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Analytical Study On Impact And Effect Of Highway Development On Environment And Communities

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Abstract: Although the effects of highway development are similar to those of other human activities that harm the environment, highways (as well as power line rights-of-way and other transportation routes) have special effects because of their linear shape. In forested landscapes, highways function as concave corridors, which are areas with lower vegetation heights than the surrounding habitat matrix; in agricultural and some rangeland landscapes, where dense vegetation is encouraged along the roadsides, highways may function as convex corridors. In addition to improving the quality of current roadways, highway development increases connection between major economic hubs. Highway expansion is a result of growing traffic and the need to support the region's economic potential. Additionally, the accession activity alters the surrounding landscape and disrupts the environment. Additionally, it has both direct and indirect effects on biotic and abiotic components. Therefore, it is essential to conduct an Environment Impact Assessment of National Highways in order to understand and forecast the effects on the environment and the socioeconomic circumstances of the inhabitants. Thus, this study examines how highway growth affects the quality of the air, water, and soil as well as the socioeconomic circumstances and health.

Keywords: Environmental Impact Assessment, Steel, Mathematical Matrices

I. INTRODUCTION

Over the past ten years, India has seen improved fiscal growth, a rise in the demand for natural resources, and a rapid expansion of infrastructure as a result of industrialization, urbanization, and modernization—all of which serve as indicators of the level of economic and technological development. India's highway development and road improvement initiatives have mostly improved the condition of the country's current highways and fortified the connections between its major economic hubs. The significant expansion of infrastructure development projects, which offer the essential framework for the construction of other economic sectors, has coincided with India's rapid surge.

The most common public sector investment is the building of new roadways, which the government uses to promote economic growth in both urban and rural areas. As a major component of the national, state, and local transportation systems, the highway network is a top priority for society. As such, highway projects are typically undertaken to improve the financial and social welfare of the people as well as their efficient connectivity. Activities such as land clearing, ground excavation, cut and fill operations, and the construction of specific facilities contribute significantly to particulate matter emissions and serve as a source of airborne ultrafine particles.

Additionally, it has been determined that these activities are a significant source of contaminants that enter natural water bodies such lakes, rivers, and streams. Water quality deteriorates physically, chemically, and biologically as a result of pollutants released into nearby water bodies through direct and indirect discharges from a variety of activities, including soil erosion, the use of fossil fuels, paint, solvents, cleaners, hazardous chemicals, construction debris, and dirt. The growing number of motor vehicles on highways has resulted in significant pollution of the residential area and roadside soil. On the other hand, heavy metal pollution, primarily from automobiles, is regarded as a major environmental problem.

The health and quality of life of those who live and work near highways are significantly impacted by dust and

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other air pollutants from various construction activities. Living close to major roads has also been associated with an increased risk of cardiovascular disease, respiratory issues, and other negative health effects. Construction site workers have also been shown to die from chronic blockage and pulmonary diseases. Changes in the land use pattern in the regions where the highway provides increased connectivity will result in adjustments to the settlement structure, industrial locations, trading, and other services. This would shed light on improvements in the way economic activities are planned, how money is made, how prices are rising, and how jobs are being created in the area in question. Greater accessibility to employment markets, healthcare, educational institutions, etc., may result from a change in land use patterns, in turn will draw funding for the construction of power distribution networks, feeder roads, telecommunications infrastructure, and other forms of connectivity. Therefore, the impact of such road construction on local economies' consumption levels, educational attainment, health status, etc., results in changes in the echelon of human development and well-being.

The main issue facing India today is how to balance the need for economic expansion with the preservation of its natural resources, or how to make both economic progress and human advancement sustainable. Therefore, it necessitates recognizing, comprehending, and mitigating the ecological costs of progress without sacrificing its advantages. As a result, highway construction and operation should be carefully planned to protect natural resources while considering the negative consequences on society and the environment and how to reduce them. Environmental Impact Assessment (EIA) approaches become crucial for such planning development projects.

It is one of the instruments used in the authorization process to give decision-makers relevant data so they can make a rational choice. Before decisions are made, the primary goal of an EIA is to inform the public and decision-makers about the environmental effects of the proposed project activity.

Background

Roads and highways are critical to economic growth and regional connectivity.

Highway expansion supports trade, mobility, and access to services.

However, infrastructure projects often have environmental and social trade-offs.

Research Problem

How does highway development influence natural ecosystems, air/water quality, land use, and local communities' well-being?

Objectives

Assess environmental impacts of highway projects. Evaluate socio-economic effects on neighboring communities. Identify mitigation strategies adopted in planning. Recommend sustainable highway development practices. What are the positive/negative environmental consequences of highway construction. How are local communities affected economically, socially,and culturally. Which mitigation and planning measures reduce adverse impacts?

Review and discussion about effects of Highway Expansion on Ecosystem

Quality of air

One of the most well-known negative effects of roads on the environment is air pollution. For many years, academics, regulators, and legislators have closely examined this aspect of transportation since toxic substances linked to airborne particulates cause illnesses and higher mortality rates in people. Most people agree that the main environmental impact of road-related mobility is air pollution. Additionally, metals and hydrocarbons from atmospheric sources are introduced into water bodies by air pollution. Although it is obvious that poisons enter the environment, remain there, and interact with biota, the wider ecological implications of chemical pollution from road-related mobility have received less attention.

Soil quality

Roads serve as major link among communities through which foods and other important commodities are transported. It is an essential amenity that plays a major role in enhancing social and economic activities. However, road construction has also resulted in heavy environmental pollution especially, on soil32. It is clear from various reports that roadside soils may be contaminated from various anthropogenic activities such as industrial processes, energy production, vehicle exhaust, waste disposal as well as coal and fuel combustion.

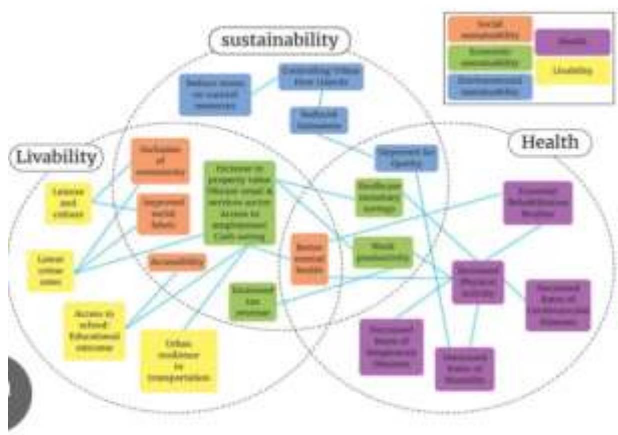
Water quality

Motorways increase the energy of stream systems, causing channel erosion and scouring on the one hand, and cutting banks of lanes near streams, causing sedimentation on the other. It has been observed that both highway and road construction projects and operational roads pose a remarkable threat to the water quality. Based on data from long-term observation of the reservoir in Taiwan, the highway construction verifies the difference in water quality before and after the highway construction.

Impacts on society and the economy

Through the dynamic externalities that such development frequently produces, the construction of transportation infrastructure, such as road infrastructure, is essential to the socioeconomic and cultural advancement of any region. It can be a crucial component of direct and indirect interventions aimed at improving the socioeconomic circumstances of the rural population, which has long been excluded from the advantages of overall economic growth, and reducing poverty. There are several scope and scale analysts in the literature that links economic factors to transportation. There are strong and positive relationships between highway transportation infrastructure and economic activity, according to research that aims to connect transportation advancements with economic growth and development.

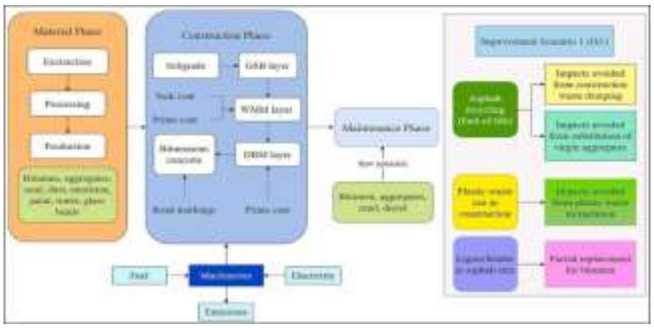
Changes in the landscape and fragmentation of habitats. Many scholars believe that one of the most important ecological implications of road expansion may be the fragmentation of ecosystems caused by roadways. Even though research on ecosystem fragmentation is growing daily, there are still very few studies that look at how roads affect ecological fragmentation. Research on the impacts of roads, habitat loss, and strategies to mitigate those effects is therefore more expansive. When a road network structure is being developed, several direct ecological effects on nearby aquatic and terrestrial ecosystems have been noted, but they also have far-reaching.



The direct, indirect, and cumulative impacts of highway development can be grouped into three general categories:

- **Destruction of habitat** (resulting in the elimination of certain habitat types and their replacement with non-natural uses or with specialized semi-natural habitats).

- **Fragmentation of habitat** (resulting in the loss of habitat integrity through the creation of barriers to species and ecological processes).
- **Degradation of habitat** (resulting in the loss of habitat integrity through disturbance of resident species, contamination with pollutants, alteration of natural processes, and introduction of exotic species)



II. LITERATURE SURVEY

The LCA studies on pavement started quite early since past three decades. Hakkinen ¨ and M¨ akela ¨ (1996) conducted a pavement LCA study to investigate and compare the environmental burdens of concrete and asphalt road pavement. The impacts were assessed for construction of 1 km pavement and assuming 50 years of the service life. This study was among one of the few studies in the early years to consider the material, construction, use and maintenance phases of pavement lifetime. The study estimated the impacts in terms of environmental loads such as SO2, CO, CO2, NOx and energy and not in the terms of environmental impacts such as Eutrophication Potential (EP) and others.

Horvath & Hendrickson (1998) performed an economic input–output LCA study to predict the impacts of concrete and asphalt pavement on the environment in the U.S. The study included the material and construction phase and environmental implications were evaluated for 1 km of the pavement. The findings were reported in terms of environmental burdens such as the Toxics Release Inventory (TRI) in terms of air emissions, water releases, land releases, and many more. There are many LCA pavement studies related to both concrete and asphalt pavement that only reported GWP and/or energy as the environmental indicator.

(Chen et al., 2017, Batouli et al., 2017, Mao et al., 2017, Liu et al., 2015), while a few presented the results in terms of environmental burdens (Zapata et al., 2005, Treloar et al., 2004). A process-based LCA research was conducted by Chen et al. (2017) to evaluate the GHG emissions in China at both the provincial and national levels. The study evaluated the impacts on ecosphere due to construction concrete and asphalt paved roads by considering the GHG emission factors for raw materials and for the road construction materials. This study accounted various classes of roads in China having different number of lanes and assessed the impacts for 1 km road pavements. The study only focused on the raw material extraction and production phase for assessing the environmental impacts. The study found that the GHG emissions for the concrete pavement were 60 % higher compared to asphalt pavement.

Fraser & Chester (2016) conducted environmental and cost analysis for asphalt and concrete pavement in the U.S. using City Road Network (CiRN) LCA model. The study mainly focused on GHG emissions from both types of pavements and considered the all the phases except use and end-of-life phases of the pavement life cycle. The functional unit adopted was 1 km and impacts were calculated for different classes of roads having different road width. According to the study, impacts on global warming from local to highway class roads in the United States varied 300 to 1000 tonnes CO2 eq/km/lane. A few pavement LCA studies were based on a hybrid LCA model including both the process and economic input–output LCA (Treloar et al., 2004; Kucukvar & Tatari, 2012). Kucukvar & Tatari (2012) compared the energy demand and CO2 emissions of hot mix asphalt and concrete pavements in U.S. The study also conducted an uncertainty analysis considering recycled materials and discovered that altering the reclaimed asphalt pavement (RAP) content varied energy consumption the most in hot-mix asphalt (HMA) pavement. Hanson et al. (2012) also considered the construction of asphalt pavement using the warm mix asphalt (WMA) and compared the environmental impacts with those of HMA pavement and concrete pavement This study adopted one lane mile as the functional unit and covered the material and construction phases for the different pavements.

III. METHODOLGY

Research Design

The study adopts a mixed-method analytical research design, integrating both quantitative and qualitative approaches to assess the environmental and socio-economic impacts of highway development. This design enables a comprehensive evaluation of measurable environmental changes as well as community perceptions and experiences.

Study Area

The study area comprises communities and environmental zones located within a defined corridor along the selected highway development. The area was chosen due to its ecological sensitivity, population density, and exposure to highway construction and operational activities. Key features of the study area include land-use patterns, vegetation cover, water bodies, and residential settlements.

Data Sources

Both primary and secondary data were used in this study.

Primary Data

Primary data were collected through:Field observations of environmental conditions Household questionnaires administered to residents living near the highway Key informant interviews with local authorities, environmental officers, and community leaders Noise level measurements and traffic volume countsAir quality indicators (where available)

Secondary Data

Secondary data were obtained from:Environmental Impact Assessment (EIA) reports Satellite imagery and land-use maps Government planning documents Academic journals and published reports Census and socio-economic data

Sampling Techniques And Sample Size

A stratified random sampling technique was employed to select households based on their distance from the highway corridor. Communities were categorized into zones (e.g., within 0–500 m, 500–1000 m, and beyond 1000 m). Sample size was determined using standard statistical methods to ensure representativeness.

- **Methods Of Data Collection**

A. Environmental Impact Assessment

Environmental impacts were evaluated using:Land-use and land-cover change analysis Noise level monitoring at selected points Observation of vegetation loss and soil erosion Assessment of water quality near drainage outlets

B. Socio-Economic Assessment

Community impacts were assessed through:Structured questionnaires focusing on health, livelihood, mobility, and safetyInterviews addressing displacement, access to services, and quality of life Focus group discussions to capture collective community experiences

C. Data Analysis Techniques

Quantitative data were analyzed using descriptive statistics (frequencies, percentages, mean values) Environmental spatial data were analyzed using GIS techniques Qualitative data from interviews were analyzed using thematic analysis Comparative analysis was conducted to assess conditions before and after highway development

D. Impact Evaluation Criteria

The impacts were evaluated based on: Magnitude and extent of impactDuration and reversibility

Sensitivity of environmental and social receptorsCompliance with environmental regulations and standards

E. Ethical Considerations

Ethical principles were strictly observed. Informed consent was obtained from all respondents, confidentiality was maintained, and participation was voluntary. The study ensured that no harm was caused to participants or their communities.

F. Limitations Of The Study

Limitations include restricted access to long-term environmental data, time constraints, and possible response bias among survey participants. However, these limitations were minimized through data triangulation and careful analysis.

1. Lack Of Integrated Socio-Ecological Studies

- **Long-Term Environmental Impact Assessment**

Most studies focus on short-term impacts (construction phase or first few years of operation), but longitudinal assessments (10–20+ years) on:

- Soil degradation and recovery patterns,
- Persistent air and noise pollution levels,
- Habitat fragmentation and ecological succession,

are limited or absent.

- Lack of long-term empirical data showing cumulative environmental effects beyond 5–10 years.

2. Integrated Socio-Ecological Impact Models

Existing studies either:

examine social impacts (displacement, livelihoods) or

study environmental impacts (pollution, biodiversity),

but few integrate both in a holistic model showing cause–effect pathways between environmental changes and community outcomes.

- Absence of interdisciplinary frameworks that capture interactions between environmental stressors and socio-economic well-being.

3. Vulnerable & Marginalized Communities

There is limited research addressing how highway development differentially affects:

low-income households,indigenous populations,women, children, elderly, in terms of access to resources, displacement, health outcomes, and cultural integrity.

- Inadequate studies on equity and vulnerability dimensions of highway impacts.

Cummulative and Synergistic Effects

Most research treats impacts in isolation (e.g., noise, vibration, air quality). However: impacts may be compounding, multiple stressors can interact synergistically (e.g., dust + traffic noise + loss of green cover),but this cumulative impact analysis is under-researched.

- Lack of multi-stress impact assessment methods.

Community Perception vs. Measured Outcomes

There's a gap between:

Quantitative environmental monitoring, and Qualitative community perceptions of change.

Understanding local perceptions helps in adaptive planning, yet very few studies link perceptions to measured impact data Low Percentage of Integrated Studies in Road Impact Research A systematic literature review of 6,189 road infrastructure articles (1984–2024) found: 58 % focused on socio-economic impacts alone.37 % focused on environmental impacts alone. Only 5 % investigated both socioeconomic and environmental dimensions simultaneously (i.e., integrated socio-ecological studies).

→ This means 95 % of research remains siloed in either social or environmental impact assessments.

The review also notes that this 5 % integration rate is lower than the 15–20 % integration rate found in comparable reviews of infrastructure impacts in other regions.

Numerically, integrated socio-ecological approaches for road/highway impact assessment remain severely under-represented.

Geographic Concentration and Bias

Of the 255 selected studies in that review:

71 % were from just five countries (Ethiopia, South Africa, Nigeria, Kenya, Tanzania), showing research concentration in some regions and gaps elsewhere.

→ This implies a lack of broad geographic coverage in integrated socio-ecological research on highways.

Methodological Data Showing Lack of Cross-Disciplinary Integration

The same review found that:

95 % of studies examined only one dimension (either environmental OR socioeconomic), not both.

Only 12.4 % of studies examined impacts beyond five years (important for socio-ecological assessment).

→ This suggests not only a lack of integration but also a lack of longitudinal socio-ecological analysis.

Comparable Evidence from Other Fields

While not highway-specific, research in urban ecology shows a similar pattern of under-integration: Only 39 % of urban ecological studies considered social factors, with lower percentages in some countries (e.g., <30 % in China). This reinforces the broader methodological gap in socio-ecological research.

These numbers quantify a significant research gap in integrated socio-ecological/environmental studies of highways: % of studies (road/highway impact research) Aspect investigated Socioeconomic only ~58 % Environmental only~37 % Both (integrated)~5 %

2. Insufficient Long-Term Monitoring And Post-Project Evaluation

Very Few Studies Include Long-Term Post-Project Monitoring

➤ Limited Time Scales in Research

Many existing highway environmental assessments focus only on construction and completion phases, not long-term operation periods. For example, typical post-assessment research suggests a 4–7 year monitoring window after completion to capture eco-environmental evolution, but this is not standard practice in most highway assessments.

→ Implication: Many highway evaluations end within a few years of project completion rather than tracking long-term (decadal) ecological and social changes.

Lack Of Standardized Long-Term Monitoring And Data Collection

➤ No National/Global Long-Term Monitoring Standards

Major comprehensive reviews (e.g., by the Transportation Research Board) concluded that methods and data currently used for environmental assessment are “insufficient to meet… objectives” and that there are no national standards for long-term data collection in road impact monitoring.

National Academies

→ This means monitoring programs often lack consistent long-term datasets (10+, 20+ years) needed to evaluate cumulative ecological effects like wildlife population changes, habitat fragmentation, and water quality trends.

Scarce Quantitative Long-Term Environmental Data

➤ Examples of Limited Research Scope

In the Changbai Mountain Ring Road study, although a 10-year monitoring effort was performed, such studies are the exception, not the norm.

Science Direct

Most highway impact studies in major literature reviews do not report long-term monitoring data, focusing instead on short-term effects or immediate post-construction conditions (before completion, during construction, or <5 years after).

MDPI

Numerical gap: While 10-year studies exist, a majority of assessments stop long before capturing real operational impacts over decades.

Limited Longitudinal And Cumulative Impact Evaluations

➤ Cumulative Assessment Gap

Reviews of road assessment methodologies point out that cumulative impacts over time (e.g., on wetlands, wildlife corridors, air and water quality) are seldom adequately predicted, monitored, or evaluated — despite evidence that such effects can accumulate significantly over decades.

National Academies

➤ Example of Cumulative Impacts

Although numerical data on long-term highway monitoring is rare, one systematic review (not highway-specific) found that habitat connectivity for wildlife decreased by 70–85% over long periods near new roads, based on long-term ecosystem studies.

→ This indicates that cumulative losses happen over long term, but monitoring systems rarely capture them systematically.

Evaluation Limitations In Practice

➤ Lack of Long-Term Impact Tracking in Institutional Monitoring

In evaluations of federal highway programs, agencies themselves reported that few organizations collect baseline or long-term impact data (e.g., time/cost savings, environmental mitigation outcomes), and that quantitative data may not exist to analyze long-term project impacts.

Federal Highway Administration

→ This institutional gap means that even agencies managing highways often lack the data necessary for rigorous long-term evaluation.

Summary — Key Numerical Findings

Aspect

Numerical Evidence

Typical post-assessment monitoring window (when done) 4–7 years after project completion

Studies with long-term (decadal) monitoring Very few; most stop short of decadal tracking

MDPI National standards for long-term monitoring None officially required in major assessment frameworks National Academies Agencies reporting lack of long-term quantitative data Reported as a widespread evaluation challenge

3. Vulnerable And Marginalised Communities

1. Disproportionate Road Crash Impacts on Low-Income and Rural Households (India)
A World Bank–linked study (based on four Indian states) found dramatic disparities in road traffic crash outcomes based on income and location:
Over 40 % of rural households reported at least one death due to a road crash, compared to 12 % of urban households.
The decline in household income following a crash was sharper for low-income households (75 % drop) vs. high-income households (54 % drop).
World Bank
These figures show that poor and rural households — often representing marginalized communities — suffer disproportionately severe outcomes from highway crashes.

Global Inequity In Road Fatalities (Who Data)

According to the World Health Organization (WHO):
World Health Organization
~92 % of all road traffic facalities occur in low- and middle-income countries, even though these countries have only ~60 % of the world's vehicles.

Displacement And Community Disruption (Urban Infrastructure Examples)

While specific numbers vary by project, historical cases illustrate highway impacts on vulnerable communities:
In the Cross Bronx Expressway (USA), an estimated ~1,500 residents were displaced, and the neighborhoods it runs through are among the poorest and predominantly minority areas in New York.

Environmental Burdens On Vulnerable Communities

Studies of environmental justice show that traffic-related air pollution (TRAP) and other highway externalities disproportionately burden low-income and minority communities:

Research has documented that communities of color and low-income neighborhoods are disproportionately exposed to traffic-related pollutants adjacent to major roads.

Structural Bias In Planning And Built Environment

Multiple analyses indicate systemic inequities:

Highway planning historically has targeted minority and disadvantaged groups, often displacing thriving communities and reinforcing segregation patterns.

Vulnerable road user share of deaths

>50 % of road traffic deaths

Cumulative and Synergistic Effects in Highway Development

A cumulative effect occurs when multiple impacts add up over time or space.

Mathematical Representation:

If impacts are independent:

$$Itotal=I1+I2+I3+\cdots+InI\_\{total\} = I\_1 + I\_2 + I\_3 + \backslash dots + I\_nItotal=I1+I2+I3+\cdots+In$$

Where:

- I1I_1I1 = Deforestation impact
- I2I_2I2 = Air pollution impact
- I3I_3I3 = Noise impact
- InI_nIn = Other environmental impacts

Example (Numerical Data)

- Suppose a highway project causes:
  • Deforestation = 200 hectares
  • Annual CO_2 emission increase = 50,000 tons
  • Noise exposure increase = 5,000 people
  • Surface runoff increase = 10%
- If over 10 years:
  Total CO_2=50,000×10=500,000 tons\text{Total CO_2} = 50,000 \times 10 = 500,000 \text{ tons}Total CO_2=50,000×10=500,000 tons
  Total forest loss (with expansion)=200+50=250 hectares\text{Total forest loss (with expansion)} = 200 + 50 = 250 \text{ hectares}Total forest loss (with expansion)=200+50=250 hectares
  This is a cumulative environmental burden.

Synergistic Effect (Multiplicative / Interactive Impact)

A synergistic effect occurs when combined impacts are greater than the sum of individual impacts. Evaluation and Weighting of Mathematical Matrix Criteria

After weighting and valuing for each of the main and complementary criteria by experts, the importance of mutual effects was assessed by a series basic index and supplementary index. The intensity of interaction between project activities and environmental components was evaluated using seven major criteria, magnitude and duration of effect, more effects, cumulative effects and differences of opinion, as well as the criterion of compensation effect. Calculation of Basic Criteria

Basic criteria include magnitude, extension and duration of effect. First, the experts used the matrix base scores for each of the three options, and finally, applying the researcher's opinion and analyzing expert opinions, the final weight was applied to the matrices. Basic criteria are essential for defining interactions. While the complementary criteria are the criteria that complete these descriptions, they can do not described in the description of the effects. Scoring is based on the scaling scale from 1 to 9 [1]. From these two profiles (base and complementary), the quantitative effect between the two variables i and j can be estimated. The variables i and j represent, respectively.

environmental components and the activities of the project. Equation (1):

$$EDij = 1/ 27\ (Mij + Eij + Dij)$$

In these equations: the magnitude of the effects; the extent of the effects; the duration of the effects; the components of the environment; the activities of the project

Calculation of Complementary Criteria

Complementary Criteria Include the combined effects of synergy, cumulative effects and controversy that there is about the effects. Scores are considered for each of the complementary criteria in the range of 1 to

Equation (2)

$$SACi\ j = 1/27\ (Sij + Aij + Cij)$$

In these equations; Sij more effects; Aij cumulative effects; Cij disagreements; i environmental components; j project Activities

Calculation Of Interactions Between Project Activity and Environmental Components (Iij)

After calculating the baseline and complementary criteria,the results were included in the studies of Bukhorkoes Tapiaet al. and their results were used to calculate the significant effects.

Calculate Meaningful Effects

In this stage, the results of complementary criteria, basal measures, interactions and compensatory effects were used to calculate meaningful effects according to the studies of

Bukhorvoes Tapia et al. in the following equation.

$$Phi = 1\text{-}SACij$$

Gij: Significance level, Tij: Compensation factor, Iij:

Effective interaction between project activity and

environmental components.

Calculation Of Compensation Profile

This equation is used to obtain meaningful effects.

$$Fij = 1 - Tij/9$$

Finally, we divide the effects into four groups: [2].

The Little effect (0.0-0.24),

Moderate effect (0.25-0.49),

Great effect (0.50-0.74),

high effect (1- 0.75).

Based on the above division, the final conclusion is made.

III. RESULT AD DISCUSSION

It is established that the amount of impurities in the atmosphere is influenced by the intensity of vehicle traffic, the width of streets and highways, the time of day, the weather, and the type and density of buildings, building heights, and the extent of landscaping when examining the level of exhaust gas pollution of the atmosphere.

Hourly observations are conducted on all working days from 6 a.m. to 1 p.m. or from 2 p.m. to 9 p.m., with morning and evening hours alternated. Once or twice a week, observations are made at night.There are a lot of dangerous contaminants released. In addition, points are arranged in areas where two or more streets meet with heavy traffic, as well as under bridges, overpasses, tunnels, tight parts of streets, and roads with multi-story buildings, where dangerous contaminants gather owing to insufficient dispersion.

Device placement locations are chosen from two locations: outside the sidewalk, half the width of the one-way road, and in the center of the separating strip, if there is one. The distance between the point farthest from the highway and the building's wall must be at least 0.5 meters. Observation posts are situated at sidewalk margins and at intervals of 0.5, 2, or 3 times the highway width on streets that cross a major highway [6].

A number of important factors support the selection of pollutants, including carbon monoxide (CO), nitrogen monoxide (NO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and others (Fig. 4 and Fig. 5), to investigate the environmental effects of vehicle exhaust gases on specific sections of urban streets: direct source from automobile emissions; substantial health impact; widespread in urban environments; and potential for management and reduction.

Table 1. Shows the results of calculating basic index (MED).

Parameters	Excavator	Leveling	Building a way	Transportation	Waste and waste disposal
Air pollution microclimate	0.70	0.33	0.48	0.44	0.29
water pollution	0.14	0.03	0.14	0.07	0.74
Soil erosion	0.66	0.37	0.33	0.22	0.44
Noise pollution	0.33	0.37	0.48	0.48	0.03
Ground deformation	0.70	0.29	0.55	0.18	0.44
Habitat destruction	0.51	0.25	0.59	0.22	0.48
Reduce biodiversity	0.25	0.18	0.51	0.51	0.40
Public health threat	0.14	0.14	0.11	0.22	0.62

Table 2. Results from Calculation of Basic index (SAC)

Parameters	Excavator	Leveling	Building a way	Transportation	Waste and waste disposal
Air pollution microclimate	0.11	0.11	0.14	0.18	0.07
water pollution	0.14	0.14	0.11	0.11	0.11
Soil erosion	0.11	0.11	0.07	0.14	0.07
Noise pollution	0.11	0.11	0.11	0.11	0.07
Ground deformation	0.11	0.11	0.11	0.07	0.14
Habitat destruction	0.40	0.07	0.25	0.07	0.07
Reduce biodiversity	0.11	0.07	0.59	0.11	0.07
Public health threat	0.07	0.07	0.11	0.07	0.40

Calculation of Complementary Criteria

In order to calculate the complementary criteria, due to effects of synergy between the variables, the cumulative effects and controversy of the scores were taken according to the conditions of the region and compared to the project activities and environmental components, these results are obtained using equation (2) And is presented in the table 2.

Division Of Significant Of Effects

Results of meaningful effects in 4 categories: L: Low; M: Medium; H: High; VH: Very high.

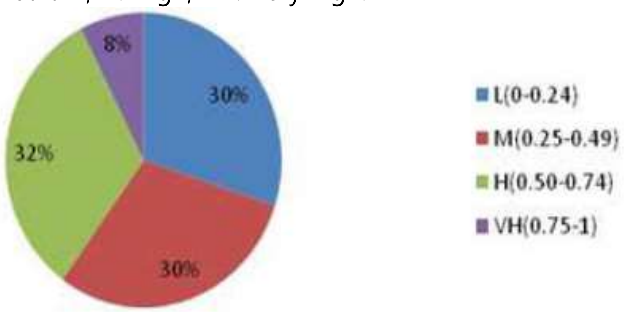


Figure 1 Project Impacts on the Environment, without Compensation.

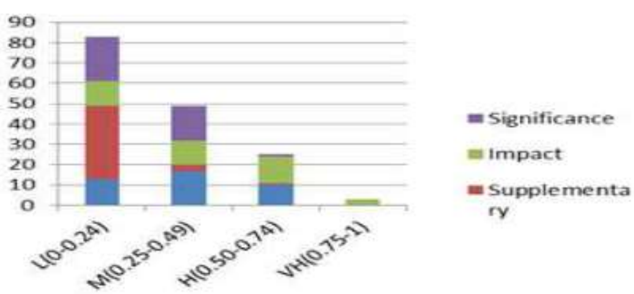


Figure 2. Overall assessment of environmental impacts using mathematical

On the other hand, the results show that for the basic factors, the most interactions are related to the middle and low classes and for complementary factors, the most interaction effects are low effects Assessing the effects of the Ghaen Steel Project shows that this industry has no negative impact on the region's environment. In order to reduce the possible negative impacts, it is suggested the corrective actions take place and to assess with more accuracy fuzzy methods are applied.

IV. CONCLUSION

The study of thematic records of industrial projects in Iran shows that in the past planning, the importance and values of natural resources and the environment have not been considered and have been designed and exploited without considering environmental considerations. The result of such measures has been the occurrence of various pollutions and severe destruction and depletion of environmental resources. Environmental assessment can be considered as mechanism that has been shown to be effective in providing short and long-term planning for both short and long term planning, through the provision of appropriate and logical ways of using human resources and natural resources.Knowledge of the community as a whole increases as the environmental assessment relates to the planning process.

Project timelines can also reduce costs in scheduled times. As a result, the pressure on government finances decreases. On the other hand, environmental assessment, due to accelerated planning, will protect more resources and prevent irreparable effects on the environment and natural resources. The results show that if the compensation profile is not applied, the sum of the effects in the first three classes is almost equal, that's mean without compensation index, low, medium, and large effects are equal to each other. This table is intended only to illustrate the role of the compensation profile. The compensation sheet specifies how much the effects can be adjusted and reduced. Activities that reduce the effects of the work can be done using a filter to reduce air pollution. General diagram of the classification without affecting the compensation factor: on the other hand, with the effect of the recurrence and reconsideration factor, we find that many of the negative effects are reduced, Table 8 shows that the effects are low and moderate, and many and very large classes make a small contribution, so that a very high class It is zero and does not include any of the project's activities in this category. Model number 2 shows this difference. General diagram of classification with effect compensation factor

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