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Compliance status on implementation of Initial Environmental Examination of drinking water supply projects in Karnali Province, Nepal

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Abstract

The environment assessment system in Nepal has been introduced successfully after the enforcement of Environment Protection Rules (EPR) 1997. The EPR has been amended in 2020. It has further institutionalized the Environmental Assessment processes through the formulation of related regulations, guidelines, criteria's & sectorial policies. The environment assessment is made mandatory for the governmental as well as the private sector development projects those cross the given threshold of the schedules of EPR regulation.

Study is carried out in Karnali Province which is located in the Mid-western part of the country. The province consists of different socioeconomically backward communities and disaster vulnerable geographical regions. For compliance status case study of IEE reports, the 6 drinking water supply projects (3 ongoing and 3 completed projects) implemented under Federal Ministry of Water Supply.

Both qualitative and quantitative techniques were used, along with multiple data sources to ensure that the conclusions and recommendations were justified, consistent and reflective of the current legal provisions. Compliance Auditing, (Literature review, direct field observation and focused group discussion).

To determine and evaluate the level of IEE compliance; IEE reports of selected drinking water supply schemes were reviewed. It was mainly focused on mitigation measures (including enhancement measures for beneficial impacts) proposed in the IEE reports. Along with this, mitigation measures of three main domains of the environment (physical environment, biological environment, and socioeconomic and cultural environment) in the field were assessed. 355 mitigation measures mentioned in IEE reports of 6 drinking water supply projects in the field were assessed. The mitigation measures were assisted through field observation at construction sites and informal interviews with stakeholders.

In overall, 144 (40.56%) mitigation measures were found to be compliance (C), 88 (24.79%) were partial compliance (PC) and 123 (34.65%) were noncompliance (NC). In the same way, the pre-construction phase of the project has highest non compliances (40.98%) whereas the mitigation measures in O& M phase has highest compliances (55.26%).As there are no specific published researches on the IEE compliance of DWSS projects, so this study can help to assess the scenario of IEE compliance of drinking water supply projects over the study area and also globally as a case study. More than 40% of the total mitigation measures were fully and 25% were partially implemented in the field. In overall, 65% of mitigation

measures were fully or partially implemented, which is higher than the related study conducted in other sector in Nepal. The environmental effects such as: soil erosion and gully formation, alteration of natural surface drainages, degradation of forest areas and effect in flora and fauna, environmental contamination, socio-economic conflicts were raised as a result of such noncompliance.
KEYWORDS: Environmental Management Plan, Environment Protection Act**,** Environment Protection Rule**.**

1. INTRODUCTION

The implementation of Nepal's environment assessment system, initiated after the enforcement of the Environment Protection Rules (EPR) in 1997 and further refined through amendments in 2020, signifies a critical institutionalization of Environmental Assessment processes. These enhancements encompassed the formulation of supplementary regulations, guidelines, criteria, and sector-specific policies. It's imperative that both government and private sector development projects adhere to the environmental assessment requirements established by the EPR.

However, there's a concerning trend where development actors—both governmental and private entities—seem to disregard the constitutional and legal obligations concerning environmental studies, impact assessments, and mitigation arrangements. The relentless pursuit of construction endeavors, road development, quarrying activities, and infrastructure construction often occurs without adhering to mandated environmental assessments. This disregard for due process poses severe threats to forests, biodiversity, environmental sustainability, and watershed conservation efforts.

Notably, Article 35 (35) of the Environmental Protection Act, 2076 outlines provisions for imposing fines on actions undertaken without the requisite environmental studies (GoN, 2076).

Karnali Province, situated in the country's Midwestern region, harbors socioeconomically disadvantaged communities and environmentally vulnerable areas. Despite various infrastructure projects being initiated at different governmental levels, the implementation and planning of these projects often lack compliance with environmental regulations. The Province government introduced its Environment Protection Act and regulation-2077, while local governments were mandated by the Local Government Operation Act-2074 to formulate their own EPAs. However, the low priority given to this mandate by local governments has led to gaps in legal institutional arrangements at the local level, contributing to environmental degradation and increased disaster vulnerability.

Analyzing the bottlenecks within government structures, especially concerning compliance with environmental laws during their execution of authority, becomes crucial for achieving desired environmental outcomes and averting potential disasters.

2. METHODOLOGY

For compliance status case study of IEE reports, the 6 drinking water supply projects (3 ongoing and 3 completed projects) implemented under Federal Ministry of Water Supply are covered (mentioned in table below).

Table1 List of drinking water supply schemes studied for IEE compliance status

S.N	Name of Project	Location district	Local level	IEE Status	Project Status
1	Musikot-KhalangaWSSP	Rukum West	Musikot Municipality	Approved	Completed
2	BabiyachaurWSSP	Surkhet	Panchapuri Municipality	Approved	Completed
3	SubhaghatWSSP	Surkhet	Gurbhakot Municipality	Approved	Ongoing
4	ChulimalikaWSSP	Kalikot	Khadachakrs Municipality	Approved	Ongoing
5	Narayan WSSSP	Dailekh	Narayan Municipality	Approved	Completed
6	BherigangaUWSSP	Surkhet	Bheriganga Municipality	Approved	Ongoing

3. DATA COLLECTION

3.1 Field observation

To collect primary data and understand implementation status of EMP of the projects, detailed field investigation was carried out. During visual Monitoring in field, the following components mentioned in IEE reports were mainly focused:

- Waste management (including storage and disposal)
- Health and safety management
- Storage, utilization and disposal of hazardous materials
- Traffic management (dust protection measures, weight; haulage, washing etc.)
- Water flow management
- Overall visual inspection of water and soil pollution due to the leakages

Maintenance of equipment and machinery

3.2 Focus Group Discussion

One of the FGD will be focused to verify the information collected from the questionnaires on relating to identify environmental consequences due to noncompliance of IEE reports in corresponding drinking water supply schemes. Another group shall be focused on the compliance monitoring in terms of policy framework. This shall be facilitated with a set of predetermined checklist.

3.3 Key informant interview

The Key Informant Interviews (KII) were conducted to assess the compliance status of The key informants included were the followings: Users committee officials of corresponding drinking water supply schemes,

4. Data analysis

4.1 Analysis of compliance status of IEE:

It will be reviewed the IEE reports of selected drinking water supply schemes. It will be mainly focused on mitigation measures (including enhancement measures for beneficial impacts) proposed in the IEE reports. It will be considered the mitigation measures based on their implementation during different project phases, such as either construction or operation.

Along with this, it will be assessed the mitigation measures of three main domains of the environment (physical environment, biological environment, and socioeconomic and cultural environment) in the field.

Table 2: Compliance auditing matrix

SN	Compliance Sector	Compliance Sub Sector	Compliance Indicators	Compliance %
1	Pre-Construction Phase	Physical and Chemical environment		
		Biological environment		
		Socioeconomic and cultural environment		
2	Construction Phase	Physical and Chemical environment		
		Biological environment		
		Socioeconomic and cultural environment		
2	Operation & Maintenance Phase	Physical and Chemical environment		
		Biological environment		
		Socioeconomic and cultural environment		

The data will be analyzed by using Microsoft Excel. The results will be expressed in the absolute number of non-compliance (NC), partial compliance (PC), and compliance (C), as well as in percentages. The result is displayed as Bar diagram as well as described in the text also. Many of the studies have formulated a framework of such compliance monitoring by studying the implementation status of mitigation measures defined in IEE reports (Hemant R. Ghimire, Sunita Phuyal, Nabin R Singh, 2021)

The level of compliance can be categorized into Three scales:

1) Non-compliance (NC): less than 25% mitigation measures addressed effectively
2) Partially Compliance (PC): 25% to 75% mitigation measures addressed effectively
3) Compliance (C): more than 75% mitigation measures addressed effectively

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4.2. Identification of corresponding environmental effects due to non-compliance:

The comparative analysis of corresponding environmental effects will be done by comparing compliance and non-compliance status of the mitigation measures in corresponding drinking water supply schemes. For this, the information collected from KII and FGD will be used and the anticipated effects identified in IEE report will also be made as reference.

5. RESULTS AND DISCUSSIONS

5.1. Compliance status of mitigation measures of IEE

It was assessed 355 mitigation measures mentioned in IEE reports of 6 drinking water supply projects in the field. The analysis indicates that total 144 (40.56%) were compliant, 88 (24.79%) showed partial compliance, and 123 (34.65%) were classified as non-compliant.

The analysis, when broken down by environmental domains and project phases, revealed interesting findings. The biological environment had the highest non-compliance rate

(45.83%), indicating significant shortcomings in this area. Conversely, socio-economic and cultural aspects showed the highest compliance rate (46.08%) among the studied drinking water supply projects.

The compliance status for mitigation measures related to the physical environment reflects adherence in essential aspects necessary for the project's smooth operation. Measures such as following daytime construction schedules, controlling vehicle speeds within designated limits, obtaining materials from government-approved sites, coordinating with relevant authorities, proper backfilling practices, and organized management of construction materials (e.g., cement, paint) in temporary sheds near the camp exhibit full compliance. However, other physical parameters have received lower priority in terms of implementation.

Similarly, the socio-economic mitigation measures found in higher levels of compliance, particularly those pertaining to campsite management, labor welfare practices such as ensuring equal wages and prohibiting child labor, among others. These aspects demonstrate a commendable adherence to compliance standards.

In instances of higher noncompliance, particularly in biological environmental mitigation measures related to flora and fauna protection, there appears to be less priority placed on implementation. Concerns arise regarding labor movements in forest areas close to construction sites, potential risks of forest fires due to these movements, and issues with noise levels and the potential for illegal hunting of wildlife. The uncontrolled flow of spoils and waste into nearby water bodies is also noted, accompanied by instances of destruction in bushes and small trees without any compensatory plantation or reestablishment efforts through bioengineering activities, as recommended in the mitigation measures.

Regarding socio-economic and cultural environment-related mitigation measures, the results were varied. Measures related to compensation, relocation, occupational health, sanitation, law, and gender showed partial or full implementation across all projects.

Furthermore, the pre-construction phase of the project displayed higher noncompliance (40.98%), while the mitigation measures in the O&M phase demonstrated higher compliance (55.26%).

During the preconstruction phase, crucial preparatory environmental activities, such as establishing a plant nursery for bio-engineering plants, creating work zone safety management plans, conducting safety training, and managing areas for stockpiling and spoil disposal, were not implemented. Priority was placed on mitigation measures primarily focused on legal approvals. In the construction phase, activities predominantly related to the physical environment were implemented as it signified the project execution stage. However, during the O&M phase, there was a higher priority given to mitigation measures, particularly in water treatment, water security, and chemical hazard management. The increased emphasis during the O&M phase could be attributed to the increased responsibility of the UC (User Committee) for project operations.

As there are limited published research studies focusing on IEE compliance in DWSS (Drinking Water Supply Schemes) projects, this research is crucial in assessing the compliance scenario not only within the study area but also as a case study globally. The study found that over 40% of the mitigation measures were fully implemented, and 25% were partially implemented in the field. Overall, 65% of mitigation measures were fully or partially implemented, showing a higher implementation rate compared to similar studies in other sectors in Nepal, where only two-thirds of the measures were implemented in hydropower projects (Hemant R. Ghimire, Sunita Phuyal, Nabin R Singh, 2021). However, there is room for improvement, as nearly 40% of measures are in partial implementation, particularly in ongoing DWSS schemes.

The partial implementation might be attributed to the absence of environmental experts within the project implementation teams, leading to partial compliance, such as in cases where compensatory plantations were established but not adequately maintained. According to Nepalese environmental legislation, project owners are responsible for monitoring, necessitating regular environmental monitoring in projects. However, the absence of internal environmental monitoring

records in these projects might contribute to higher rates of partial and non-compliance.

The compliance status varies across domains, with socio-economic and cultural aspects demonstrating higher compliance. Non-compliance in social aspects can directly affect project implementation due to local protests. Mitigation measures in the pre-construction phase, which are focused on preparatory activities and scheme design processes, exhibit higher non-compliance. This could be due to low involvement of community members during this phase.

Mitigation measures directly impacting local communities or those entailing legal obligations, such as land acquisition, compensation, and relocation, have been partially or fully implemented in most projects. Local pressures and legal processes might contribute to higher compliance rates in these aspects. However, measures indirectly impacting local communities, such as those related to air and noise, water, and waste, have lower implementation rates.

Despite higher overall compliance rates, specific non-compliances in mitigation measures could significantly impact environmental quality in project areas. This raises concerns about the adverse consequences on biodiversity and the environment, emphasizing the importance of addressing these specific areas of non-compliance.

Although the studied projects are international donor-funded, their compliance with environmental studies indicates a weaker situation in government-funded DWSS projects. This highlights the need for further studies specifically focusing on compliance issues in government-funded projects, beyond those funded by international donors.

5.2. Corresponding environmental effects due to non-compliance

The environmental effects were classified or grouped based on different environmental domains to understand which specific areas are being affected due to non-compliance with mitigation measures.

The excavation for pipelines and structural foundations during the rainy season, coupled with uncontrolled spoil dumping, has triggered soil erosion and gully formation. This has heightened turbidity in downstream water bodies and led to the erosion of topsoil, reducing vegetation cover while altering natural surface water drainage. The lack of bioengineering measures within the scheme has exacerbated these issues, intensifying soil erosion and disrupting the environment further. The Department of Soil Conservation's estimation indicates a worrisome erosion rate of 1.7 mm of topsoil per monsoon cycle (Wagley, 1997). Reports highlight that approximately one third of the total area lacks vegetation cover, while two-thirds of the country faces geological fragility.

Even though the DWSS scheme doesn't involve large-scale structures, the ongoing pattern of the continuous linear soil erosion strongly impacts on the surrounding environment, ultimately leading to socio-economic issues.

During the construction phase, various non-compliant activities like vehicle washing in water bodies, chemical leaks from vehicles and machinery, and unregulated waste disposal led to water contamination. Rivers have unfortunately turned into primary sites for solid waste dumping, industrial effluent discharge, and pollution from construction activities. Consequently, these actions have severely degraded river water quality, contributing to the prevalence of waterborne diseases such as diarrhea, dysentery, cholera, and typhoid. These diseases are predominantly linked to poor sanitation and compromised water quality (DOHS, 2005). Additionally, adverse impacts on aquatic life have also been observed due to these contaminated water conditions.

The absence of compensatory plantation to counter tree loss during structural construction, coupled with unrestricted movement of construction workers in forest areas, has resulted in a noticeable reduction in forest cover. This situation has intensified the vulnerability of forests to fires and illegal timber harvesting, potentially causing significant long-term and cumulative adverse effects. According to DFRS (1999), over 120,000 hectares of forest have been cleared for infrastructure development, particularly affecting the Terai and middle mountain regions (HMG/ADB/FINNIDA, 1988). In the Terai region alone, approximately 15 percent of the forest area was lost between 1978/79 and 1990/91. The current deforestation rate in the Terai is estimated at 1.3 percent annually (FORESC, 1994). Moreover, Nepal has about 246 species, roughly 5 percent of its total flora, that are endemic (MFSC, 1997). Activities like forest clearing, burning, wetland drainage, converting natural areas into agricultural land, and meeting demands for fuelwood, fodder, and medicinal plants have severely impacted biodiversity, resulting in substantial loss (ADB/ICIMOD, 2006).

It was not found major social conflicts due to the presence of external construction laborers during the construction period, but it resulted the loss of local employment opportunities. In the Karnali province, around 68.56% of households heavily rely on short-term and seasonal employment in India. On average, two members from a family migrate to India for seasonal employment, as highlighted in the First Five Year Plan of Karnali. This indicates a substantial dependence on external job opportunities due to the lack of local employment prospects, potentially affecting the economic stability and opportunities within the region (First Five Year Plan of Karnali).

The noncompliance issues have highlighted the challenge regarding public participation in the construction and long-term ownership of the DWSS schemes for sustainable operation. Nepal currently operates approximately 41,205 piped water supply systems, yet a significant portion of these systems face functionality issues. Only about 25% of these water supply systems are operating effectively, and merely 4.5% have allocated funds for maintenance, as reported by SEIU (2016).

6. Conclusion and Recommendation

6.1 Conclusion

This study aims to assess Compliance status on implementation of Initial Environmental Examination of drinking water supply projects in Karnali Province, Nepal. For compliance status case study of IEE reports, the 6 drinking water supply projects (3 ongoing and 3 completed projects) implemented under Federal Ministry of Water Supply were selected in the part of compliance status auditing, 355 mitigation measures mentioned in IEE reports of 6 drinking water supply projects in the field were assessed through field observation at construction sites and informal interviews with stakeholders. In overall, 144 (40.56%) mitigation measures were found to be compliance (C), 88 (24.79%) were partial compliance (PC) and 123 (34.65%) were noncompliance (NC).

Analyzing the compliance status, the pre-construction phase of the project has highest non compliances (40.98%) whereas the mitigation measures in O & M phase has highest compliances (55.26%). Out of those, the biological mitigation measures have highest non compliances. As there are no specific published researches on the IEE compliance of DWSS projects, so this study can help to assess the scenario of IEE compliance of drinking water supply projects over the study area and also globally as a case study. More than 40% of the total mitigation measures were fully and 25% were partially implemented in the field. In overall, 65% of mitigation measures were fully or partially implemented, which is higher than the related study conducted in hydropower projects sector in Nepal.

6.2 Recommendations

Based on the study's findings and discussions, the following recommendations are provided:

1. Particular due to the environmental fragility and socio-economic vulnerability of Karnali province of Nepal, the observed low compliance level of Initial Environmental Examination (IEE) mitigation measures demands immediate attention. Actions should focus on enhancing environmental compliance by instituting regular monitoring and inspections, crucial for enforcing

adherence to mitigation measures and minimizing adverse environmental effects.

2. The overall institutional capacity of the governmental institutions those responsible for environmental compliance should be improved in terms of institutional set up, capacity building and legal enforcement.

3. Further research is recommended to explore into the underlying reasons for non-compliance, assess the effectiveness of mitigation measures, and identify strategies for enhancing environmental compliance in the sector.

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