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Environmental, Bio-Social and Economic Impact of Road Construction at Kunjwani-Nagrota Bypass Highway, Jammu Dist. (J&K), India.

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Abstract
Road infrastructure is one of the key components of development of any area. In as much as new roads bring development to previously underdeveloped areas, sometimes this development can cause substantial effects on the subtle environments and the lives of the people living near or using the road.
The present study finds that development of the Kunjwani-Nagrota bypass highway has had various alterations to the social, economic and environmental state of the households and businesses/institutions located along the road. This change have been mostly positive especially with regards to the increased business prospects and greater markets but found to be negative in reference to the environment and in specific vegetation and wildlife as most of the places under study were experiencing unplanned development of small businesses and investments.
The researcher endorses the use of environmental impact assessment to be used to a means before the instigation of such projects and monitoring done during the development of the road projects in order to reduce loss of wildlife and eco-balance.

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I. Introduction

Roads are the backbone of any nation's economy and welfare, as human development is expanding, more roads are being constructed in today's world for transportation on a daily basis. Construction, maintenance and improvement of roads result in significant exploitation of natural and physical resources. Hence, there is a need to study multiple factors for road projects, which can directly or indirectly impact the environmental and social characteristics of the communities and some of these factors include contamination of soil, air pollution, water quality, excessive noise, poor drainage, endangerment of local flora and fauna, loss of livelihoods, displacement of population etc. (Jashmed et al.,2018). The impact of a new road has both direct effects as well as indirect effects. The direct effects involve increased mobility, reduced travel time and better connectivity while the indirect effects consist of structural changes in the economy due to enhanced opportunities which would result from increase in mobility arising from the development of infrastructure (Socio-economic Impact of National Highway on Rural Population, Asian Institute of Transport Development, 2011). Apart from this some negative effects also seem to be there such as road traffic accidents and instances of shift in population demographics. Building of roads have shown to interact with climate in many ways, especially in urban areas which experience increase in temperature and the process called urban-heat-island effect, which sometimes increases the chances of rainfall (Shepherd et al., 2002, Han et al.,2014). The physical presence of roads and railroads in the landscape creates new habitat edges, alters hydrological dynamics, and disrupts natural processes and habitats as studied by Seiler, A. (2001). Noise from cars can impact birds by disrupting acoustic communication and interfering with warning signals, leading to bird population declines in the proximity of roads (Rheindt, F.E., 2003).

Studying the bio-social impact of roads is also an important area of study in Conservation Biology, Environmental and Social Science, as the impacts often extend far beyond the surface of the road itself. Because of the fact that highway road transportation interacts with all linkages of society, be they social, economic, cultural, environmental, etc. it is imperative to study changes in these directions as well. The present study shall focus on changes in wildlife, green cover and social habits brought in the small community along the Kunjwani-Nagrota bypass highway. The mid-way point between Kunjwani and Nagrota is situated at the latitude of

32.762474 and longitude of 74.886079. Nagrota is located nearly to North-East side to Kunjwani approximately. The bearing degree from Kunjwani to Nagrota is 34º.

The analysis and reviews undertaken during the study will generate a considerable amount of data and information and there shall be a number of resulting issues that could be discussed and investigated further.

Fig. 1: Map of the study area.

Objectives of the study

The study approach is to assess and categorize various impacts of the road, after a lapse of a period of 12 years (from 2019-2021), in accordance with bio-social factors like the impacts on wildlife of the area, general vegetation diversity, tree replantation, economic growth (with respect to shops and other business enterprises) and benefits and adverse effects to the local population. For the purpose the road highway from Kunjwani to Nagrota shall be divided into three broad zones of study, viz., urban, semi-urban and rural.

The survey in this study shall help in analysing the standard of public space and environment provided by improved road and its maintenance thereof (e.g. road condition, proper fencing of the highway, clear road signs and cyphers, pedestrian walkways/footpaths, cycle tracks, bus stops with rain sheds, CCTV, adequate street lights, maintenance of the road divider, infrastructure for disabled/physically challenged people etc.) that impact directly on the quality of life.

The study would also help in analysing various factors for the population residing in the area and using the road who can be affected in every aspect including noise and vibration, air quality, visual amenity, cultural

aspect, wildlife and landscape of the area, physical fitness of the road, accident rate, security, community and comparative accessibility and the like.

II. Methodology

The study is exploratory in nature under which the survey technique was employed for the collection of data. The research is based on primary as well as secondary sources. Collection of Primary data was done through the field survey. Collection of secondary data was carried out from different sources such as Records of the Government Institutions (Central and State), Municipal Records, Department of Forestry, Soil Conservation Department etc., Newspapers; studies conducted by other Research Agencies/Institutions, books and journals dealing with this subject and academic studies conducted by different universities in the selected field.

The following methods ware employed during field study:

Photography and direct observation: Photography is particularly useful as it captures the real situation on the ground that is relevant to the study. Direct observation involves site viewing of the proposed study location to see the extent of development on it and the condition of the existing road as shown.

Scheduled interviews: This involves face-to face interaction between the consultants/experts and the stakeholders of the project.

Interviews have been carried out in the study area by the use of questionnaires, to find out all the views from the stakeholders on the proposed road that included general public, land economists, shopkeepers, agriculturalists, frequent travellers on the road and rural sociologists.

The main objective of the study was to find out if the stakeholders support the project and have no objection to it. The questionnaire also included questions on the acceptance of the road project and whether the project has caused any negative impacts on the following:

a) Businesses; b) Ecology of the area; c) Human environment; d) Recreational and leisure facilities; e) Public health and safety; f) Effect on water resources and quality; g) Effect on the soils; h) Effect on road transport and; i) Waste disposal. The said parameters will be directly mentioned to foresee any intense negative impacts.

Statistical technique employed

In the present study, we applied simple statistical technique for analysis of data which is called calculation of frequencies. In this procedure we mark tallies against each item in the questionnaire so as to workout frequencies for both negative as well as positive responses (Yes/No) to be divided by the total sample and then multiplied by 100.

$$\text{Percentage} = \frac{\text{No. of responses}}{\text{Total no. of samples}} \times 100$$

III. Results and discussion

In the present study a total of 148 individuals participated from three zones of study area viz., urban, semi-urban and rural. These include general public, land economists, shopkeepers, agriculturalists, frequent travellers on the road and rural sociologists. The different parameters studied during the study period were as follows:

Characteristics of the respondents

In the present study both male (56.75%) and female (43.24%) individuals of different age groups took part in the survey. Their age wise percentage is shown in Figure 1. Most of the individuals who participated in the present study were educated, with 76% had education up to graduation and post-graduation level. However, 19% of the respondents had attained secondary school level education and 5% had primary level of education respectively (Figure 2). The different parameters studied during the study period were as the follows:

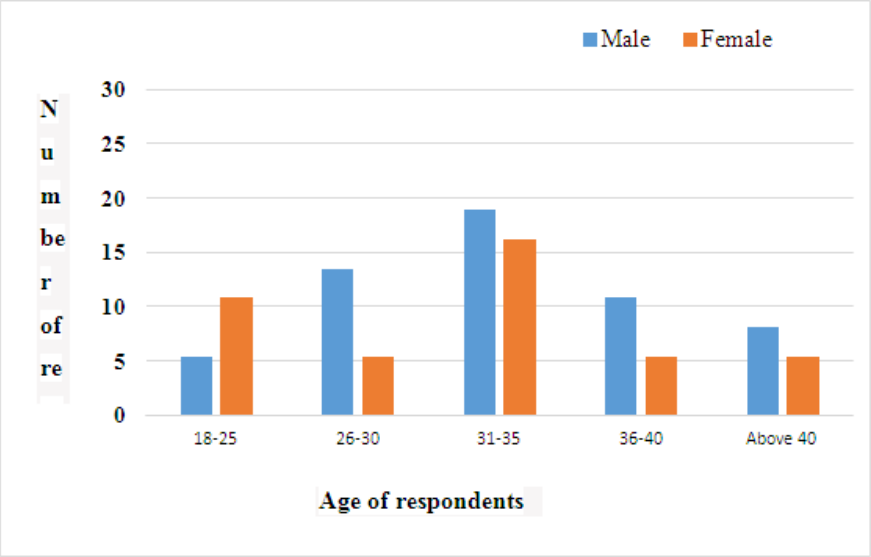


Figure 1: Age-wise percentage of different study participants.

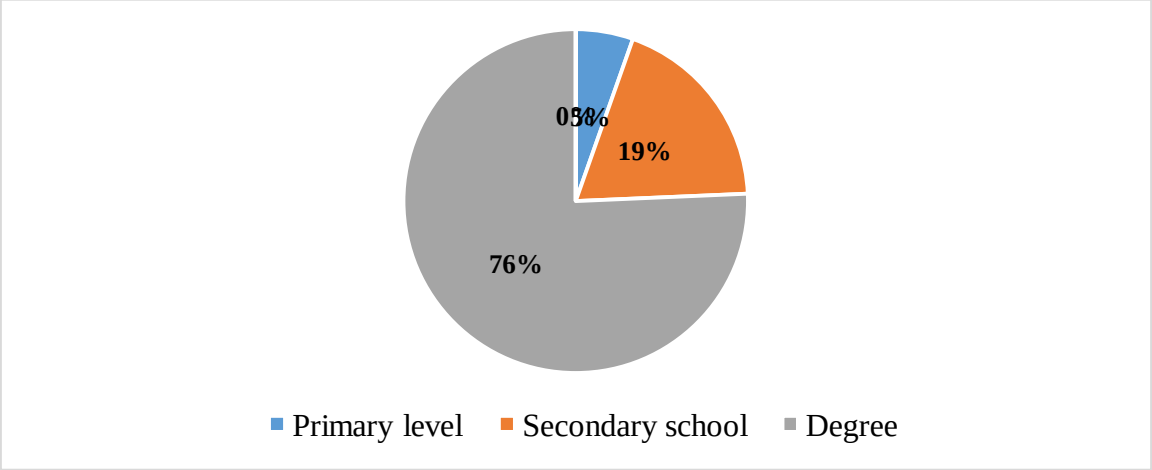
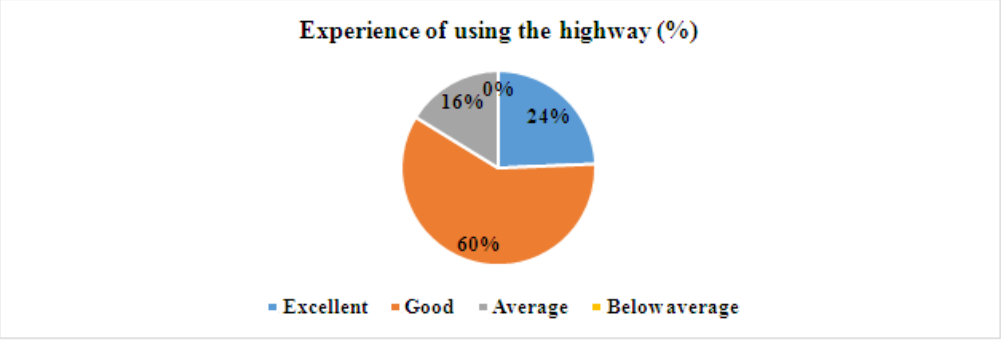


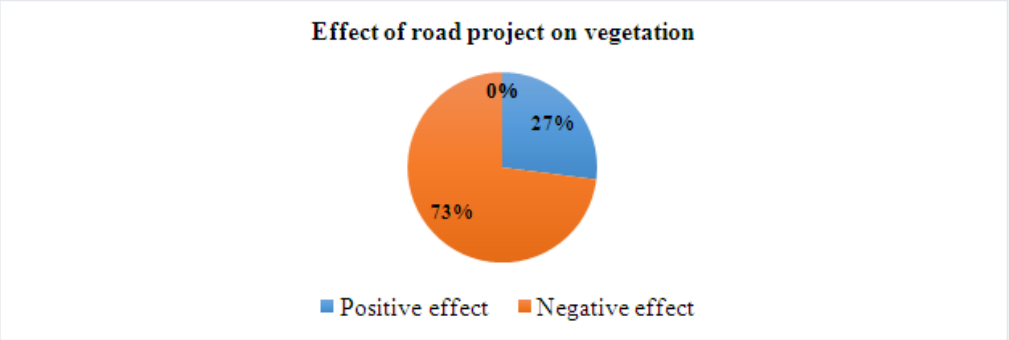
Figure 2: Qualification of participants.

1) Experience of using the highway: Many people have the opinion that the experience of using the new highway is good (60%) and 24% of respondents have view that experience was excellent as the new road is wider and smooth which reduces their travel time. However, 16% have average experience.

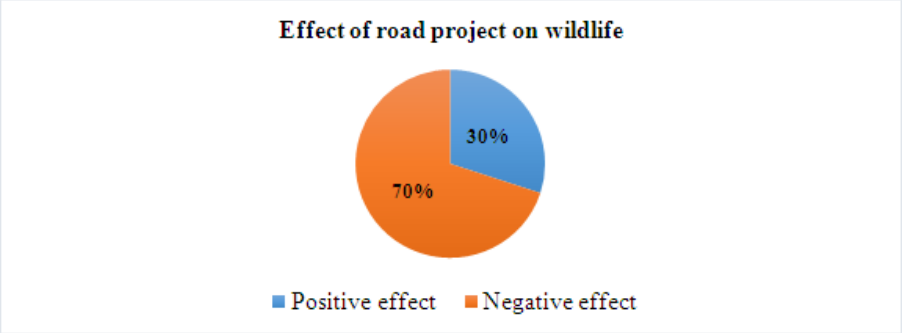


2) Effect of road project on major environmental factors along the road:

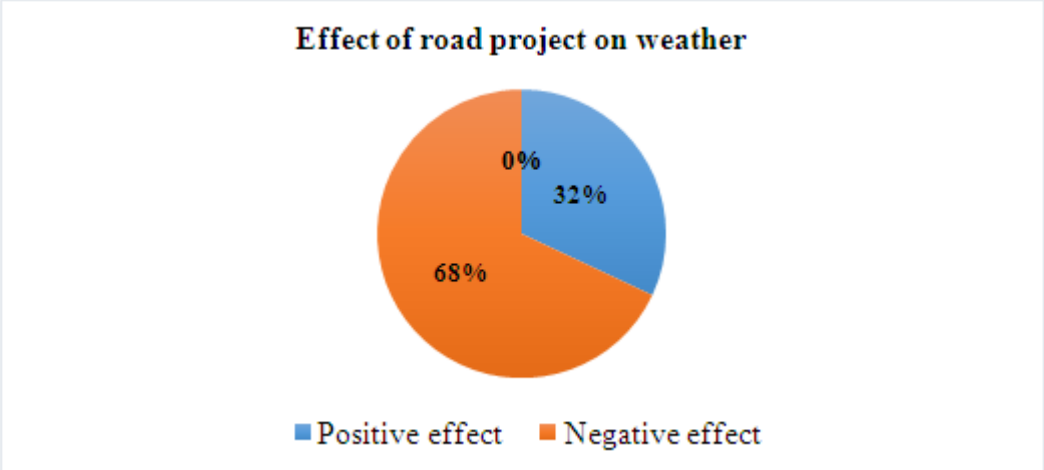
i) Effect on vegetation: According to the survey it was found that 73% of the people have the view that there is negative effect on the vegetation along the road as much of the vegetation cover was removed from the area for the purpose of establishment of new buildings, houses etc. after the completion of road project.



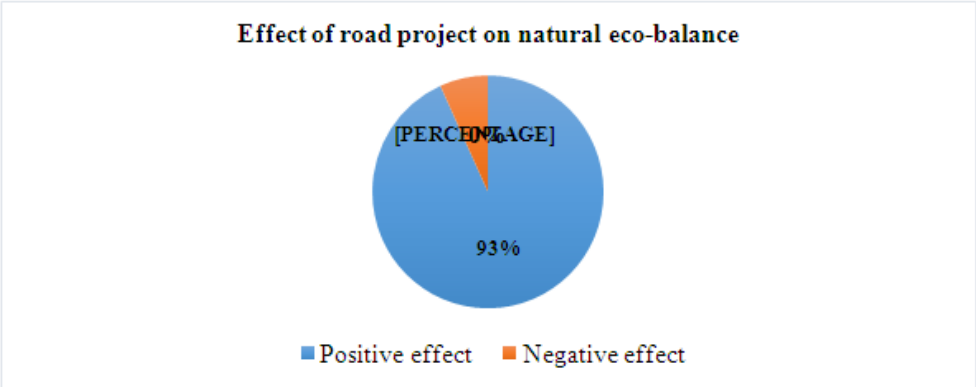
ii) Effect of road project on wildlife: After survey it was found that about 70% people have the opinion that there is negative effect on wildlife as the large stretch of the road passes through the area that was once with dense forest cover. Therefore, due to the construction of new broad road, many restaurants, government offices, shopping complexes etc. were established there which led to the fragmentation and direct interference of humans with their natural habitats.



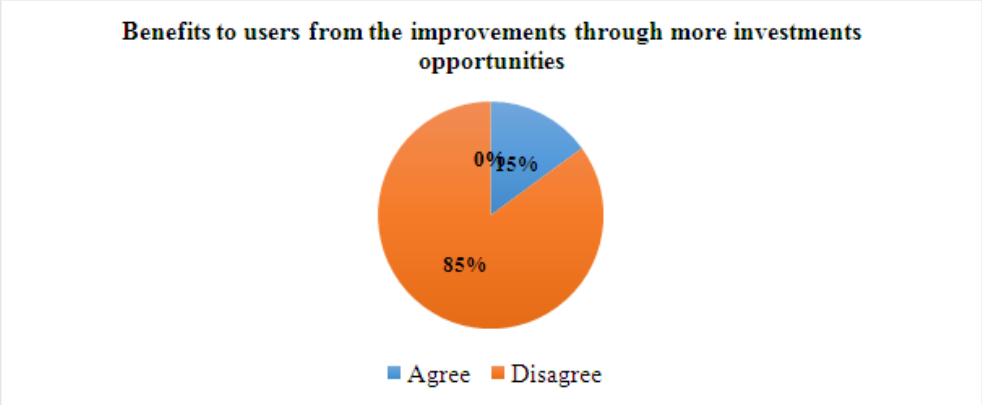
iii) Effect of road project on weather: According to the survey it was found that 68% of the people have the view that there is negative effect on weather and 32% have the opinion that positive effect on weather conditions.



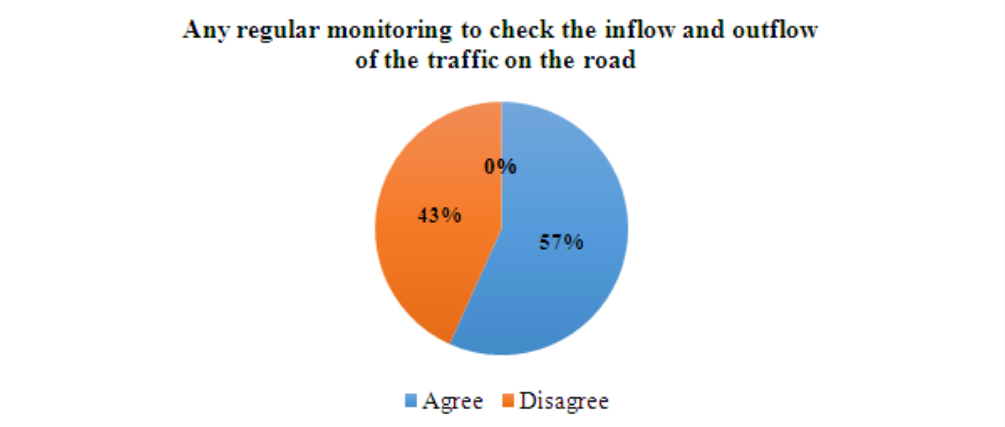
iv) Effect of road project on natural eco-balance: About 93% respondents have the view that there was not much influence on natural eco-balance due to the road project.



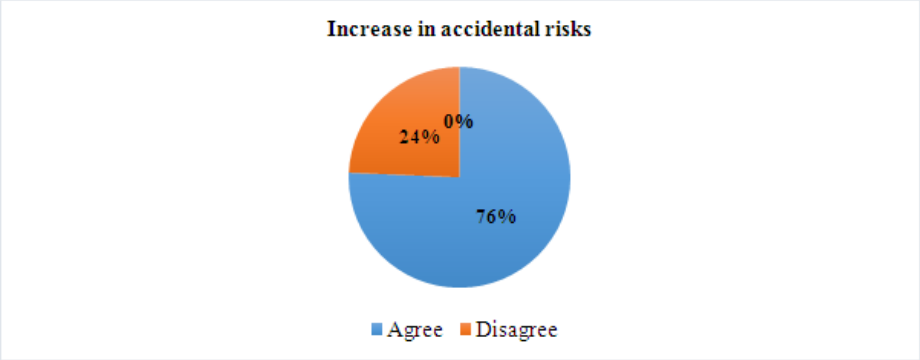
3) Benefits to road users from the improvements through more investments opportunities: The road users are fully benefited by improvements that has taken place along the road, about 85% of the people agree with this statement and only 15% disagreed.



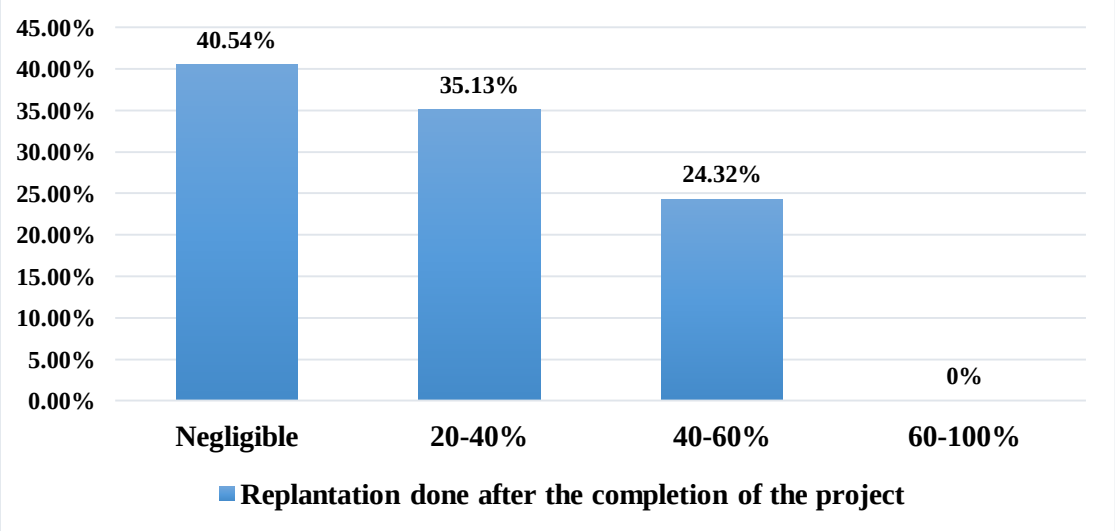
4) Any regular monitoring to check the inflow and outflow of the traffic on the road:
Only 57% of the road users agreed with this statement and rest 43% people disagreed, and have the opinion that only in a limited area such monitoring to check the inflow and outflow of traffic on the road was watched out.



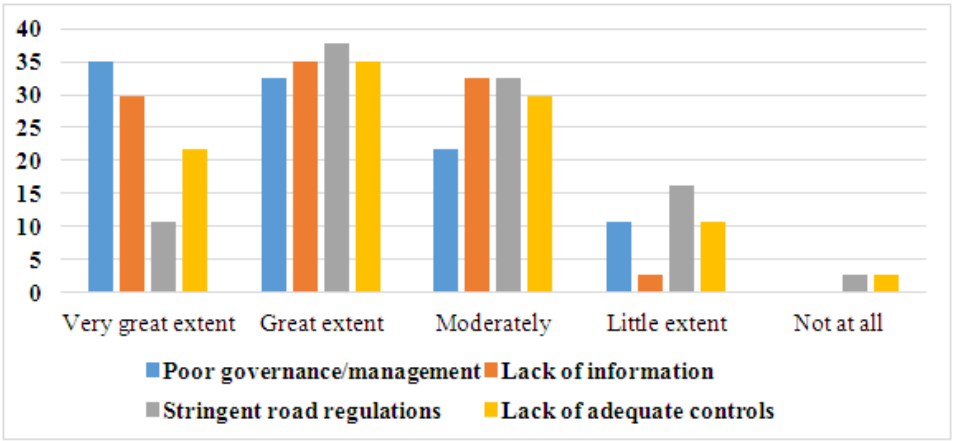
5) Increase in accidental risks: Most of the people, about 76% agree that accident risks have increased with the construction of new wider road due to high speed vehicles.



6) Replantation done after the completion of the project: All the study participants have the opinion that many trees and vegetation was cut down and removed during the construction of the road, and many road users (40.54%) said there is negligible amount of replantation done, 35.13% road users said 20-40% replantation have done followed by 24.32% who said 40-60% replantation have done after the completion of the road, as shown in bar graph below.



7) Following factors affect the extent to which the environmental problems were experienced along the superhighway:



IV. Discussion and conclusion

Table showing positive and negative impacts after the road project in adjoining areas:

Major dimensions	**Positive impacts (Kunjwani to Nagrota)**	
Social	Improved social interactions	social network improved the social interactions between the residents.
Spatial	Improved accessibility	improved and easier accessibility to basic facilities and services to local residential people and road users.
	Reduction in traffic jams	New broad road bypasses the city, by this less traffic load is observed in city area.
	Reduction in travel time and cost	Shortening of the distance for travellers to reach the destination, better connectivity, saving of fuel
Economic	Increased commerce	Improved business and market base due to opening of new shopping malls, shops, restaurants etc.
	Increased employment opportunities	Due to opening of new shopping malls, shops, restaurants, hospitals, education institutes new job opportunities increases
Environmental and	Diverted traffic away from city	Due to this relieving the noise air pollution from the city

Major dimensions	**Negative impacts (Kunjwani to Nagrota)**	
Social/Spatial	Displacement of people	Displacement of low-income people with high-income people, increase in land prices and house rents
	Conversion of land uses	Change in agricultural/residential area into commercial area (loss of farmland)

Economic	Disruption of local business, malls,	Due to establishment of big
	customers and income	shops, marriage halls, business of local shops has been affected badly
Environmental	Impact on vegetation, wildlife	Removal of vegetation along the weather roads, led to increase in air and noise pollution, habitat destruction or fragmentation road accidents of animals, act as barriers to animal, movements, increase in temperature in urban area

The present study was done to investigate how the construction of new Kunjwani-Nagrota bypass highway impacted the environment and bio-social life. After the expansion of the road, there was increase in perceived accessibility for people using that road. The Nagrota highway not only improved basic accessibility services but also opened up smooth connectivity to Jammu. With the road expansion, travelling time had decreased since the highway bypasses the Jammu city, and therefore this area is now becoming famous for residential and commercial purposes. In both Sidhra and Nagrota the improved accessibility of basic facilities and services have been seen after the road project. This follows other studies in which it was found that roads act as a means of enhancing socio-economic needs of societies by providing access to basic facilities and services (Gibson and Rozelle 2003; Pradhan and Bagchi 2013). A lot of vehicle pollution have been reduced from the Jammu city, since before the road project vehicles which had to move towards the upper part of J& K had to pass through the city. Also more job opportunities were seen in that area now, due to increased commerce and development projects along the roadside. Opening of malls, shops, restaurants, car show rooms, sanitary show rooms, marriage halls, hotels, residential colonies, educational institutes, hospitals etc. has transformed the area from rural to semi-urban and at places from semi-urban to urban along the highway. Similarly, as reported by Khanani et al., 2020 the roads served as an impetus for the influx of both high and middle income people into the peri-urban communities, and this changed the urban form of residential development patterns. Also, Tennoy et al., 2019, reported that people saw the improved road availability as an opportunity for growth and development, and bought large pieces of land in areas close to the roads, for development and businesses.

In addition to the positive effect of road, many negative effects have also been seen such as since the road passed through the forest and mountains, a large deforestation was done and not much work had been done in the name of afforestation. Mountains were cut, which divided the forest into two parts and thus disrupted the path of many animal species residing there and resulted into many animal accidents, which is in agreement with study by Underhill JE and Angold PG, 2000, they reported that on the International scale, roads and traffic are a major cause of death to larger mammals. Further, a lot of disputes have occurred in that area between revenue department, forest department and people who are living or doing businesses there as many illegal activities are seen to be occurring. There was seen a sharp increase in the value of land. Forest land changed to commercial land, lot of small scale business is seen along the highway like vegetables and fruits vending, welding shops etc. Our study is in agreement with a study by Khanani et al., 2020, in their study on Accra city they reported that the conversion of land uses emerged in the communities after the road project they also revealed that agricultural lands were converted into commercial and residential uses over time.

V. Conclusion

This study aimed to investigate the effect of Kunjwani-Nagrota bypass highway on environment, bio-social and economic life of people has reflected that such road projects have come with both positive as well as negative effects. In present study, the road project created many changes which included displacement of people, disruption of small scaled businesses along the road sides during construction phase which in turn led to economic and spatial changes. Removal of natural vegetation, cutting of mountains which lead to habitat loss and fragmentation, increase in noise and air pollution, increase in land prices, conversion of forest or agricultural land into residential land all these changes effected in negative way. Also along with negative effects this road project come with many benefits like, it created many developments along the road sides like

increase in commerce, improvement in accessibility, increases employment opportunities and reduction in travel time.

It is therefore suggested that taking precautionary measures and adopting eco-friendly technologies can reduce these impacts. Also, the mitigation measures should be considered that would be sustainable and long term robust for the proposed road construction projects.

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