POST CONSTRUCTION EFFECTIVENESS OF KATHMANDU- NAUBISE ALTERNATIVE ROAD

Anjana Bhatta

Email Address: anjana.bhatta@yahoo.com

Abstract

Transportation is the backbone of the economic development of any developing country. Therefore, Nepal has emphasized on the construction of new roads both in the rural and urban areas. But there are various types and degrees of environmental problems associated with the construction of roads in Nepal. Kathmandu-Naubise Alternative Road has been taken in the case study for the research work. The project directly deals with the Twelve Environmental issues and their performance indicators which are contain in EMAP. This study emphasizes on the mitigation measures implementation in the project. This study has evaluated the degree of effective implementation of mitigation measures.

The study has evaluated the arrangement in the project design and implementation aspects. It is concluded that the enforcement in the implementation is the key to the success of the project.

***Keywords**: Transportation, EMAP, Environmental Issues, Mitigation Measures*

1. Introduction

Roads often bring significant economic and social benefits, but they can also have substantial negative impacts on communities and the natural environment. As we become more aware of these impacts, there is a growing demand for the techniques and skills needed to incorporate environmental considerations into road planning and management.

Government of Nepal has been giving priority to development of roads since the beginning of planned development programmes more than 40 years ago. With this effort, the National Road Network has altogether 15,308 km roads, including 4,522 km blacktop, 3,646 km gravel and 7,140 km earth roads. Put alternatively, the National Road Network comprises 15,308 km roads including 4,977 km strategic roads 1,984 km urban roads and 8,347 km district roads. GoN has proposed Strategic Road Network of about 12,600 km in the coming decade. Among Nepal's 75 district headquarters, only two are not connected by a motorable road. The Department of Roads is responsible for constructing and maintaining the main national lines of access through intricate, inter connected environments of Nepal. In the past, the pressure to open a road network as quickly as possible has caused to neglect many environmental considerations. The construction of Roads in Nepal which mostly has rugged topography dissected by north to south flowing rivers is not merely technical and economical challenges but also an environmental one. Although Roads are meant for the economic development of the country, there are various types and degrees of environmental problems associated with their construction. These environmental problems are not only associated with the physical environment but also related to biological, social, cultural and sometimes archaeological problems. Landslides, slope failures, soil erosion, loss of agricultural and forest land, and sedimentation into water bodies are some of the negative impacts of road construction. These adverse impacts have, in some cases, negated the objective of the development project. With the promulgation of environmental law, all the development projects are subjected to environmental screening in according with these guidelines.

Environmental Management Guidelines- 1999 was developed by Department of Roads as part of a program undertaken jointly by Government of Nepal and the World Bank under the Road Maintenance and Rehabilitation Project to implement environmental mitigation measures in the surveying, design, construction and maintenance and operation of road project.

2. Main Objective

To evaluate the effectiveness of the environmental mitigation measures, as contained in the Environmental Management Action Plan (EMAP).

Specific Objectives

- Identification of positive and negative impacts on environmental resources
- Examination of the significance of environmental implications.
- Recommend preventive and corrective measures.

3. Methodology

This study is based on both primary and secondary data. Primary data are collected through survey on expert's opinion, key informants and field observations in the project sites. Secondary data and information are collected from EIA report and related literature review.

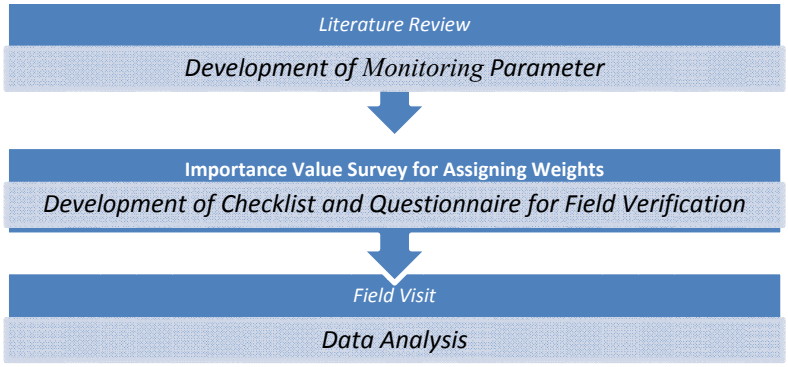

Fig 1 Schematic diagram of the methodology

During the field visit, observations were made about the contractor's activities on twelve environmental issues. Quantity as well as quality measurement of indicator judging effective implementation of mitigation measures were recorded including emerging impacts (landslides, littering, etc.) due to road construction and related activities. Line transect method was used during the observation i.e. walking along the length of the road and observing the biophysical impacts as detailed in the checklist.

The degree of effective implementation for each performance indicator obtains from site observation is then multiple with its own weight and corresponding weight of the environmental issues to get the weight degree of effective implementation. The weighted degree of individual environmental issues will be summed up to get the overall degree of effective implementation.

4. Analysis, result and discussion

4.1 Monitoring Parameter and Performance Indicator

Major twelve environmental issues that highlight all biophysical environment- oriented action in the road construction were identified and their respective performance indicator developed to monitor performance achievement of mitigation measures. Issues and their performance indicators are summarized in Table 1.

Table 1 Monitoring parameter

Environmental Issues	**Performance Indicator**
1.Quarries and Borrow pits	1-1 No evidence of water ponding or presence of fresh gullies and quarry spoil littering. No increased visual turbidity of surface waters 1-2 Natural contours and vegetation are restored. Engineers report testifying to completion of restoration work.
2.Spoil and Construction Waste Disposal	2-1 Presence of slides, scouring erosion or destruction of property on the valley side, disruption of water supply and irrigation systems. 2-2 Complaints from local residents 2-3 Survival rate of plants.
3.Work Camp Location and Operation	3-1 Latrines constructed; no disruption in local water supplies. 3-2 Timely and effective waste disposal and fire control 3-3 Re-plantation of the site 3-4 Natural contours and site appearance restored. Engineer's report testifying restoration of site.
4. Labour Camp location and Management	4-1 No complaints from local residents. 4-2 No disruption in local water supplies 4-3 Timely and effective waste disposal 4-4 Re-plantation of the sites. 4-5Natural contours and site appearance restored. Engineer's report testifying restoration of site
5.Earthworks/Slope Stabilisation	5-1 Adequacy and quality of planting. 5-2 Survival of rate of plants.
6. Blasting	6-1 No major rock fracturing of the remaining hill slope. 6-2 Damage to valley side private property.
7. Stockpiling of Materials	7-1 Sufficient protection measures are provided against the washouts.
8. Explosive, Combustible and Toxic Materials Management	8-1 Hazardous materials management procedures implemented. 8-2 No visible puddles of oil or contaminated soil.
9.Retaining wall construction	9-1 No occurrence of slope instability and damage to adjust features
10. Restatement of services	10-1 Complaints Received 10-2 Full Functioning of Reinstated Water Supply Lines, Canals and

	Trials
11. Drainage/ Water management	11-1No evidence of fresh surface erosion or presence of new gullies of the valley side. No increased visual turbidity of surface waters. 11-2 1No evidence of loss of agricultural land and forests. No complaints from landowners.
12. Air and Noise Pollution	12-1 No complaints from local residents.

4.2 Weightage Determination

The importance value survey analysis for Weightage determination is presented. The results and discussion are as follows:

4.2.1 Weightage Distribution for each Environmental Issues

The graphical representation of weight distribution for each environmental issue is presented in Fig 2.

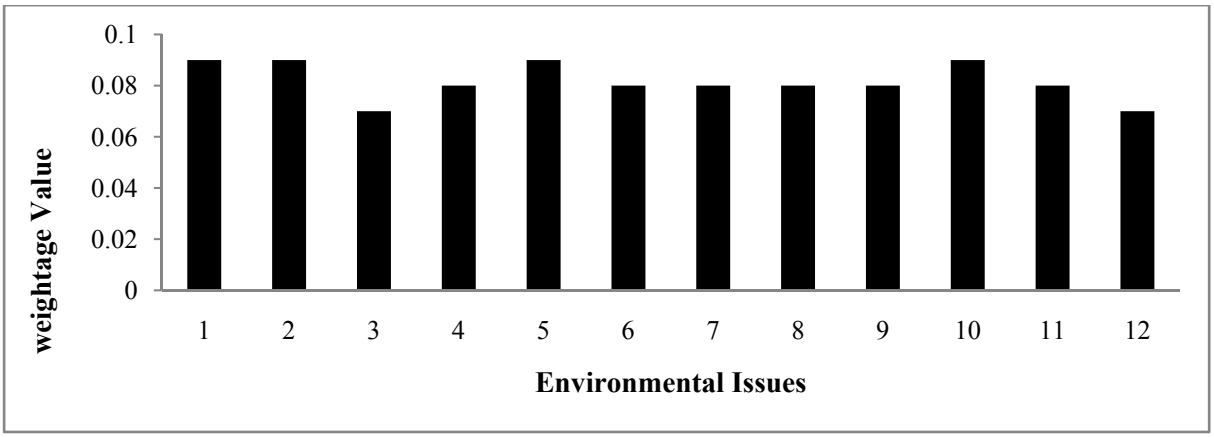

Fig 2 Weightage distributions of environmental issues

The standard deviation on weights obtained for environmental issues from various professionals is very minimal. The data's deviation is within 14% to 27% from the mean value that signifies its relevance.

The result shows that environmental issues as; quarries and borrow pits, spoil and construction waste disposal; earthworks/ stabilization; and drainage and water management among twelve parameters carries higher weight0.09. The result seems reasonable as the action of these environmental issues in the road construction extends a higher area of implication and directly activities service erosion and slope instability.

The weights distribution for issues as; work camp location, blasting, stockpiling of materials , explosive combustible and toxic materials management, retaining wall construction; and reinstatement of services are slightly lesser carrying similar weights of .08.

The lowest weight distribution having 0.07 values was obtained for issues as; labour camp location and management and air and noise pollution. Expect for air pollution, the issues express actions supporting road construction. The impact on air pollution though significant carried low weight. This is supportive considering remoteness of the construction site.

4.2.2 Weightage Distribution for each Performance Indicator

The graphical representation of results obtained on weight distribution for each performance indicator is presented in Fig 3.

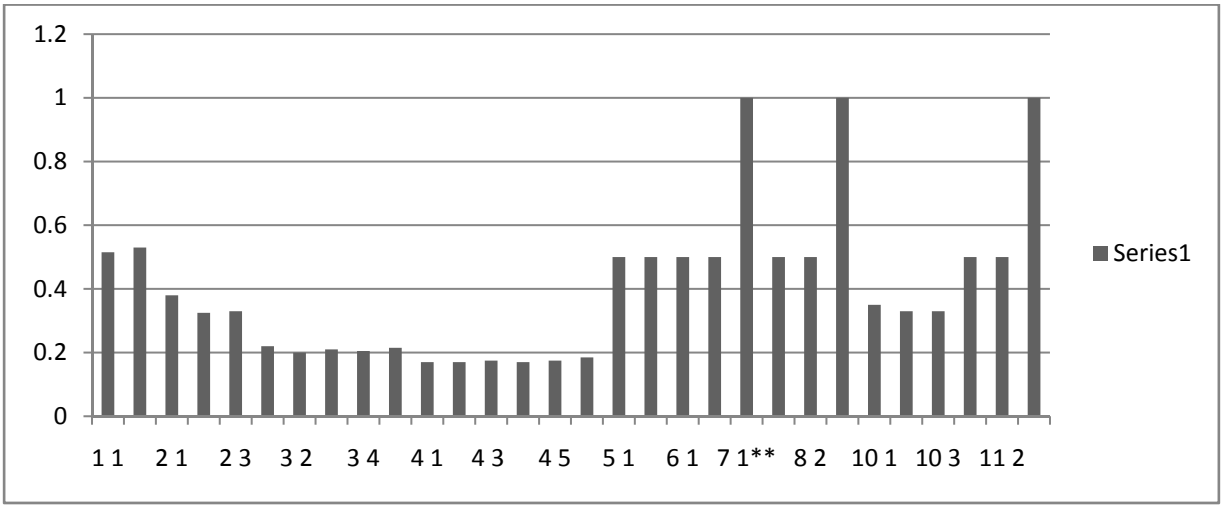

Fig 3 Weightage distribution of performance indicator

The standard deviation on weights obtained for performance indicators from various professional is also minimal. Most of the data's deviation is within 3% to 15% from the mean value that also signifies its relevance. The distribution weight noted is in general similar for performance indicators under each environmental issue. However, is observed that the performance indicators that directly accounts on evaluation for actions caused by road construction activities were given slight higher weights than the performance indicators that bases the evaluation on public complaints.

4.3 Degree of Effective Implementation

4.3.1 Implementation Assessment of Environmental Issues

The performance rating of each indicator then were multiplied with its respective weights and summed under each issue to obtain the degree of effective implementation for each environmental issues and the details are summarized in Table 2 and the graphical representation of the results are presented in Fig4.

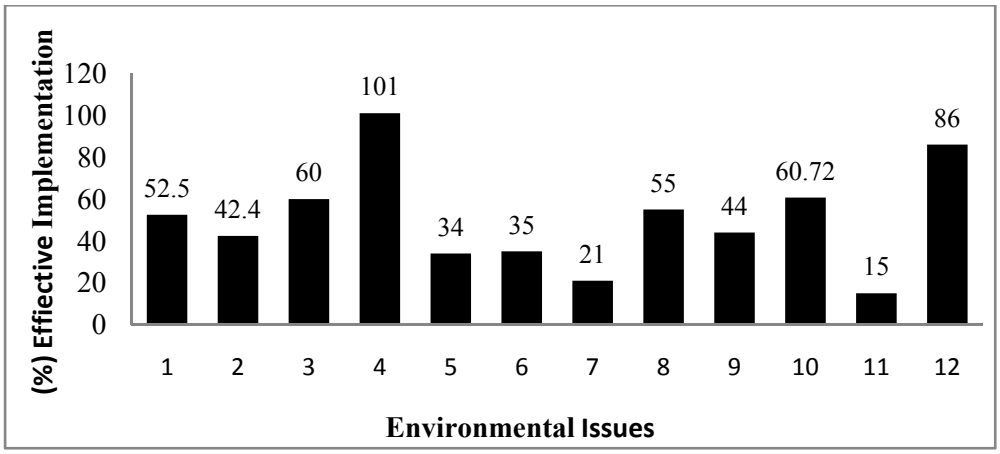

Fig 4 Effective implementation of environmental issues

4.3.2 Overall Degree of Effective Implementation

The effective implementation of each environmental issue is multiplied with its weights to obtain the weighted degree of effective implementation. The weighted degree of each issue is summed up to obtain the Overall Degree of Effective Implementation is summarized in Table 2.

Table 2 Overall degree of effective implementation

Environmental issues A	Respective Weightage B	Performance indicator C	Respective Weightage D	Effective Implementation of performance indicator (%) E	Weights effective Implementation of Performance Indicator (%) F= E*D*B	Effective Implementation of Environmental issues (%) G= D*E & sum of each issue	Weighted effective Implementation of Environmental issues (%) H= sum of 'F' for each	Overall degree of Effective implementation (%) I = sum of H
1	0. 10	1-1	0.5	50	2.25	52.5	4.73	52
		1-2	0.5	55	2.48			
2	0.09	2-1	0.36	60	1.94	42.4	3.81	
		2-2	0.32	35	1.01			
		2-3	0.32	30	0.86			
3	0.07	3-1	0.2	100	1.4	60	7	
		3-2	0.2	100	1.4			
		3-3	0.2	100	1.4			
		3-4	0.2	100	1.4			
4	0.08	4-1	0.16	100	1.28	101	8.08	
		4-2	0.17	100	1.36			
		4-3	0.17	100	1.36			
		4-4	0.17	100	1.36			
		4-5	0.17	100	1.36			
		4-6	0.17	100	1.36			
5	0.09	5-1	0.5	30	1.35	34	3.06	
		5-2	0.5	38	1.71			
6	0.08	6-1	0.5	40	1.6	35	2.8	
		6-2	0.5	30	1.2			

7	0.08	7**	1	21	1.68	21	1.68	
8	0.08	8-1	0.5	50	2	55	4.4	
		8-2	0.5	60	2.4			
9	0.08	9**	1	44	3.52	44	3.52	
10	0.09	10-1	0.33	53	1.57	60.72	5.46	
		10-2	0.33	66	1.96			
		10-3	0.33	65	1.93			
11	0.08	11-1	0.5	20	0.8	15	1.2	
		11-2	0.5	10	0.4			
12	0.07	12**	1	86	6.02	86	6.02	

The graphical representation of the weighted effective implementation of each environmental issue and cumulative degree of effectiveness is presented in Fig 5.

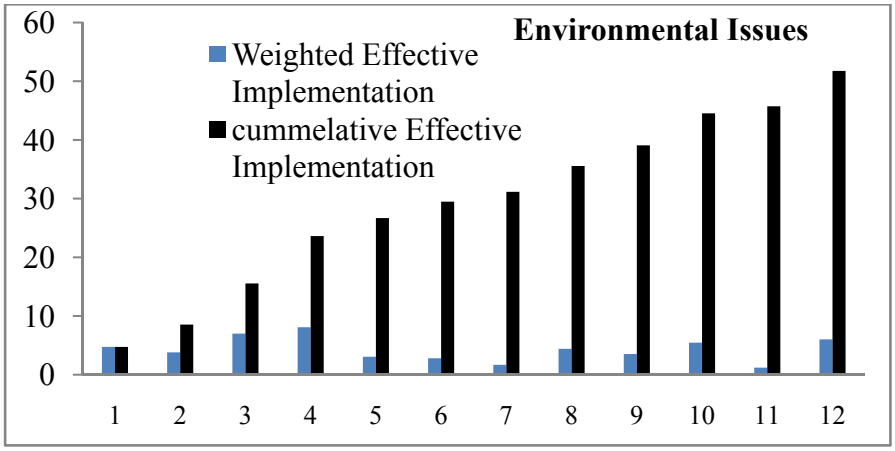

Fig 5 Overall degree of effective implementation

The result shows that the overall degree of effective implementation of mitigation measures of Naubise- Dharke Alternative Road is only about 52% with a rating notation of **Fair**.

The site observation analysis shows that the activities relating to environmental issues regarding Spoil and Construction Waste Disposal; Earthworks/Stabilization; blasting stockpiling of material; drainage and water management have been performed with a poor rating(i.e.<40).

Road construction in mountainous region requires the installation of structures i.e. retaining walls to support carriageway, toe-walls to support extra widening of road widths, flood ways to facilitate the natural cross drainage across the road length and breast walls to support the falling cut batter etc. often structural works commence after the completion of the excavation works only after disposing off much of the valuable rocks and soils down the valley. Instead these could have done earlier at

locations where its installation is required and rock source is available. Rocks are often extracted with a little or no considerations of the environmental implications of the surroundings. Quarries are often located within unsafe road right of ways and are not properly rehabilitated to safe conditions upon completion of its use. Often quarrying is undertaken without care with a common result of impoverishing the cultivated lands, especially in the vicinity and downstream. These sources in absence of adequate protective measure during and post harvesting had induced erosion and escalated its extent further. Hence these sources necessarily are closed with effective protective measures being put into so that it no longer remains a source of potential environmental degradation.

Workforces' need it camp sited with locations of minimal lead of construction alignment stretches in order to optimize their outputs. But there was not any work camp, labor camp location in the site. The local services e.g. drinking water supply lines, trials, irrigation canals etc. are also disrupted by the excavations during road constructions. The supply or access of the existing services must provisionally be maintained for its continuity during construction stage, and reinstated fully to its original capacity upon completion of the constructions. This is the concerned Supervising Consultants; especially Resident Engineer's due to for ensuring its being implemented.

While the highlights of the above issues sounds common phenomenal observations and the adverse effects resulted thereof be rectified as and where the situations calls for, it is often the practice of overlooking or not implementing completely or partially.

5. Conclusion

The overall degree of effective implementation of mitigation measures is categorised as FAIR as it has 52% of rating score. The overall result signifies that the environmental issues carrying higher weight and that involves higher mitigation costs were in general neglected by the performer. The contractor responsible for implementation has sincerely expressed their inability to perform efficiently due to cost factor due to the poor enforcement of the provision mentioned in EMAP. Serious violation was traced regarding hill slopes failures, poor drainage and water management was noted throughout the alignment. As a result, smothering of vegetation and topsoil on the valley side was immense causing scouring, erosion, slides and littering to high value and agricultural land at several locations which has much more implications on the environment. The contractor in an attempt to be competitive may not have allocated the rates to a realistic level to adequately fund environmental mitigation and protection and thus have lacked in implementing mitigation effectively. The forestation and bioengineering were arranged in the project to be carried out by other contractors after the completion of the road construction. However, environmental management of the road should have been carried out parallel with the construction.

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