic and social sphere was classified into cultural, technical, economic, and social factors. These were conducted by comparison matrix of the main Criteria. Across the physicochemical sphere, the pollution factors including noise, soil, waste, and the hydrology parameters including above- and underground water were performed by pairwise comparison. Across the biological sphere, the wild life parameters including birds and the fishes were weighted and compared. Across the social sphere, the population and migration factors and across the economic sphere the parameters of employment, real state price, and across the cultural sphere the landscape beauty and land use, and across the technical sphere, accessing urban services and accessing urban infrastructure were weighed through pairwise comparisons.

Then, at the forth level, the sub-criteria of physic-chemical sphere including noise parameters ( noise at the construction and commission phases); air (CO, NO<sub>x</sub>, SO<sub>2</sub>, suspended particle); soil (erosion, soil characteristics); wastes (construction and human residues); hydrology including above-ground water (ecology- quality) and underground-water (quantity, quality); biological sphere including birds (protected species, food chain), fishes (population-food chain); economic-social sphere including (size , class variety) migration(internal, external), employment (side-local), real state price ( residential, commercial), land use( agricultural, residential), landscape beauty (visual effect, land shape); accessing urban services (educational, health), and accessing urban infrastructure (electricity and gas, access road security) were weighted through pairwise comparisons.

In the next stage, weight of each index was calculated against the higher-level index (relative weight) through the equivector method, using the Expert Choice (EC), which incorporates them with the relative weights, as the final weight determined. Finally, a total priority vector is obtained, which shows the effect and significance of the lower elements. The score which obtain higher weight is more significant compared to the others.

The economic-social, physic-chemical and biological spheres gained scores of 0.699, 0.237 and 0.064, respectively. As a result, the greatest weight was attributed to economic-social sphere because of its significance. The geometrical matrix of the physicochemical sphere was developed, considering the AHP questionnaire. The weights of air pollution criteria were 0.167, and those of the hydrology were 0.833. The pollutant had bigger scores than the hydrology. The geometrical matrix of the biological sphere was developed, considering the AHP questionnaire. The wild life was weighted 0.875 for the fishes and 0.125 for the birds.

The geometrical matrix of the economic-social sphere was developed, considering the AHP questionnaire. The economic, social, technical and cultural criteria were also weighted 0.53, 0.225, 0.178 and 0.067, respectively.

After weighting the criteria and the options according to the AHP method and determining the priorities of them, the weights were incorporated into the alignment evaluation checklist. It was done as follow: first, the weights criteria were inserted. Then, the option weight compared to the each criterion was inserted in the raw data column. Then, determining the scale of criteria in every option, the raw data of every option was divided in the highest score of the raw data of the criteria. Then, the weighted criteria of each option was obtained from the multiplying the weight of criterion by its scale. Finally, the total index was determined by summing the products of criteria weight multiplied by criteria scale.

## Conclusion

The intense expansion of Mehr housing construction in the Mazandaran Province and its rapid implementation at the suburb and their consequences and environmental outcomes because of population aggregation, may seem unimportant from the decision-maker point of view. But a glance at the current problems of big residential areas around the cities or the new cities several years after construction and occupation, lack of necessary infrastructures for fresh water, sewage and waste management reveal that residential construction, without considering environmental facts will lead to serious problems. Problems which don't show themselves in light of establishing the most basic forms of facilities are worsening as the other side of the coin. Nevertheless, paying no serious attention to these problems in common house construction and rapid extensive construction of the housing projects without considering the most important problems "ecological capacity for construction" and occupying human population "more than the bio-capacity" will cause many serious problems.

This paper aimed at aforementioned objects to study the environmental effects of the Mehr housing Project, using various methods. Then, the weighted criteria were incorporated into the alignment evaluation checklist, and the total index obtained. The checklist results show that the criteria including urban infrastructure (1.002) in the technical sphere; the scape beauty (0.951) in the cultural sphere; the real state price (0.99) in the economic sphere; the population (1.02) in the social sphere; the fishes (0.99) in the biological sphere; the undergroundwater (0.951) in the physicochemical; and the noise (0.649) in the pollutants sphere, all gained the highest indices. According to the matrix results, the project operations include 9 positive effects and 19 negative effects in building phase, and 14 positive effects and 21 negative effects in the commissioning phase. This shows that the construction phase of the project affect the environment slightly, but its effects are more extensive and impressive in its commissioning phase. This can be amended observing environmental measures. Thus, the quantitative results indicate the fact that implementing the project while administrating environmental management will guide the region to economic and environmental boom.

**Keywords:** Analytical Hierarchy Process (AHP), checklist, environmental effects, Mehr Housing, Rapid Impact Assessment Method (RIAM).

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