Strategy for Prioritization of Storage Hydropower Projects - A Case from Nepal

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Area/Section: Project Management.

Type of the Paper: Research Case Study.

Type of Review: Peer Reviewed as per |C|O|P|E| guidance.

Indexed in: OpenAIRE.

DOI: http://doi.org/10.5281/zenodo.5210936

Google Scholar Citation: IJMTS

How to Cite this Paper:

Surendra Kaini, Mishra, Anjay Kumar, Rajesh Sapkota & Aithal, P. S., (2021). Strategy for Prioritization of Storage Hydropower Projects - A Case from Nepal. *International Journal of Management, Technology, and Social Sciences (IJMTS), 6*(2), 28-46. DOI: http://doi.org/10.5281/zenodo.5210936

International Journal of Management, Technology, and Social Sciences (IJMTS)

A Refereed International Journal of Srinivas University, India.

CrossRef DOI: https://doi.org/10.47992/IJMTS.2581.6012.0151

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ABSTRACT

Purpose: This research aims to analyze the Sensitivity for Prioritization of Storage Hydropower Projects of Nepal.
Design/Methodology/Approach: Analytical Hierarchy Process (AHP) based on Multi-Criteria Decision Making (MCDM) has been used for analyzing the Technical, Financial, Policy, Environment factors Sensitivity with pairwise comparison in different multiple criteria. Additionally, the response from the client and expert opinion was conducted.
Findings/Result: Technical on first (weightage of 34%), financial on the second (weightage of 25%), environmental on third (weightage of 16%), policy and political on fourth (weightage of 11%), uncertainties on fifth (weightage of 9%), and respondents on sixth (weightage of 5%) are the main the factors. The impact can be explained at 50 % change in weight of respondent Nalsaugad Storage Hydropower Project stands at first rank. If the weightage of respondents changes by 100% then Uttarganga Storage Hydropower Project stands at first rank with respect to respondent factor. The sensitivity analysis with respect to factors was done, which shows no significant difference in the ranking of projects at the base case and at the case of change in weight of factors.
Originality/Value: It is action research to assure factors weights
Paper Type: Analytical Policy Research
Keywords: AHP, Technical, Financial, Policy, Environment, Sensitivity Analysis

1. INTRODUCTION :

Nepal has a ton of potential in creating power because of its various waterways and streams, the complete introduced limit of the hydropower has been just 1332.858MW (NEA, 2020) [1]. An Integrated Nepal Power System (INPS) ought to have electrical energy creating plants for base burden and pinnacle load for working in coordination so that the interest is met constantly. In Nepal, the INPS is a hydro-overwhelmed framework with many Run-of-River (ROR) hydropower plants so the base and middle force requests are covered fundamentally by Run-of-River hydropower plants and the pinnacle interest by every day cresting ROR plants, occasional capacity and hardly any diesel power plants of low limit. Any INPS ought to have adequate capacity and constrained stockpiling power plants to work on the framework's unwavering quality.
The force plants in Nepal are utilized to satisfy the base-load as are not generally ready to satisfy the interest at top periods. The INPS is overwhelmed by Run-of-River (ROR) hydropower plants. Power from such regular force plants must be utilized exactly when it is produced; this force can't be put away. This is the reason lattice control and power dispatching frameworks are significant; they need to adjust the interest for power with supply. At the point when the power organic market drops out of equilibrium, issues happen. Accordingly, store energy through saves like stockpiling activities to keep a harmony between framework interest and supply.
Nepal has concluded that it ought to go for the advancement of the framework by fostering a wide range of undertakings including ROR, topping ROR, stockpiling, and sun based (NEA 2020)[1]. Among other

energy projects, hydro capacity is the most frameworks agreeable in light of the fact that it is adaptable and more effective; also, it is less exorbitant and fires up immediately when force is required (NHA, 2006) [2].

The yearly pinnacle interest of Nepal is 1408 Megawatts (MW) for year 2019/20 though the complete stockpile in the framework is 7894.47 GWhr (NEA, 2020) [1]. Nepal still has deficiencies of force. Nepal Electricity Authority (NEA) own age contributed 39.02 % while those imported from India and neighborhood IPPs represented 22.33 % and 38.64 % individually (NEA, 2020) [1]. The all out energy import from India for the year 2019/20 was 1720.6 GWhr (NEA, 2020)[1]. We actually have the modern burden shedding in dry season. So it is important to direct the examination on prerequisite, fitting stockpiling hydropower project that can lessen the force import in Nepal. Consequently, foster stockpiling power activities to satisfy the nation's requirement for top burden interest and to adjust its arrangement of power age. There is incredible potential for capacity in Nepal. Practically 50% of Nepal's specialized limit of hydropower 20,498 MW falls under capacity type projects. In Nepal, Quality control of material, Adequacy of design and specification, Overall management action, Skillful workers, insufficient supply of materials were the most significant factor affecting the performance of Construction Project (Chiluwal and Mishra, 2018) [3]. In the practice of hydropower construction several weaknessess were found for improvements which impact profitability also (Chuluwal and Mishra, 2018 [4]; Chiluwal and Mishra, 2017 [5]).

As indicated by Kaini et al. (2021) [6], the activities under the examination don't have development permits. Budigandaki Storage Hydropower Project is the lone undertaking which has finished its Detail Project Report (DPR). Dudhkoshi and Nalsaugad Storage Hydropower Project are progressing DPR till date. Uttarganga and Tamour Storage Hydropower Projects have finished attainability study and Adhikhola Storage Hydropower Project is as yet progressing achievability study. Tamour Storage Hydropower Project is the solitary undertaking among the investigation project which have finished its practicality concentrate without giving permits. None of the undertakings under our examination have discovered financial backers with the exception of Nalsaugad Storage Hydropower Project. This current situation of every one of these Storage Hydropower Projects shows that we actually need to stand by over 10 years to have them in activity mode.

The variables and sub-components and Co-factors considered in the investigation model merits their full worth in the dynamic cycle. In understanding to the aftereffect of the examination, the main goal is acquired by the Nalsaugad Storage Hydropower Project, second by Dudhkoshi Storage Hydropower Project, thirdly by Uttarganga Storage Hydropower Project and Fourth by Tamor Storage Hydropower Project, fifth by Budigandaki Storage Hydropower Project and 6th by Adhikhola Storage Hydropower Project.

Essentially, if specialized factor, monetary factor, sway on climate, strategy and political, vulnerabilities and respondents are thought about alone Dudhkoshi stands first on specialized and sways on natural factor while Nalsaugad stands first on monetary factor, strategy and political factor, vulnerabilities and respondents factor. The positioning of the undertaking can be changed in the future which is displayed by affectability investigation of the activities concerning factors.

2. OBJECTIVES :

The general objective of the study is to analyze the sensitivity of the prioritization of storage hydropower projects with respect to the change in weight of factors.

3. LITERATURE REVIEW :

Super Decision Analysis Software

Super Decision Analysis Software implements the AHP from Windows 3.1/95/98/NT to Macintosh to UNIX systems such as Linux, SGI's, Sun Systems, etc. A web version is also available. The free version of software is easily available. It creates and manages AHP and ANP models, based on judgments for sensitivity analysis on the result. The case study of prioritizing hydropower development of Nepal can be done with it.

Diffusion of AHP in Nepal

According to Bhattarai in 2014, this research conducted to accumulate the research done under AHP. The study prompts for the study on the diffusion of AHP in other countries. It is observed that application of AHP in Nepal is more useful in the areas where conflicts and controversy is persisting, such as water, energy, environment and forest resources related issues (Bhattarai, 1997) [7].

Assessment and Ranking Procedure on AHP

Out of the six alternatives to be ranked by one decision maker with respect to a set of six factors, fifteen sub factors and thirty-five co-factors. Numerous multi-criteria techniques are at hand. The selection procedure to identify an appropriate technique is again an MCDM approach. Here, the ability to handle qualitatively expressed criteria, to analyze the sensitivity of ranking, the visual support of the method and the proven applicability to hydropower projects assessment were decisive. The Analytical Hierarchy Process satisfies these conditions using software called Super Decision. Subsequently, the fundamentals of AHP are discussed briefly to facilitate its understanding and app (Bhattarai, 1997) [7].

The MCA model is addressed by an assessment grid X of n choice choices and m measures. The crude presentation score for choice i concerning model j is indicated by x_{ij}. The significance of every measure is generally given in a one-dimensional loads vector W containing m loads, where wj indicates the weight relegated to the jth basis. It is workable for X and W to contain a blend of subjective and quantitative information.

An incredible assortment of MCA calculations can be utilized to one or the other position or score the choice choices. The MCA calculations will characterize, by certain means, either of these capacities:

$r_i = f_1$ (W, X) and $u_i = f_2$ (W, X)

Here r_i is an ordinal number addressing the position of choice i and u_i is the general presentation score of alternative i. The arrangement of r_i and u_i happens inside a more extensive MCA dynamic cycle.

The MCA interaction for the most part contains the accompanying stages: picking choice alternatives and assessment rules, acquiring execution measures (x_{ij}) for the assessment framework. Changing them into similar units, weighting the standards, positioning or scoring the alternatives, performing affectability investigation lastly settling on a choice (Hajkowicz and Higgins, 2008) [8]. It is generally applied strategies is the Analytic Hierarchy Process is pairwise correlation. This methodology includes looking at measures and choices in each one-of-a-kind pair giving (n-1)/2 examinations. The correlations can be settled on to achieve rules loads and choice alternative execution scores. Different scaling frameworks can be utilized. AHP leaders are approached to communicate an inclination for one measures/alternative over another in each pair on a nine-point scale.

The AHP is based on the axiomatic foundation as follows (Saaty, 1987) [9]

The reciprocal property that is basic in making paired comparisons. Homogeneity that is normal for individuals' capacity for making combined Comparisons among things that are not very disparate regarding a typical property and, consequently, need for masterminding them inside a request safeguarding chain of command. Reliance of a lower level on the nearby more significant level.

The possibility that a result can possibly reflect assumptions when the last are all around addressed in the pecking order.

The work on the AHP includes the assessment of need loads of a bunch of measures or choices from a square network of pair-wise correlation A = [a_{ij}], which is positive and if the matched examination judgment is entirely steady it is complementary, for example

$a_{ij} = 1/aji$ for all $ij = 1, 2, 3,.., n$.

In actuality, decisions a mistake on the judgment is unavoidable. The proposed Eigen esteem technique registers w as the main right Eigen worth of the lattice An or w fulfills the accompanying arrangement of n direct conditions: A w = *max w,*

Where, max is the maximum eigen value of A. This is to say that:

The natural measure of inconsistency or deviation from consistency, called consistency index *(CI)* is defined as

$$CI = \frac{\text{max-n}}{\text{n-1}}$$

The consistency index of a randomly generated reciprocal matrix from scale 1 to 9, with reciprocals forced, for each size of matrix called random index (*RI*) is presented in Table 1.

Table 1: Random Index (RI)

Matrix order	1	2	3	4	5	6	7	8	9	10

RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Source: (L. Saaty, 1991) [10]

Then the consistency ratio is (*CR*) = *CI* / *RI*, where RI value applied corresponding to the matrix size. The value of *CR*< 0.01 is typically considered an acceptable limit. If this limit is not reached one should reduce the inconsistencies by revising his judgments.

The other undertaking in the progression is the amalgamation of the decisions all through the chain of command to process the general needs of the choices regarding the objective or targets. The loads are made by adding the need of every component as indicated by a given standard by the loads of that basis. A pair-wise comparison scale for an evaluation of the relative importance of factors used in the AHP based on subjective judgment.

4. RESEARCH METHODOLOGY :

The Steps up to three along with project descriptions, Data collection and analysis is adopted from Kaini et al. (2021)[6] and from fourth step is as follow.

Fourth Step

Pair-Wise comparison matrix for all the multiple criteria are entered in super decision analysis software and a final model is generated by super decision which is presented in figure 1 below

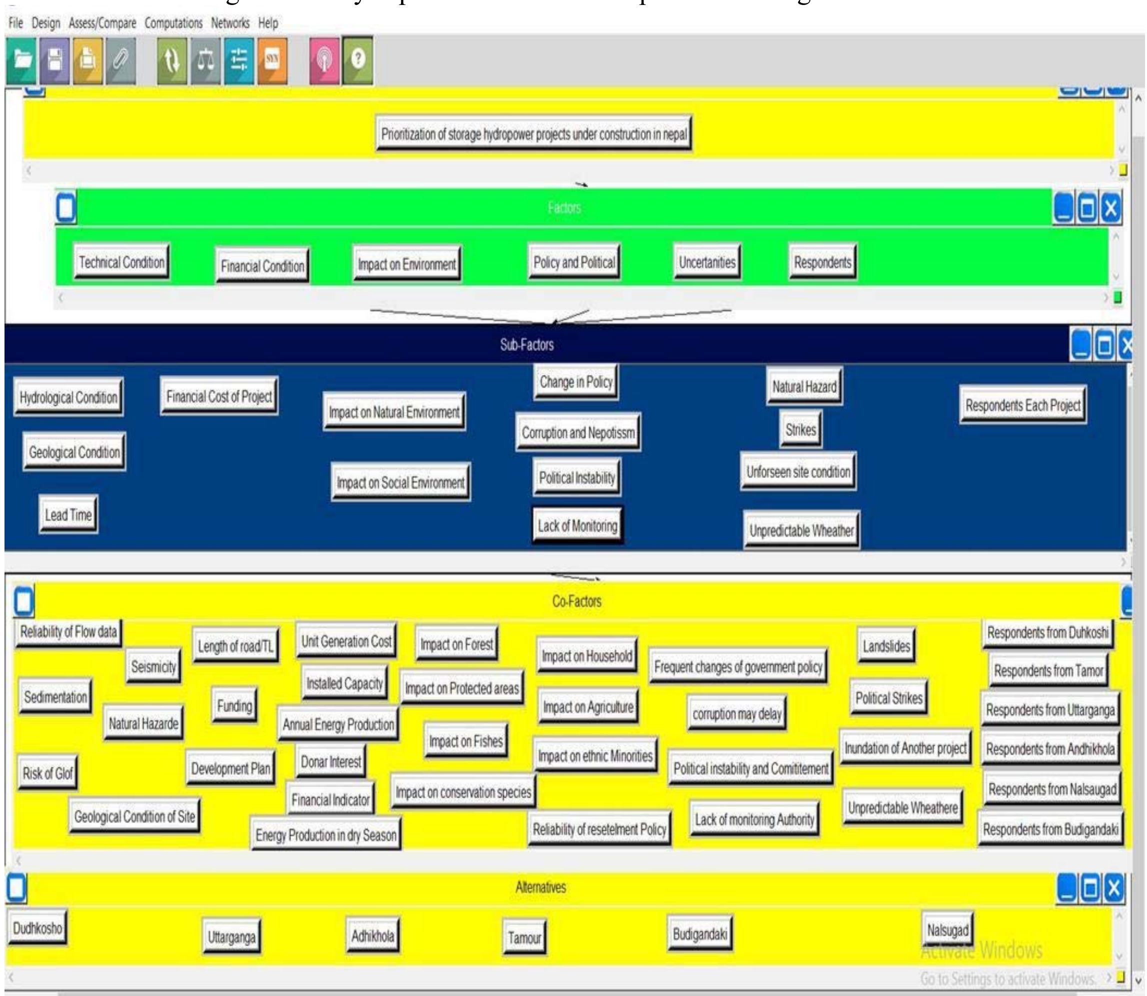

Fig. 1: Model Formulation in Super Decision Analysis Software

4.1 Model Application, Processing and Reporting:

The factors, sub-factors and co-factors are finalized by the first round talk with the key-informants (from the study project and also the hydropower expert) in the decision making process. Based on the model, sets of pair-wise comparison questionnaire is prepared. Prior to introducing the survey to the concerned faculty, it was pre-tried, on the grounds that in the AHP application clearness on the issue and lucidity in the pair-wise examination is vital to get the right outcome and decisions. The leaders need to do the worth decisions. On the basis of subjective judgment, numerical values for the weightage of multicriteria are directly used.

The processing of the completed questionnaire is carried out by using the AHP based latest software called the Super Decision. The software is versatile specially conducting the sensitivity analysis. Super decision is considered as well- regarded software package for the AHP.

Super Decision software is created by Creative Decisions Foundation. This software can be freely downloaded from internet.

4.1.1 Sensitivity Analysis:

Sensitivity analysis is conducted based on the factors. Levels of hierarchy structure could be defined as below. Level1: Main goal of research lies in level 1. Level 2: Based on the goal, n mummer of dimensions can be identified. So dimension of barriers of renewable energy development could be listed in level 2. Level 3: With in each dimension of barriers, specific barriers could be listed up to n number in each dimension. In each dimension number of barriers may be different. A specific barrier within each dimension is listed level 3.

4.2 Research Matrix:

To achieve the desired objective of research, various surveys and collection of data were carried out.The detail of activities is presented in table 2.

Table 2: Research Matrix

Objective	Data Required	Data Source	Tools	Outcomes
To determine the sensitivity of the prioritization of storage hydropower projects with respect to the change in weight of factors.	Factors, Sub-Factors and Co-Factors	Literature Review, Articles and Journals	Sensitivity Analysis by using Super Decision Analysis Software	Sensitivity analysis of the prioritization of storage hydropower projects with respect to the change in weight of factors.

5. RESULTS AND DISCUSSION :

5.1 Sensitivity Analysis Model:

This is the model generated by Super Decision software.

5.2 Overall Judgments from Multicriteria:

From the software "Super Decision "the result depict in table 2 that Nalsaugad is on the first priority, Dudhkoshi on second, Uttarganga on third, Tamor on fourth Budigandaki on fifth and Adhikhola on sixth . The result is based on the evaluation of all multicriteria.

5.3 Overall View

Table 2: Ranking of the projects

Name	Graphic	Ideals	Normals	Raw
Adhikhola		0.583988	0.129252	0.033117
Budigandaki		0.636936	0.140971	0.036119
Dudhkosho		0.913019	0.202076	0.051775
Nalsugad		1.000000	0.221327	0.056708
Tamour		0.648015	0.143423	0.036747
Uttarganga		0.736245	0.162951	0.041751

Node Sensitivity with over all respondents
Overall Judgments on the Basic of Factors
With Respective to Technical:

The sensitivity analysis with respective to technical factor, Dudhkoshi shows the highest important whereas Adhikhola shows the least important at base case.

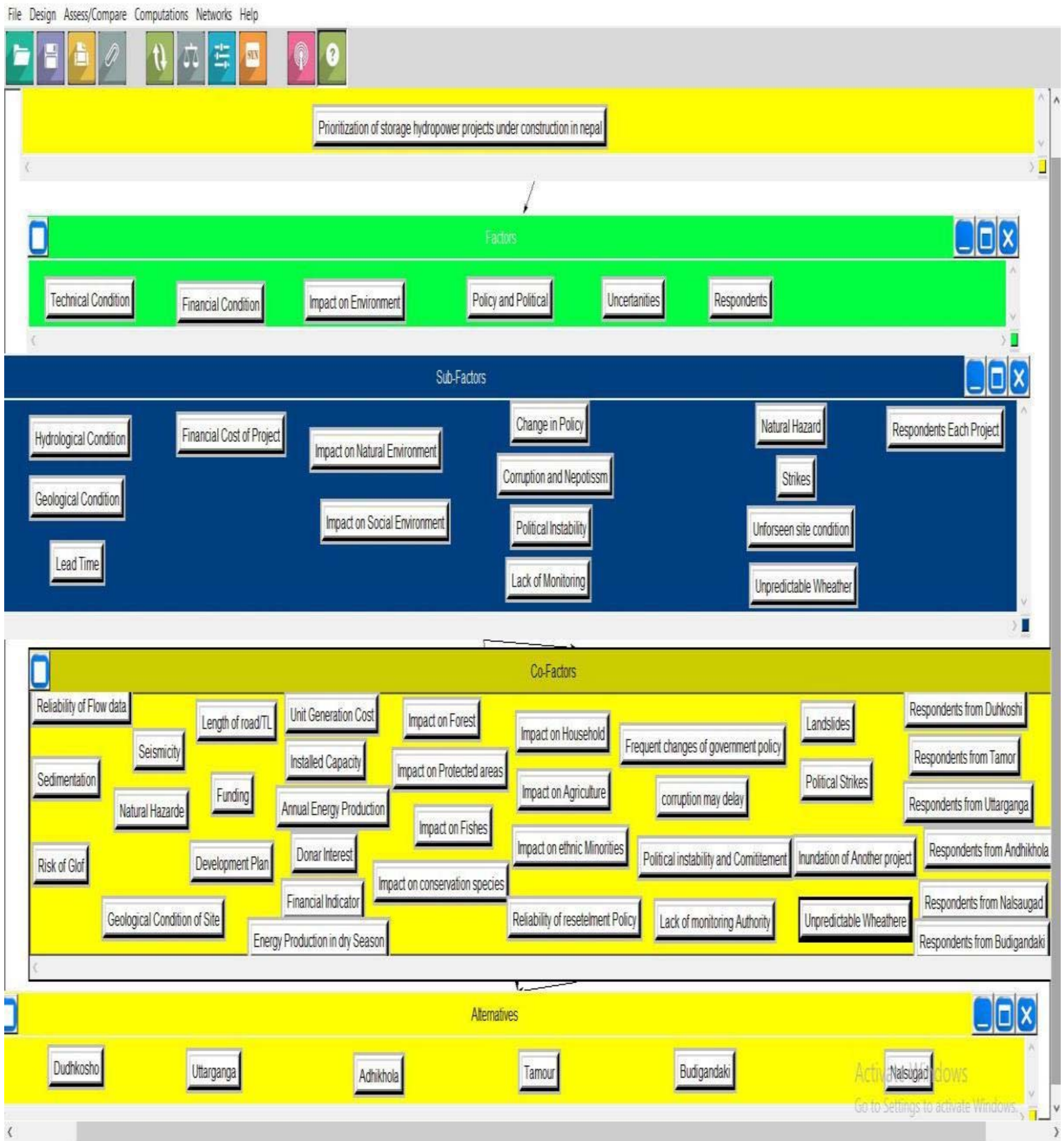

Fig. 2: Super Decision Model of Study Projects

Table 3: Sensitivity Analysis with respect to Technical Analysis

S.N	Name of Project	At Base Case	At 50 % Change	At 75% Change	At 100% Change
1	Adhikhola Storage Hydropower Project	6	6	6	5
2	Budigandaki Storage Hydropower Project	4	4	4	4
3	Dudhkoshi Storage Hydropower Project	1	2	2	3
4	Nalsaugad Storage Hydropower Project	2	1	1	1

5	Tamor Storage Hydropower Project	5	5	5	6
6	Uttarganga Storage Hydropower Project	3	3	3	2

Case1: Base Case

Dudhkoshi under technical factor resulted on first rank whereas Adhikhola at last rank at base case.

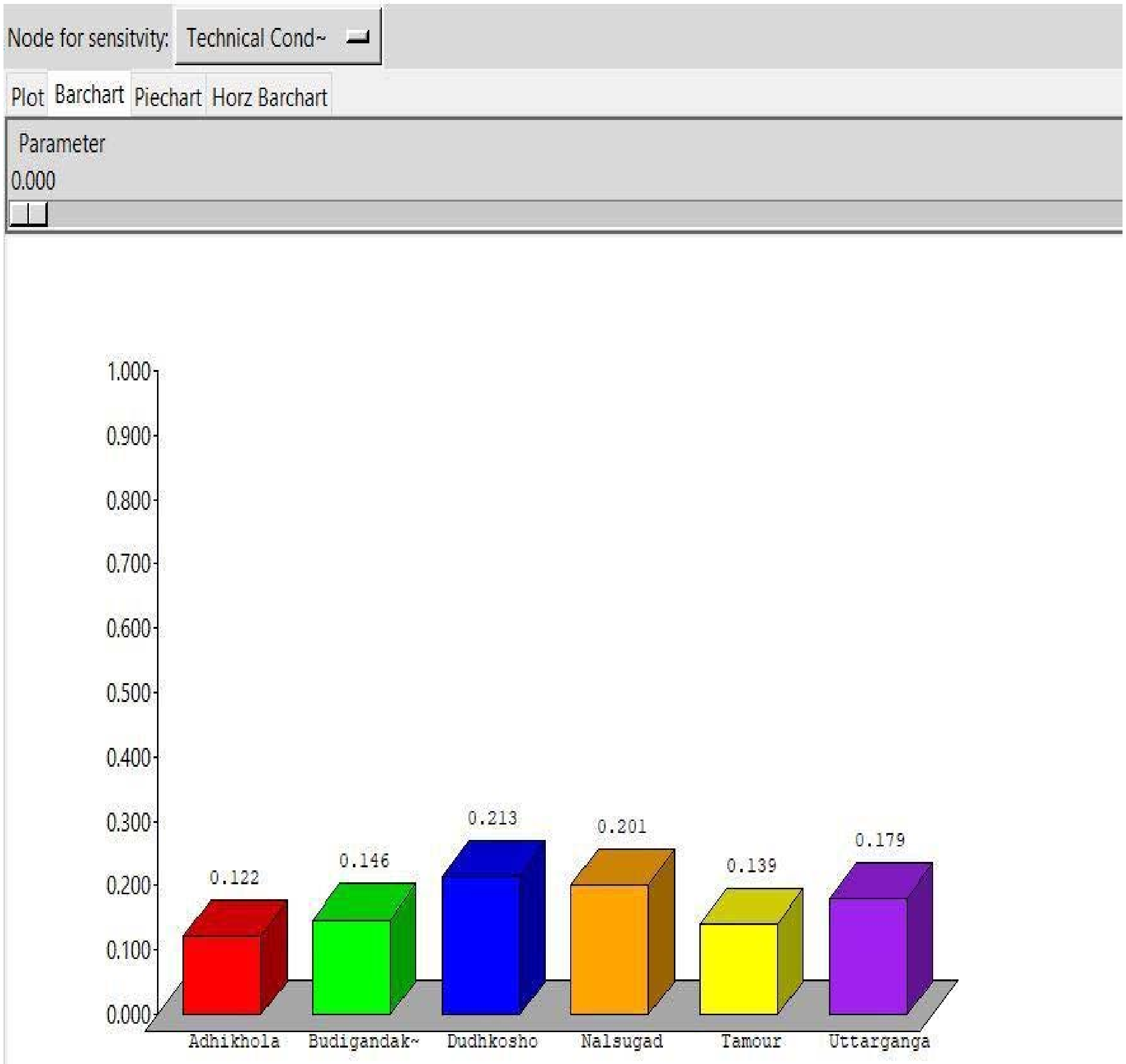

Fig. 3: Sensitivity Analysis with respective to Technical Factor at Base Case

Case 2: At 100%

When the weight of technical factor is increased to 100% rank got changed .Here with respect to technical, Nalsaugad showed the first rank whereas Tamor shows on last rank.

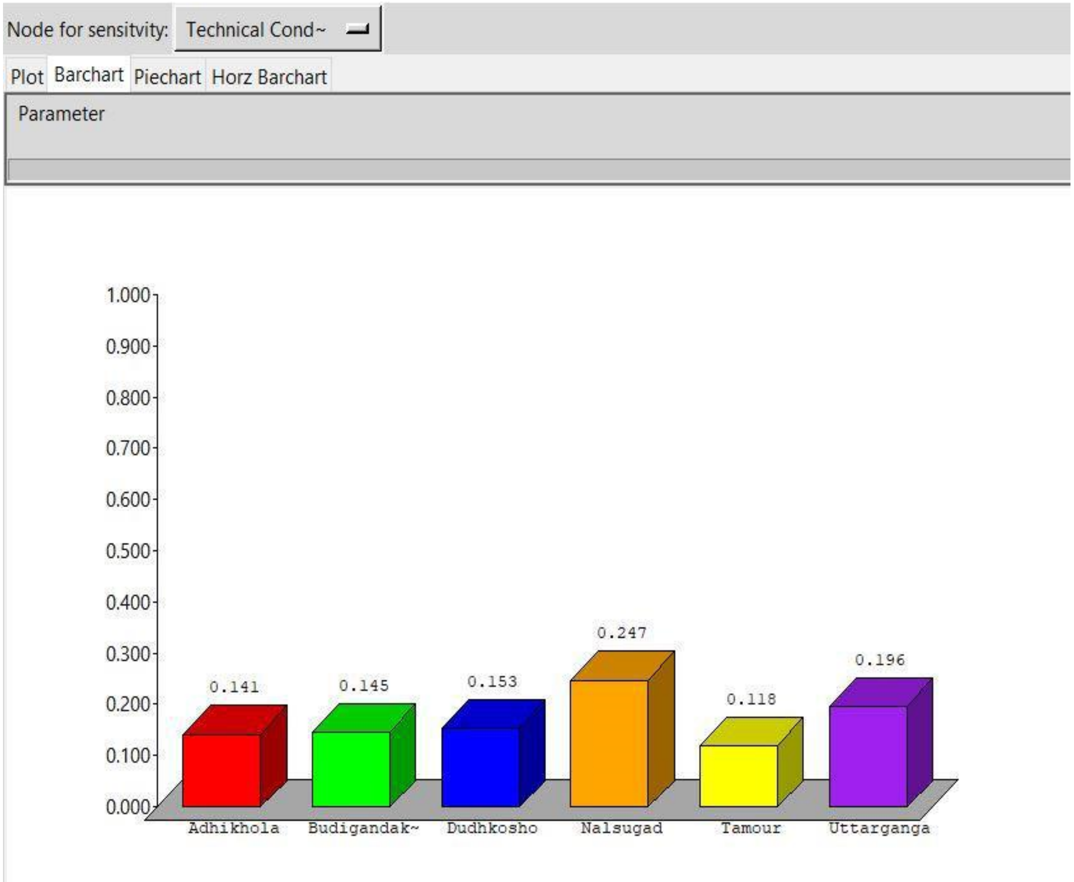

Fig. 4: Sensitivity Analysis with respective to Technical Factor at 100% Change

Here, Dudhkoshi was highly sensitive with respect with the technical factors whereas Budigandaki was neutral. In future if the ranking of technical got changed then ranking of the projects is also changed. Dudhkoshi is highly sensitive due to the reason that it has best importance on technical criteria. Among the different technical criteria if only one of them get changed the ranking of Dudhkoshi on technical criteria will be changed.

5.4 With Respective to Financial Condition

The sensitivity analysis with respective to financial condition, Nalsaugad shows that it is highest important whereas Tamour shows the least important at base case and the ranking can be changed if the percentage of weight is changed.

Table 4: Sensitivity Analysis with respect to Financial Condition

S. N	Name of Project	At Base Case	At 50 % Change	At 75% Change	At 100% Change
1	Dudhkoshi Storage Hydropower Project	3	2	1	1
2	Tamor Storage Hydropower Project	6	5	3	2
3	Uttarganga Storage Hydropower Project	2	3	4	4
4	Adhikhola Storage Hydropower Project	5	6	6	6

5	Budigandaki Storage Hydropower Project	4	4	5	5
6	Nalsaugad Storage Hydropower Project	1	1	2	3

Case 1: Base Case

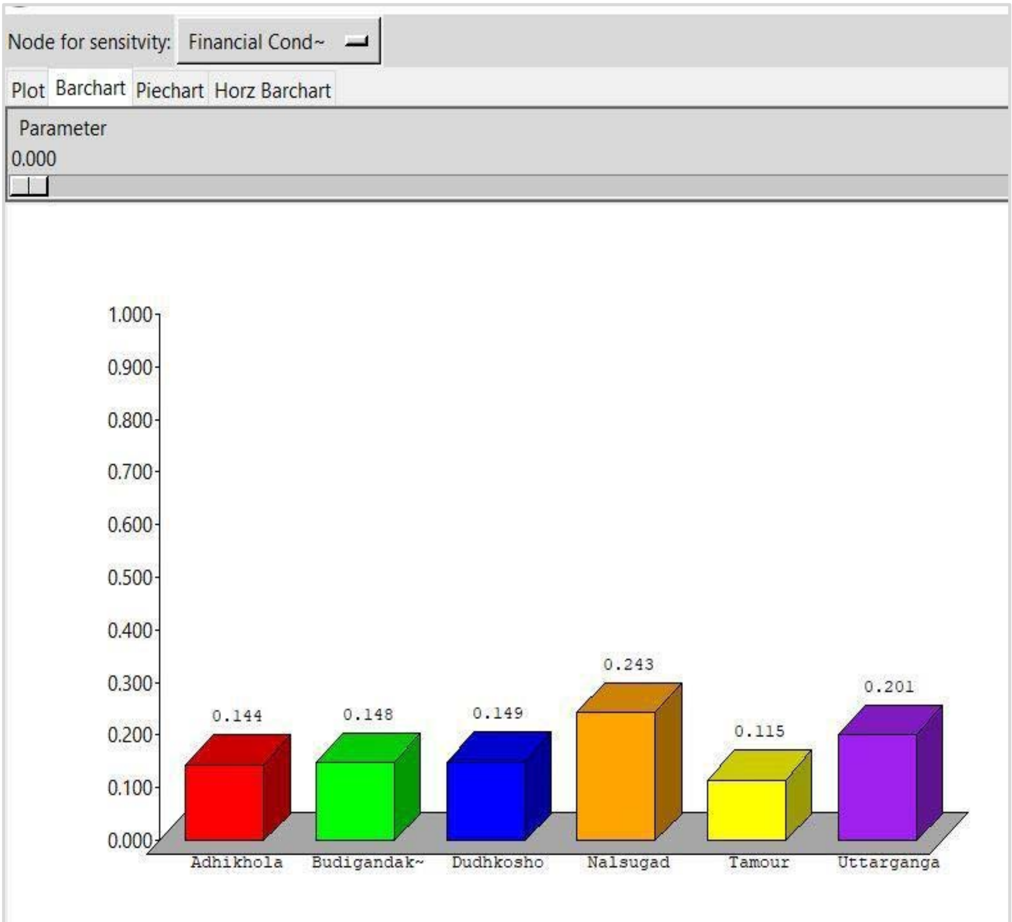

Fig. 5: Sensitivity Analysis with respect to financial factor at Base Case

Nalsaugad under financial factor was at first rank whereas Tamour on the least one at base case.

At 100 % Change

When the weight is increased to 100% rank got changed. Here with respect to Financial Condition Dudhkoshi on first rank whereas Adhikhola on last rank.

In figure 6, Dudhkoshi. Tamour, Uttarganga, Nalsaugad was sensitive with respect to financial condition whereas Adhikhola and Budigandaki was moderately neutral. These projects are sensitive in financial condition due to the reason that these projects are not strong in all aspects of financial condition. Nalsaugad is highly important in unit generation cost, whereas moderately strong on other factors. So in future if the ranking of this factor got changed then ranking of the projects is also changed. Budigandaki and Adhikhola are moderately neutral in sensitivity analysis of financial condition.

5.5 With Respective to Impact on Environment:

The sensitivity analysis with respective to Impact on Environment shows that Dudhkoshi is highest important whereas Tamor shows the least important one at base case and the ranking can be changed if the percentage of weight is changed.

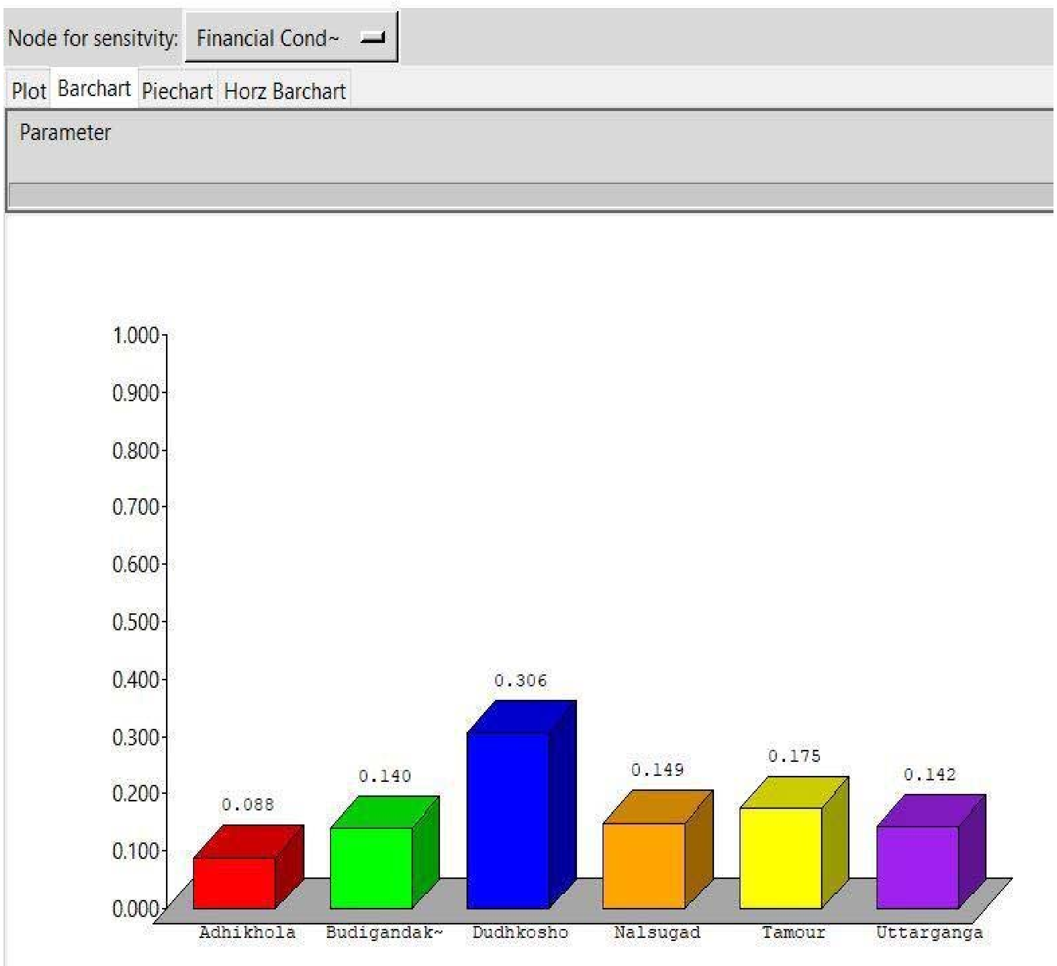

Fig. 6: Sensitivity Analysis with respect to Financial at 100% Change

Table 5: Sensitivity Analysis with respect to Impact on Environment

S.N	Name of Project	At Base Case	At 50 % Change	At 75% Change	At 100% Change
1	Adhikhola Storage Hydropower Project	5	6	6	6
2	Budigandaki Storage Hydropower Project	4	4	5	3
3	Dudhkoshi Storage Hydropower Project	1	2	2	4
4	Nalsaugad Storage Hydropower Project	2	1	1	1
5	Tamor Storage Hydropower Project	6	5	4	5
6	Uttarganga Storage Hydropower Project	3	3	3	2

Case 1: Base Case

Dudhkoshi under factor Impact on Environment resulted on first rank whereas Tamor on last rank at base case.

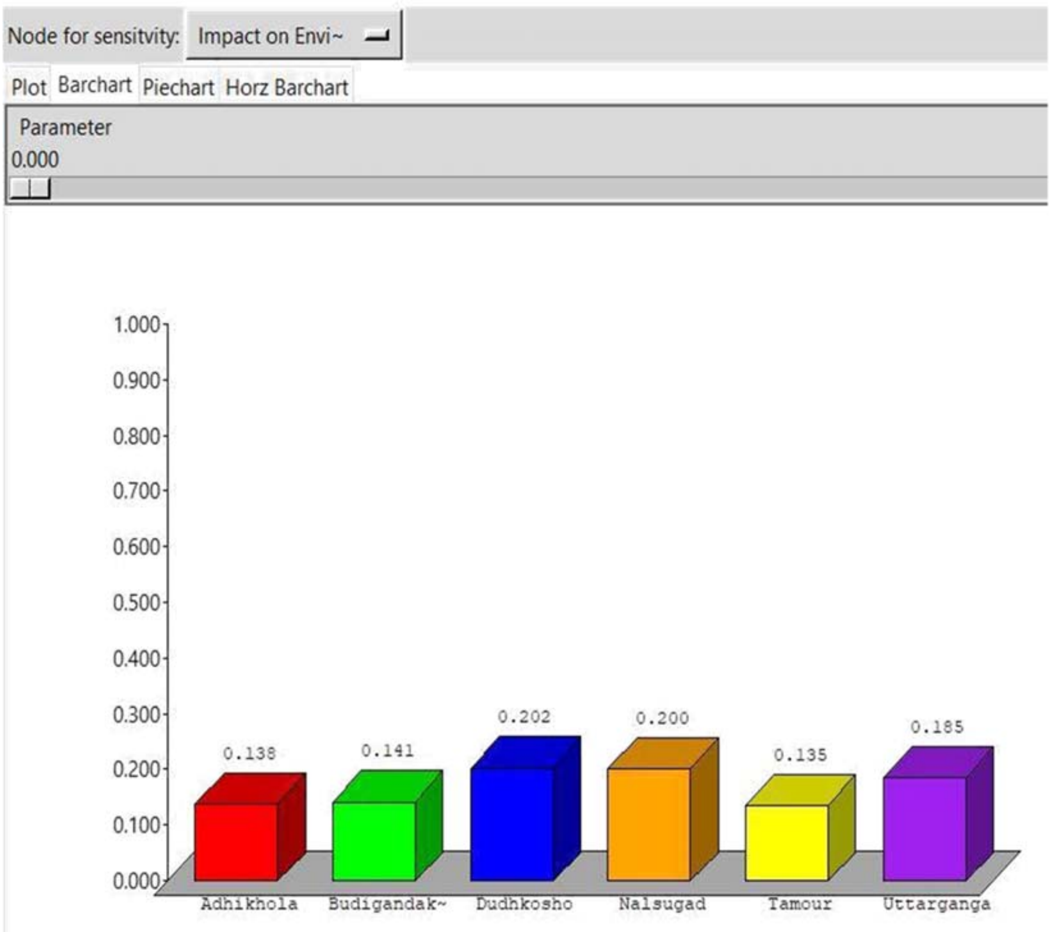

Fig. 7: Sensitivity Analysis with respect to Impact on Environment at Base Case

At 100 % Change

When the weight is increased to 100% rank got changed. Here with respect to Impact on Environment Nalsaugad on first rank whereas Adhikhola on last rank.

In figure 8, Dudhkoshi was highly sensitive with respect to Impact on Environment where as other projects under study were moderately neutral. Dudhkoshi is highly sensitive due to the reason that it has best importance on environmental criteria at base case. In future if the ranking of this factor got changed then ranking of the projects is also changed.

5.6 With Respective to Policy and Political:

The sensitivity analysis with respective to Policy and Political shows that Nalsaugad with highest important whereas Tamor shows the least important one at base case and the ranking can be changed if the percentage of weight is changed.

Table 6: Sensitivity with respect to Policy and Political

S.N	Name of Project	At Base Case	At 50 % Change	At 75% Change	At 100% Change
1	Adhikhola Storage Hydropower Project	6	6	3	3
2	Budigandaki Storage Hydropower Project	4	4	6	6
3	Dudhkoshi Storage Hydropower Project	2	2	2	2

4	Nalsaugad Storage Hydropower Project	1	1	1	1
5	Tamor Storage Hydropower Project	5	5	5	5
6	Uttarganga Storage Hydropower Project	3	3	4	4

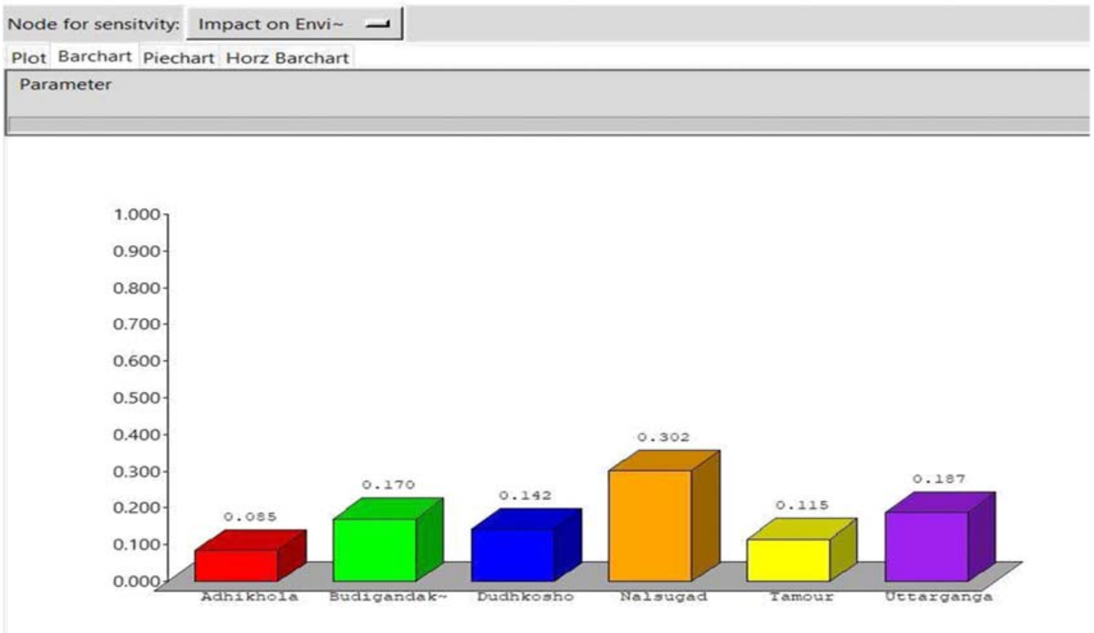

Fig. 8: Sensitivity Analysis with respect to Impact on Environment at 100% Change

Case 1: At Base Case

Nalsaugad under factor Policy and Political on first rank whereas Adhikhola on last rank at base case.

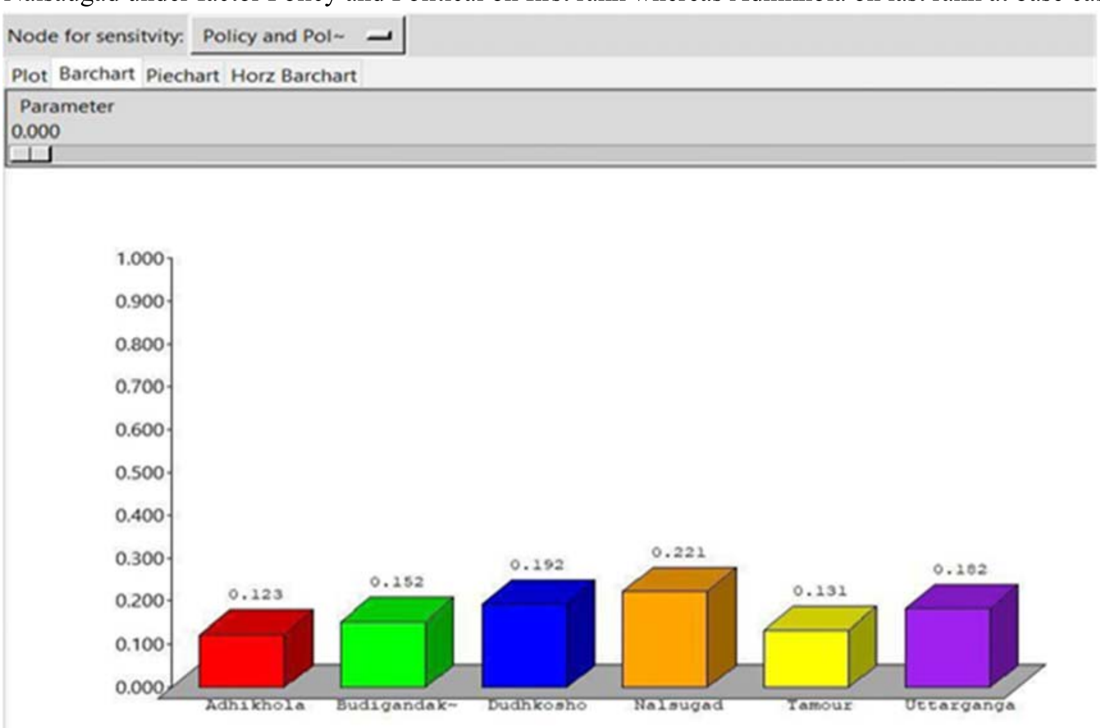

Fig. 9: Sensitivity Analysis with respect to Policy and Political at Base Case

Case 2: At 100 % Change

When the weight is increased to 100% rank got changed. Here with respect to Policy and Political, Uttarganga on first rank whereas Budigandaki on last rank.

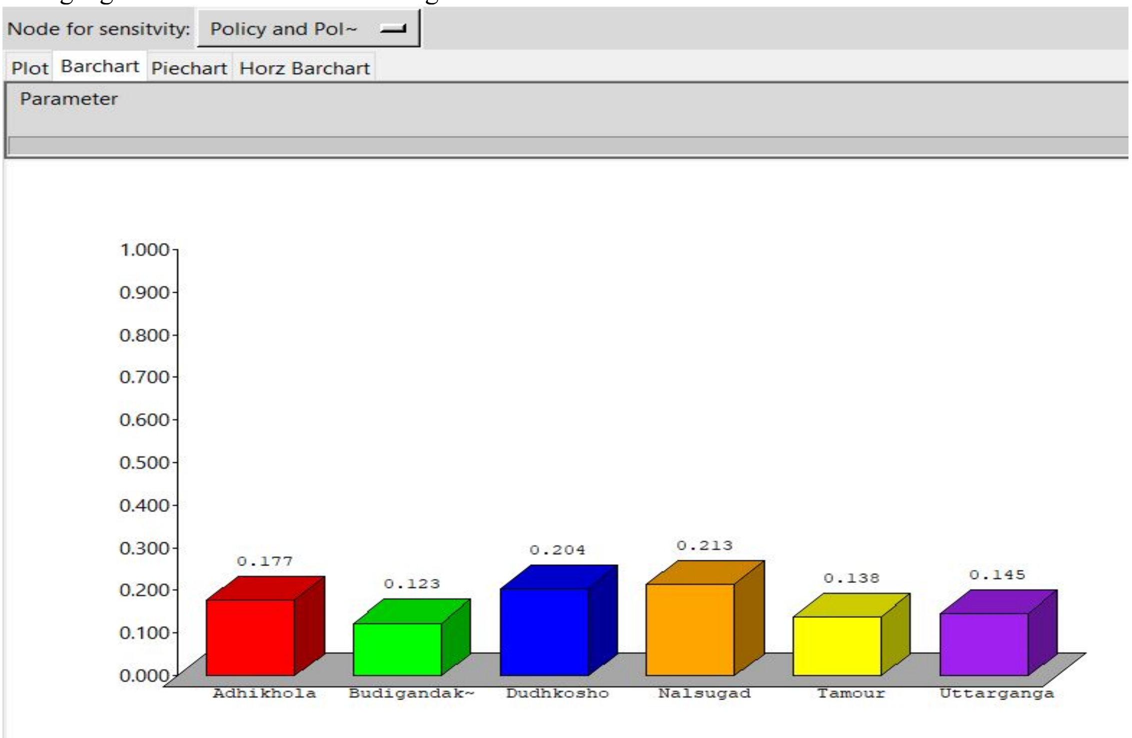

Fig. 10: Policy and Political at 100% Change

Here, Tamour, Dudhkoshi and Nalsaugadwas neutral with respect to Policy and Political whereas other projects under study were moderately sensitive. Tamour was neutral in sensitivity analysis of policy and political due to the reason that Tamour is least important in most of the aspect of policy and political. In future if the ranking of this factor got changed then ranking of the projects is also changed.

5.7 With Respective to Uncertainties:

The sensitivity analysis with respective to Uncertainties factor, Nalsaugad shows it is highest important whereas Adhikhola shows the least important one at base case and the ranking can be changed if the percentage of weight is changed.

Table 7: Sensitivity with respect to Uncertainties

S. N	Name of Project	At Base Case	At 50 % Change	At 75% Change	At 100% Change
1	Adhikhola Storage Hydropower Project	6	6	6	6
2	Budigandaki Storage Hydropower Project	4	4	5	4
3	Dudhkoshi Storage Hydropower Project	2	2	2	2
4	Nalsaugad Storage Hydropower Project	1	1	1	3
5	Tamor Storage Hydropower Project	5	5	4	5

6	Uttarganga Storage Hydropower Project	3	3	3	1

Case 1: At Base Case

Nalsaugad under factor Uncertainties resulted on first rank whereas Adhikhola on last rank at base case.

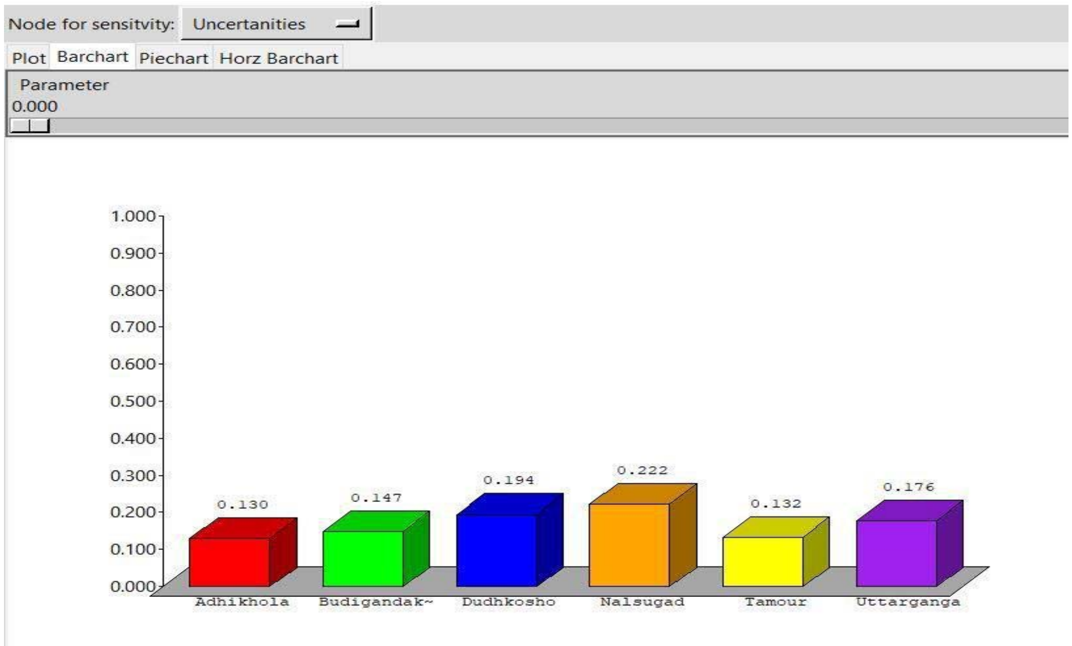

Fig. 11: Sensitivity Analysis with respect to Uncertainties at Base Case

At 100% Change

When the weight is increased to 100% rank got changed. Here with respect to Uncertainties, Uttarganga on first rank whereas Adhikhola and Tamor on last rank.

In figure 12, Uttarganga and Nalsaugad were sensitive with respect to uncertainties factor whereas Adhikhola, Budigandaki, Dudhkoshi and Tamor were neutral. In future if the ranking of this factor got changed then ranking of the projects is also changed.

5.8 With Respective to Respondent from Project:

The sensitivity analysis with respective to Respondents factor, Nalsaugad shows it is highest important whereas Adhikhola shows the least important one at base case and the ranking can be changed if the percentage of weight is changed.

Table 8: Sensitivity with respect to Respondents from Project

S.N	Name of Project	At Base Case	At 50 % Change	At 75% Change	At 100% Change
1	Adhikhola Storage Hydropower Project	6	6	2	1
2	Budigandaki Storage Hydropower Project	4	4	3	3
3	Dudhkoshi Storage Hydropower Project	2	2	4	5
4	Nalsaugad Storage Hydropower Project	1	1	1	2

5	Tamor Storage Hydropower Project	5	5	6	6
6	Uttarganga Storage Hydropower Project	3	3	5	4

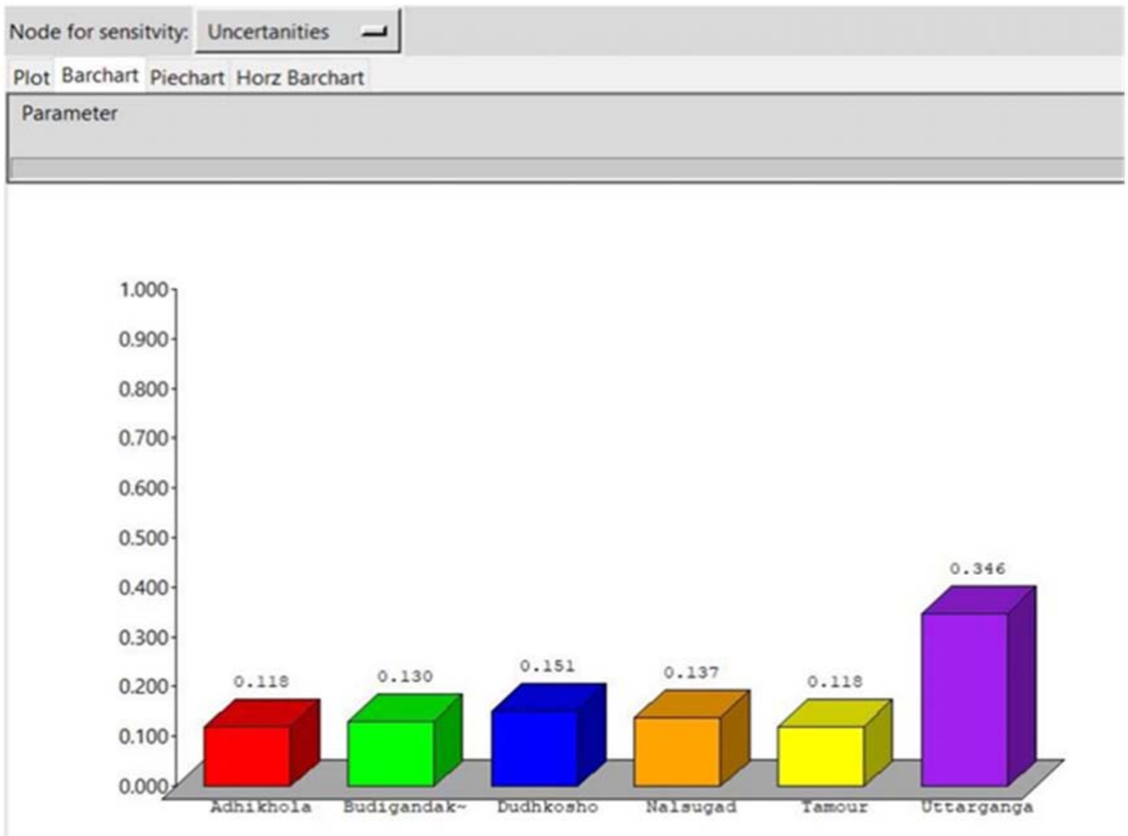

Fig. 12: Sensitivity Analysis with respect to Uncertainties at 100% Change

Case 1: At Base Case

In base case, Nalsaugad under factor Respondents from Project resulted on first rank whereas Adhikhola at last rank.

At 100% Change

When the weight is increased to 100% rank got changed. Here with respect to Respondents, Adhikhola on first rank whereas Tamor on last rank (Fig. 13).

Adhikhola and Dudhkoshi was highly sensitive with respect to Respondent factor where as other projects under study were moderately natural. In future if the ranking of this factor got changed then ranking of the projects is also changed (Fig. 14).

6. CONCLUSION :

All the factors, sub-factors and co-factors composed on the model carries significant weight from various actors covering wide influence horizon of respondent and decision-makers in the process of storage hydropower project of Nepal. The priority ranking from the study is the consensus among the various respondent taking care of multiple conflicting objectives of them. The research suggests government of Nepal to follow findings while making a plan.

Rank of Various Factors, Sub-Factors and Co-Factors affecting Storage Hydropower Project of Nepal. The results also indicate that Technical on first (weightage of 34%), financial on second (weightage of 25%), environmental on the third (weightage of 16%), policy and political on fourth (weightage of

11%), uncertainties on fifth (weightage of 9%) and respondents on the sixth (weightage of 5%) are the ranking of the factors considered.

Prioritization of Storage Hydropower Projects under Study with the change in Weight of Factors. At base case with respective to technical condition Dudhkoshi Storage Hydropower Project stands in first rank. If the weightage of technical condition changes by 50 % or by 100% then the Nalsaugad Storage Hydropower Project stands first with respect to technical condition.

At base case with respect to the financial condition and at 50% change in the weightage of financial condition Nalsaugad Storage Hydropower Projects stands at first rank. If the weightage of financial condition changes by 100 % then Dudhkoshi Storage Hydropower Project stands first with respect to financial condition.

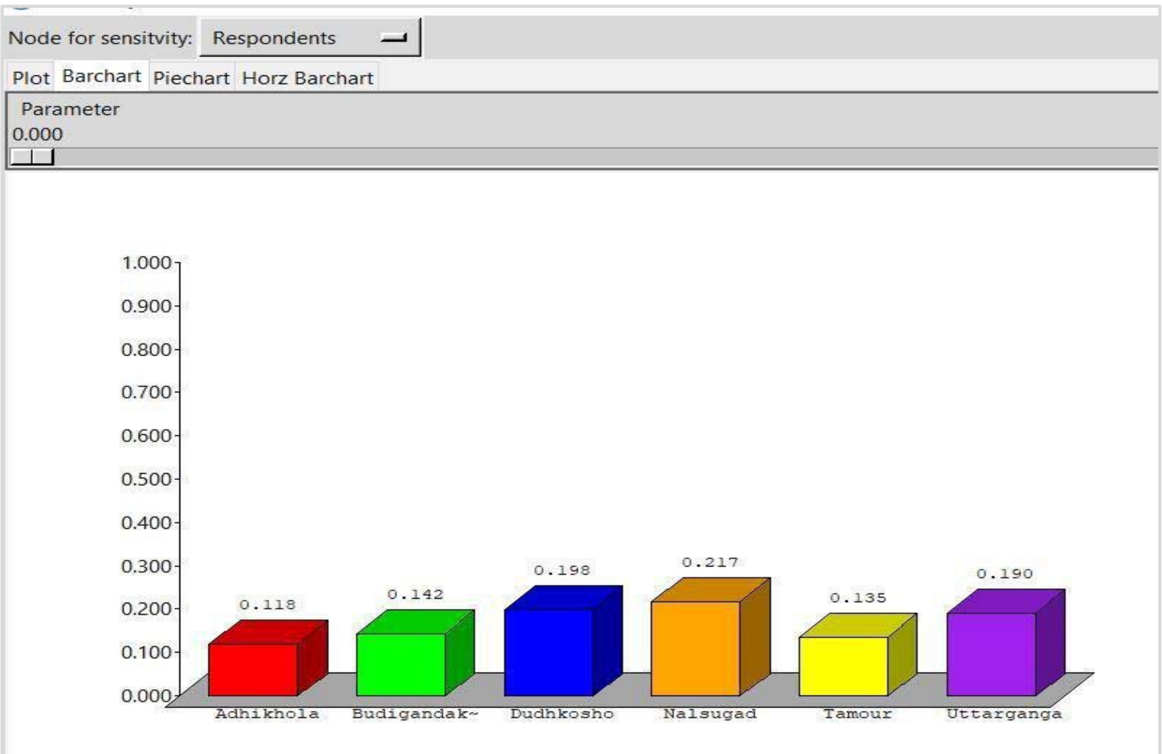

Fig. 13: Sensitivity Analysis with respect to Respondents from Project at Base Case

At base case with respect to impact on the environment, Dudhkoshi Storage Hydropower Project stands first but when the weightage of impact on environment changes by 50% or by 100% then Nalsaugad Storage Hydropower Project stands first with respect to impact on environmental factor.

At base case with respect to policy and political and at 50% change in weightage of policy and political Nalsaugad Storage Hydropower Project stands at first rank. If the weightage of policy and political changes by 100 % then Uttarganga Storage Hydropower Project stands first with respect to policy and politics.

At base case with respect to respondents from the project and at 50 % change in weight of respondents Nalsaugad Storage Hydropower Project stands at first rank. If the weightage of respondent changes by 100% then Uttarganga Storage Hydropower Project stands at first rank with respect to respondent factor. The optimum thrust can be put on the first prioritized project i.e. Nalsaugad Storage Hydropower Project.

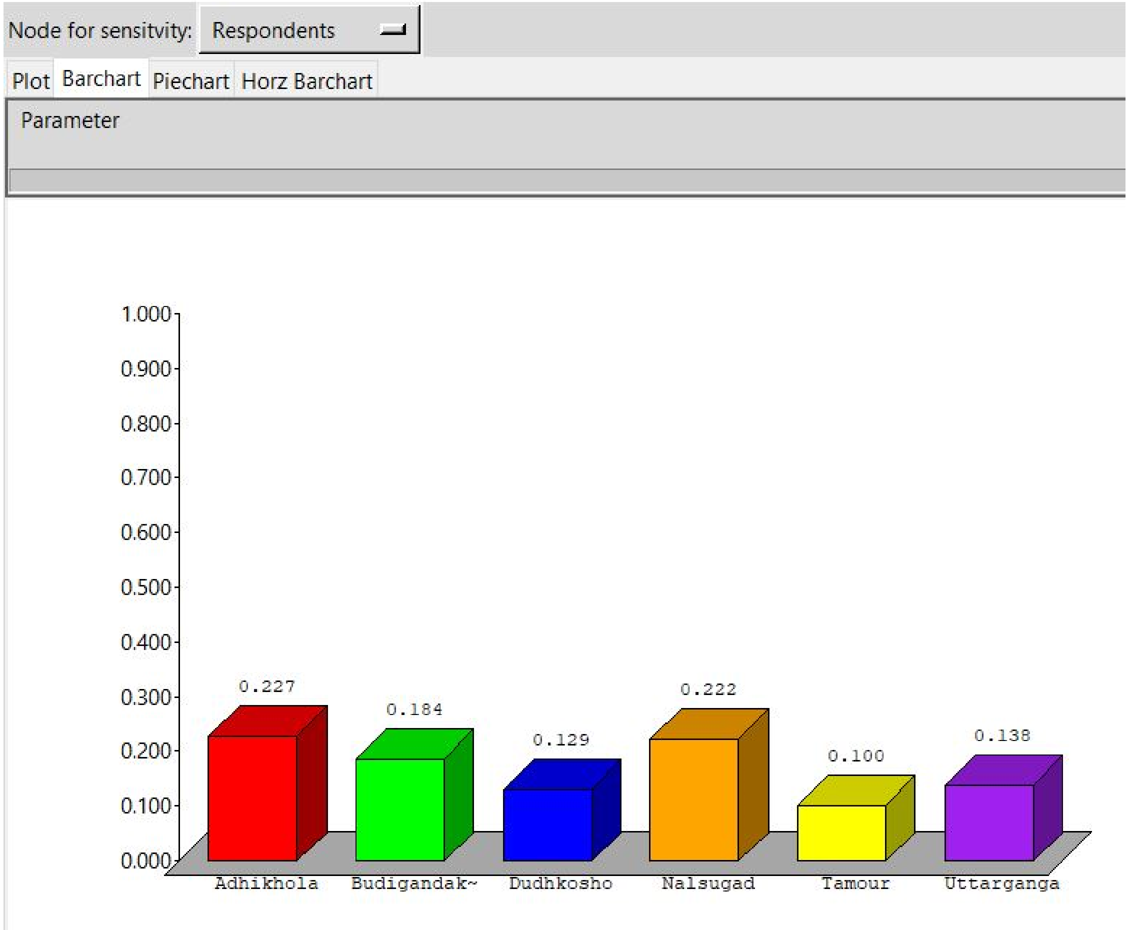

Fig. 14: Sensitivity Analysis with respect to Respondents from Project at 100% Change

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