



## Impact assessments of road development project on flora and fauna recorded from Narshan to Dehradun (Uttarakhand) India

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### Abstract

The present study includes impact assessment of road development project on flora and fauna that has been recorded from Narsan to Dehradun Uttarakhand, India. Study includes the survey of existing green plants on the both side of National Highway from Narshan to Dehradun and Identification of different species and assessment of socio-economic importance of green plants. The methodological approach was divided into four main steps: flora and fauna loss impact assessment, mitigation, monitoring and recommendations. At the beginning of the study a preliminary survey was conducted in the study area for research design and the study was includes key information interviews and elderly and knowledgeable people, group discussion and map and transect walks. The total length of highway road in Uttarakhand is 110 km within two districts Haridwar and Dehradun. The major impact of road widening network was on flora and fauna that involves the removal of trees and destruction of animal's habitat. As a result about 19934 trees are required to be cut for the proposed project on the left side and the right side due to the proposed widening. This study would provide integrated approaches to mitigate and manage to achieve sustainable road development project in India or abroad.

*Key words: Environmental impact assessment, flora and fauna, mitigation and monitoring*

### Introduction

India has planned to improve the road network by providing better quality and safer roads to the users in sustainable manner. The main objective of the road/ highways Environmental impact assessment is to alleviate the current unsafe and congested conditions of the road network connecting the villages and towns by providing better quality and safe roads to the users in a sustainable and environment friendly manner (Byron.*et al.*, 2003). The major impact to improve the widening road network project on flora and fauna that involves the removal of trees and destruction oh animal's habitat (Treweek *et al.*,1993). The big number and the major density of total flora and fauna removal within the road widening is due to having national park, sanctuaries, biosphere reserve and the plantation along the road side or any other forest area on the way (Southerland, 1995). The forest of Haridwar and Dehradun of Uttarakhand and its surrounding area come under sub-tropical

deciduous forest of lower Shiwalik range. The forests are not much dense in U.P as compared to U.K area due to the various developmental and human activities. U.K is having rich flora and fauna because of not much anthropogenic activities as like in other place tourists and road construction pressure make the environment doubtful. Cattle grazing, plant diseases, timber harvesting for medicinal purposes, firewood collection etc are some of the cases of destruction of vegetation in these forests. The present study includes the road widening impact assessment of different impact on flora and fauna that has been recorded from Narsan to Dehradun and its surroundings.

### Materials and Methods

#### Study area

The present study was carried out on the assessment of different impact due to road widening on flora and fauna that has been recorded from Narsan (Uttarakhand boarder) to Dehradun within Uttarakhand state. The total length of road is 110 km within two districts Haridwar and Dehradun.

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## Methodology

A structural survey of existing green Plants on the both side of National Highway from Narshan to Dehradun was conducted that helped to identification of different species Assessment of environment and socio-economic importance of green plants was also carried out of different species.

## Results and discussion

The details of trees and vegetation to be removed for the upgradation, widening and geometric improvement of the project road and their species characteristics are detailed in brief up to towline. For the widening of the project road about 19934 trees and vegetation to be removed (Table-1).The major impact in this project on flora involves the removal of trees to permit construction and to provide clear zone for safety of the road users. Trees located within the toe line (bottom of formation) need to be removed for efficient construction workmanship and more importantly to prevent collision with the trees, in case of accident. Roadside trees with strong and rigid stems can pose

safety hazards. Some trees obstruct clear sight distances. Others have a propensity to overturn when old and are potential safety hazards depending upon age and decay condition. All such trees that are safety hazards need to be clear. There will be a significant, direct impact on cutting of the roadside trees, it includes 1. The loss of shade 2 Loss of tree products 3 Removal of roadside trees will also reduce comfort levels for slow moving traffic and pedestrians.4. The removal of trees would leads to erosion and contributes to the loss of the micro-ecosystems developed on the roadside.5. Besides this trees act as noise barrier, dust absorption, air purifier etc. A detailed tree inventory was carried out of all the existing trees within the corridor of impact. As a result a total of about 19934 trees are required to be cut for the proposed project on the left side and the right side due to the proposed widening. The major trees affected are Babul, Neem, Kadam, Kinkar, Khair, Bakli, Eucalyptus, Aam, Amrood, Shisham, Shagoun, Sal, Popular, Jhingan, Arjun, Jamun etc.(Table-2).

**Table 1: Number of trees are required to be cut for the proposed project on both side due to the proposed widening.**

S.NO	Impact Due To Construction	Number of trees/length
1	Tree & Vegetation felling	19934
2	Total length of road	110 KM

The major impact of road network was on flora and fauna that involves the removal of trees and destruction of animal's habitat. The big number and the major density of total flora removal within the road widening are due to falling Rajaji National park on the way. Raja ji National Park area is rich in wildlife.The planning of proposed road widening project intervention point towards the impacts in the pre construction, construction stages and the operation stage. The subsequent sections deal with the prediction of impacts due to the project on the flora and fauna on the both side of N.H from Narshan to Dehradun that helped to identification of different species. The general environmental impacts on air, land, water, flora and fauna expected due to the proposed upgradation of the project road development. For the impact

assessment on flora and fauna more focus is on Raja ji National Park which is rich in wildlife. For the wild life crossing there is no corridor found along in pre existing road. In new widening project there are two proposed wildlife corridor but there should be more than two wildlife corridor. Forest and wild life in India are under immense pressure due to various kinds of human activities among which indiscriminate illegal cutting and poaching are the most disastrous one. (Forman *et.al*,1998). (Table-3). Besides, mentioned impact on natural environment there will be socio-economic impacts due to disruptions on the social and economic interactions of communities. This involves effect on both the adjacent communities mostly direct as well as the near by community mostly indirect (Table-4).



**Table 2: A detailed tree inventory of all the existing trees within the corridor of impact and their characteristics**

S.No.	Species	Characteristics	No. of Existing trees to remove
1	<i>Azadirachta indica</i> - Neem	Category of wood is. it is dust resistant, gas absorbent. Controls erosion, drought resistant and supports wildlife. Seeds yield <i>margosa</i> oil , which has medicinal properties including being extremely effective in treatment of leprosy and as skin diseases	715
2	<i>Acacia Arabic</i> - Babul	Category of wood. it is dust resistant, water resistant quality and medicinal plant	600
3	<i>Anthocephalus indicus</i> - Kadam	Category of wood, it is dust resistant	1500
4	<i>Acacia farnesiana</i> - Kinkar	Category of wood, it is dust resistant and water resistant quality.	1808
5	<i>Acacia catechu</i> - Khair	Category of wood. It is dust resistant and timber plant.	1400
6	<i>Anogeissus latifolia</i> - Bakli	Category of wood. It is dust resistant and timber plant.	1105
7	<i>Eucalyptus hybrid</i> - Eucalyptus	Category of wood. It is dust resistant and timber plant.	2000
8	<i>Mangifera indica</i> - Aam	Category of wood. It is dust resistant and fruiting plant	900
9	<i>Peridium guajava</i> - Amrood	Category of wood. It is dust resistant and fruiting plant	300
10	<i>Delbergia sisso</i> - Shisham	Category of wood. It is dust resistant and timber plant.	1783
11	<i>Tectona grandis</i> - Shagoun	Category of wood. It is dust resistant and timber plant.	1750
12	<i>Shorea robesta</i> - Sal	Category of wood. It is dust resistant and timber plant.	1333
13	<i>Popular spp.</i> - Popular	Category of wood. It is dust resistant and timber plant.	803
14	<i>Lanna coromandelica</i> - Jhingan	Category of wood. It is dust resistant and timber plant.	1607
15	<i>Terminalia arjuna</i> - Arjun	Category of wood. It is dust resistant and timber plant.	1200
16	<i>Syzygium cumini</i> - Jamun	Category of wood. Vinegar is prepared from juice. It is dust resistant, gas absorbent Controls erosion, is drought resistant.	1130

**Mitigation, avoidance and enhancement**

Prevention or avoidance of impact is better than mitigation of impact. Hence avoidance and reduction of adverse impacts approaches should adopt during the design stage through continue interaction between the design and environmental teams. That will reflect in the designs of the

horizontal & vertical alignment, cross sections adopted, construction methods and construction materials. In-depth site investigations have been carried out so that sensitive environmental resources are effectively avoided, leading to the environmentally best-fit alignment option.



**Table 3: General impact on natural environment of road widening during different phases**

Project Activity	Planning and Design Phase	Pre Construction Phase		Construction Phase					Road Operation	Indirect effects of Operation or Induced development
		Removal of Structures	Removal of Tree & Vegetation	Earth Works Including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Asphalt & crusher plants	Sanitation & waste (labour campus)		
Env. component Affected	Land Acquisition	Removal of Structures	Removal of Tree & Vegetation	Earth Works Including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Asphalt & crusher plants	Sanitation & waste (labour campus)	Vehicle operation	
Air		Dust generation during dismantling	Reduced buffering of air and noise pollution, Hotter drier microclimate	Dust generation	Asphalt odour	Noise, dust, pollution	Noise, soot, odour, dust, pollution	Odour / smoke	Noise, dust, pollution	Other pollution
Land	Loss of productive land	Generation of debris	Erosion and loss of top soil	Erosion and loss of top soil		Contamination by fuel and lubricant compaction	Contamination compaction of soil	Contamination from wastes	Spill from accidents deposition of land	Change in cropping pattern
Water	Loss of water sources	Siltation due to loose earth	Siltation due to loose earth	Alteration of drainage break in continuity of ditches siltation water pools in quarries	Reduction of ground water recharge area	Contamination by fuel and lubricants	Contamination by asphalt leakage or fuel	Contamination from wastes overuse	Silt contamination by fuel, lubricants and washing of vehicles	Increased contamination of ground water
Noise		Noise pollution	Noise pollution due to machinery	Noise pollution		Noise pollution	Noise pollution		Noise pollution	Noise pollution
Flora		Loss of biomass		Lowered productivity loss of ground for vegetation		Removal of vegetation	Lowered productivity use as fuel wood	Felling trees for fuel	Impact of pollution on vegetation lowered productivity toxicity of vegetation	
Fauna			Disturbance habitat loss	Disturbance		Disturbance	Disturbance	Poaching	Collision with traffic	Distorted habitat

For this trees should be avoided at the design stage. As part of the effort it is also considered to remove tree up to toe line only. However the road alignment can adjust to minimize tree felling. Alignment can adjust to save the Green Tunnel. In case of both side trees not having sufficient clear distance, one side trees can save (table-5).

### Conclusion

This research paper summarises the findings of the study conducted on the assessment of different

impact due to road improvement project construction on flora and fauna that has been recorded from Narsan to Dehradun in Uttarakhand state. The total length of road development project in Uttarakhand is 110 km within two districts Haridwar and Dehradun. The major impact of road network was on flora and fauna that involves the removal of trees and destruction of animal's habitat. As a result about 19934 trees are required to be cut for the proposed project on the left side and the right side due to the proposed widening.



The big number and the major density of total flora removal within the road widening are due to falling Rajaji National park on the way. Raja ji National Park area is rich in wildlife.

The number of wild life corridors should be more because more the wild life corridors less the poaching, hunting, man and animal's conflict and animal accidents. Forest and wild life in India are

under immense pressure due to various kinds of human activities. Unsustainable road developmental project can have some very disturbing impacts on the environment. It can cause disturbance of ecosystems and upset the ability of natural processes to replenish it. These problems need integrated approaches to mitigate and manage to achieve sustainable road development project

**Table- 4: General impact on social and cultural environment during different phases**

Project Activity	Planning and design phase	Pre Construction Phase			Construction Phase					Operation	
		Land acquisition	Removal of structures	Removal of trees & vegetation	Earth works including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Asphalt and crusher plants	Labour	Direct	Indirect
Env. Comp onnt Affected	Design decision & Implementation policies									Vehicle operation	
Agricultural land		Change in land prices	Loss of land economic value	Loss of standing crops	Loss of productive land			Dust on agricultural land reduced productivity			Conversion of agricultural land
Building and built structures			Loss of structures, debris generation, noise, air pollution		Noise, vibration may cause damage to structures		Noise, vibration may cause damage to structures	Dust accumulation on building and structures		Vibration and noise	Change in building use and characteristic
People and community	Anxiety and fear among community	Displacement of people psychological impact on people loss of livelihood	Loss of shade & community trees loss of fuel wood and fodder, loss of income	Noise and air pollution		Odour and dust	Noise and air pollution, collision with pedestrians livestock and vehicles	Air and noise pollution and discomfort	Community clashes with migrant labour	Noise pollution risk of accident	Induced pollution
Cultural assets			Displacement loss of structure from RoW	Loss of sacred trees	Noise, vibration may cause damage structure		Damage from vibration & air pollution	Dust accumulation		Damage from vibration & air pollution	
Utilities and Amenities			Interruption In supply				Damage to utility and amenities	Dust accumulation on water bodies	Pressure on existing amenities		
Labours Health & Safety					Increase of stagnant water and disease	Asphalt odour and dust	Collisions With vehicles, pedestrians and livestock	Impact on health due to inhale of dust	Increase in communicable Diseases	Collisions pedestrians & livestock	



**Table 5: Flora and fauna mitigation**

Sr.No.	Item	Impact	Impact (Reason)	Mitigation/Enhancement
1	Forest area	Direct impact	Forest area	Afforestation and transplanting of plants
2	Wild life	Direct impact	Wild life habitat	Construction Wildlife corridors
3	Trees cutting	Direct impact	Increase in soil erosion, silting of water bodies, dust and noise pollutions of shade & loss of tree product	Maximum deviation in alignment design to save the road side trees. Compulsory tree plantation in the ratio of 1:2, i.e. for each tree cut ,two saplings will be enforced however avenue plantation along corridor is also proposed
4	Vegetation	Direct impact	Increase in soil erosion, silting of water bodies, dust pollution	Clearing and grabbing will be minimized and sprinkled with water to reduce dust pollution

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