



# Bridging the Gap: Assessing Performance and Planned Importance in Watershed Projects Using Participatory Methods

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**Abstract** Integrated Water Resource Management (IWRM) has become a significant policy objective worldwide. In India, the government plans to apply the IWRM protocols through different projects under Prime Minister Krishi Sinchayee Yojna (Watershed Development Component), with stakeholder participation, to achieve sustainable economic growth. The programs adopt a common strategy of multi-resource management involving all stakeholders within the watershed who, together as a group, co-operatively identify the resource issues and concerns of the watershed and develop and implement a watershed plan with environmentally, socially, and economically sustainable solutions. However, evaluating the performance of watershed projects is challenging as the diverse socio-economic characteristics influence project goals. Commonly, watershed managers face a major problem: identifying key performance evaluation variables for a participatory appraisal to assess ‘the’ disparity in performance against planned importance. In this paper, a participatory performance evaluation framework is proposed from a base-line study of three Integrated Watershed Management Program projects in the

lower Brahmaputra valley zone of Assam, India, namely, the Satpokholi, Kaldia, and the Turkunijan. The framework contains 65 variables divided into eight categories of developmental goals built on IWRM principles, priorities in planning, project goals, and regional socio-economic settings focusing on community information. Based on the framework, a structured questionnaire survey, using a four-point ratio scale field surveys are conducted amongst the community in the selected projects. Performance Index (PI) of each projects are obtained by analysing the data. The results show that besides providing better bottom-up performance evaluation in watershed management, this model would provide inputs to design intervention against the nonalignment of project performance and planned importance by policy-makers.

**Keywords** Watershed project performance indexing · Community participation

## Introduction

Integrated water resource management (IWRM) is a worldwide accepted policy objective. In India, the National Institution for Transforming India (NITI Aayog), the Ministry of Department of Land Reforms, and the Ministry of Water Resources have emphasized the Integrated watershed management programme (IWMP) through stakeholders’ participation to achieve sustainable economic growth [1]. Despite the high acceptance of IWRM and IWMP principles, the variables for performance evaluation of IWMP projects are relatively amorphous as the project goals are specific to the regional hydrological and social characteristics. This makes IWRM operations exceedingly challenging to comprehend. Subsequently, the NITI Aayog has developed the

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Composite water management index (CWMI), incorporating nine themes and 28 critical indices for different areas [2]. CWMI report provides an annual snapshot of the water sector status and the water management performance of the other states and UTs in India. CWMI establishes a clear baseline and benchmark for state-level performance on the water indicators, encouraging states and non-profit organizations to highlight participatory governance practices [3]. Accordingly, watershed projects strive to utilize and control water and allied resources in the project area through community-based organizations' (CBO) participation [4]. Therefore, it is imperative to evaluate the performance of individual watershed projects through a participatory mode.

Researchers have outlined key success performance indicators [5–8]. Mostly, these indicators are generic and prescribed with universal connotations [7, 9]. In this context, more studies need to be done on the performance assessment of each watershed project in a localized context. In addition, existing watershed evaluation protocols mainly focus on acquiring data from estimated assets or expenditures made for a top-down appraisal where the perspective of the beneficiaries is not taken care of. Commonly, watershed project baseline study, benchmarking, and monitoring and evaluation are entrusted to centralized agencies. The monitoring procedures mainly assessed the structural components of an IWMP project using a top-down method. The monitoring system has also been upgraded using the Geographical Information System (GIS) and Management Information System (MIS) to investigate watershed performance. They seem to have focused more on technical assessment than socio-economic impact assessment [10–12]. Contextually, it is necessary to assess the IWMP performance from the perspective of the beneficiaries. There is an absence of a comprehensive framework for a performance assessment that can be used in participatory mode [13]. Therefore, one objective of this study is to construct a performance indexing framework for watershed projects and to validate existing project areas.

Discussing watershed effectiveness, Kenney observed that watershed initiatives are successful if they contribute to achieving on-the-ground objectives defined by prevailing social norms. Discussing 36 watershed studies, he also said that 60% of respondents listed 'participation by stakeholders' and about 25% of respondents listed 'problems with on-the-ground project goals' as key to success [14]. With that perspective, it is crucial to explore and quantitatively evaluate the community's expectations, prioritization, and alignment regarding project goals and realized achievements to design an adaptable framework for bridging the gap between watershed performance and planned importance.

Here are some pertinent questions: How can the relevant watershed performance variables be identified, and how can

the disparity between performance and planned importance be gauged?

To answer these questions, this study aims to design a participatory performance evaluation framework (PEF) for indexing watershed project performance supported by field-level community information. The research objectives are (a) Mapping the planned importances or targets of selected watershed projects to use them as the variables of the PEF, (b) Introducing a methodology to quantify community perceptions about the project achievements, and (c) Validation of the PEF in selected projects in Brahmaputra Valley, Assam to obtain their performance index (PI).

This study applies a survey in three IWMP projects in the Brahmaputra Valley, Assam, to explore the critical variables (goals) for evaluating watershed performance and examining the community perception of those variables to obtain a performance measuring index. The framework, being applicable in a participatory manner, has the potential to enhance community participation and efficiency in project implementation. Since the watershed programs in Assam are congruent with the IWMP protocols initiated by the Government of India [2, 15], the developed methodology is valuable for watershed projects with analogous socio-economic environments elsewhere in Assam and India. This paper comprises five sections: (i) Introduction, (ii) Methods, (iii) Results and Discussion, and (iv) Conclusion.

## Methods

The research methodology adopted includes (i) a literature review and content analysis of watershed project documents to classify the most common watershed developmental goals as PEF variables, (ii) semi-structured focused group interviews of experts for coding goal categories, (iii) inter-coder reliability testing to identify project goals categories, (iv) validating PEF with a questionnaire survey in the study areas and statistical analysis.

## Content Analysis for PEF Variables

A comprehensive literature review was conducted to list sustainable watershed projects' most common characteristics and goals. Guidelines of DoLER [16, 17], NITI Aayog [18], SLNA objectives [19], and detailed project documents of different projects in Assam [15, 20] are reviewed. After cross-checking the validity of the obtained goals list, a thorough qualitative analysis was done to determine the activities planned in the selected watershed projects. The primary project goal categories and the most common IWMP developmental goals are extracted from project reports and field studies [1, 15, 16, 19–22].

Subsequently, a list of performance variables comprising 75 relevant variables in 8 categories is prepared. Then, focus group discussions were held with three IWMP project stakeholders to finalize the list. The FGD members arrived at a list of 65 variables in 8 categories of goals to be included in the PEF. For validating the goal categories, five watershed experts are invited to code the listed goals and Krippendorff's inter-coder reliability test (Kalpha reliability) was executed on their observations [23]. (Table 1).

### Survey Areas

Three IWMP projects were selected based on three primary considerations: (i) covering three different regions with analogous project protocols and goals prescribed by SLNA [15, 20, 22], (ii) covering both banks of the Brahmaputra River with similarity of socio-economic scenarios, and (iii) cooperative attitude and response of the local community. (Fig. 1, Table 2).

**Table 1** The primary project goal categories and the most common IWMP developmental goals

Goal-categories	Goals/variables
A. Naturalisation and afforestation	1. Increasing vegetative cover of the project area, 2. Protecting Forest area, 3. Restoration of degraded ecosystem, 4. Afforestation
B. Socio-economic upgradation	1. Facilitating micro-enterprises like handloom, pottery making, carpentry, mobile repairing, vermin compost, bamboo craft, and tarja making, 2. Creating man days to reduce labourer migration, 3. Improving human development, 4. Enhancing combined economic outcome, 5. Controlling distress migration, 6. Training the Users' Groups, 7. Ensuring SHGs are formed to include people under the poverty line, 8. Ensuring the formation of UGs, including female members, 9. Ensuring the formation of UGs, including SC/ST members, 10. Ensuring the formation of UGs, including BPL members, 11. Training of the SHGs to be active and alert, 12. Training the UGs to be active and alert, 13. Formation of targeted numbers of Users' Groups
C. Soil and Land management	1. Controlling soil erosion/siltation, 2. Building check dams, drop spillways, farm ponds, and earthen embankments, 3. Construction of water distribution canals, 4. Construction of earthen dams to arrest the runoff water, 5. Protecting the paddy fields from inundation by flood, 6. Decreasing velocity of runoff water, 7. Plantation on roadside, river bank, and institutional campus
D. Water resource management	1. Installation of hand pumps and tube wells for drinking water, 2. Encouraging rainwater conservation/soil moisture retention, 3. Encouraging groundwater recharges through surface water storage, dug-out ponds, ring wells, 4. Providing alternatives for rejuvenation of water bodies/water budgeting, 5. Install shallow tube wells, ponds and hand pumps to meet drinking water needs
E. Agricultural production	1. Providing water pumps for Kharif crops, 2. Encouraging multiple cropping, 3. Raising irrigation potential for different crops in a drought situation, 4. Increasing cropping area, 5. Encouraging area under horticulture, 6. Encouraging quality and high-yielding varieties to raise rice production, 7. Raising the production of rice through the creation of small irrigation facilities, 8. Encouraging processing of different agricultural products like cereals, oil seeds, fruits etc., 9. Facilitating agricultural marketing of surplus produce like cereals, oil seeds, fruits/ milk etc., 10. Arranging crop demonstration programmes on different agricultural produce, 11. Achieving targeted growth of the cropped area, 12. Achieving targeted growth of cash crops like jute, 13. Achieving targeted growth of the wheat crop, 14. Achieving targeted growth of crops like pulses and oil seeds
F. Animal husbandry and pisciculture	1. Improving pisciculture, 2. Facilitate fish rearing and construction of firm ponds and fishery ponds, 3. Increasing milk production, 4. Providing training on weaving/ fishery/ dairy/ goatery and poultry, 5. Developing rearing of livestock and poultry for asset-less/marginal labourers, 6. Helping asset less/marginal labourers SHGs with schemes of rearing cows, poultry, piggery, duckery, beekeeping etc
G. Social capital development	1. Improving gender equality, 2. Improving social cohesion, 3. Helping to improve the nutritional need of users, 4. Training the Self-Help Groups, 5. Training the Watershed Committees, which Gram Sabha forms, 6. Undertaking participatory rural appraisal exercises like participatory modeling and evaluation, 7. Coordinating between project implementing agency (PIA) and beneficiaries, 8. Forming the Producers' Collective group and motivating them to the project activities, 9. Facilitating collaboration of watershed managers with the village community, 10. Facilitating collaboration of watershed managers with gram panchayats (GP)/ DRDA/ ZP cells., 11. Motivating the watershed committee (WC) to be active and alert, 12. Motivating the SHGs formed by the watershed committee, 13. Conflict resolution between the watershed organisation and villagers
H. Associated infrastructure development	1. Developing children's park and historic sites, 2. Building roads and bridges, 3. Providing public utility

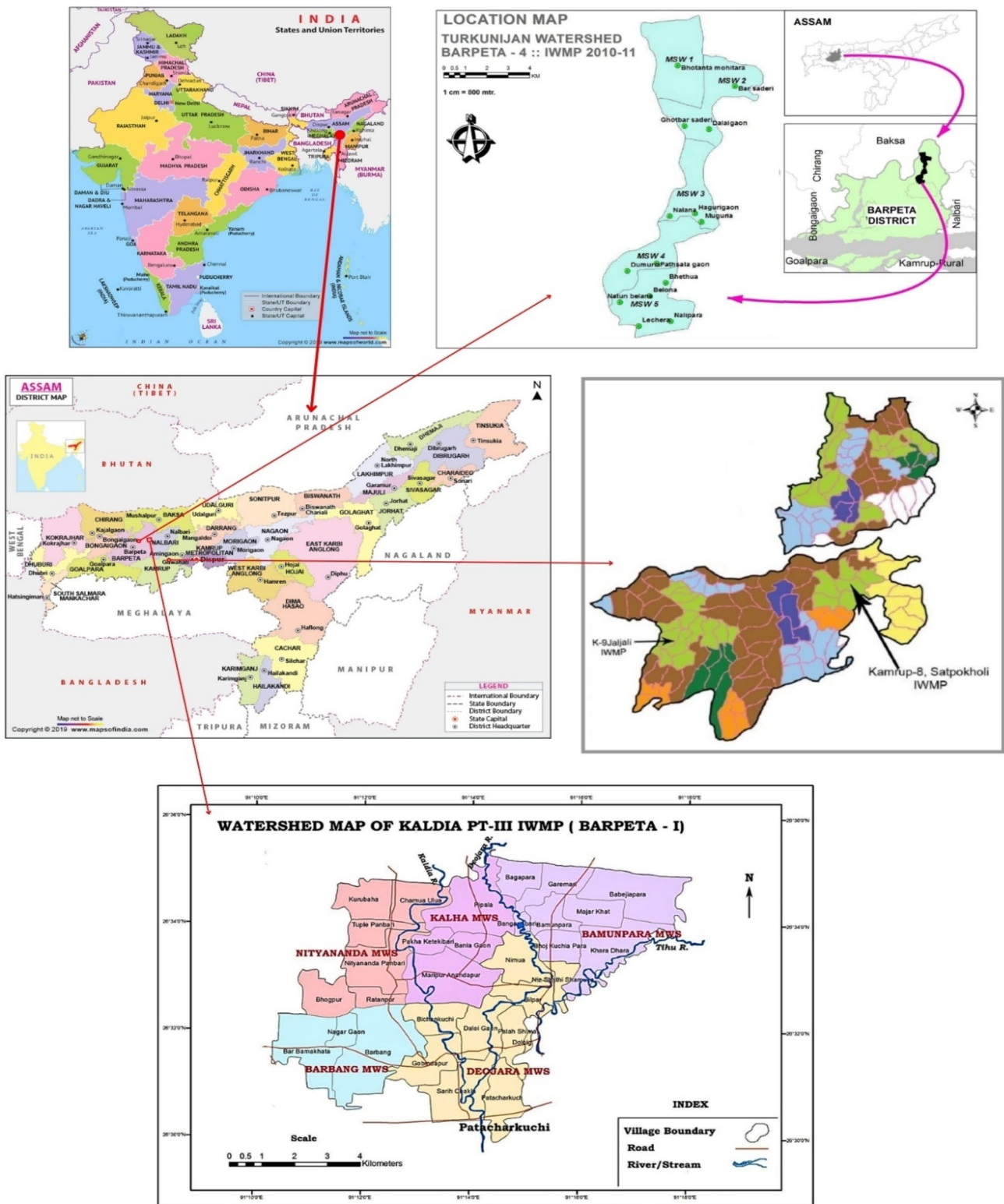


Fig. 1 Maps of the study areas. (Source: Detailed Project Report of Satpokholi, Turkunijan and Kaldia IWMP)

**Table 2** Watershed projects selected for study

Watershed projects	Developmental block	District	Region
Kaldia IWMP part III (2010–11), Code 3A2A7/4	Bajali	Barpeta, Assam	North bank of Brahmaputra River
Turkunijan IWMP (2010–11), Code 3A2A6/a2	Bajali	Barpeta, Assam	North bank of Brahmaputra River
Satpokholi IWMP (2011–12), Code 3B1C8	Rampur and Choy-aniborduwar	Kamrup, Assam	South Bank of Brahmaputra River

**Survey Methods**

Pilot interviews were conducted with five watershed experts to examine the local practice of assessing the performance of IWMP projects and to validate the compiled list of PEF variables. They consented to the identified variables. Subsequently, a structured close-ended questionnaire protocol with a 4-point ratio scale ('0 for not started', '1 for started', '2 for partially completed', and '3 for completed') is done amongst the randomly selected project beneficiaries. A ratio scale is quantitative with true zero and equal intervals between neighboring points [24].

**Data Analysis**

*Goal-Wise, Category-Wise Performance Score (CPS) and PI Calculation*

The score of each goal is calculated as given below.

Let, in any goal category 'A' having n numbers of goals, the score of the i-th goal is denoted by  $G_{Ai}$ , where  $i = 1, 2, 3, \dots, n$ . For each goal, respondents gave a mark between 0 and 3. Now, if the number of respondents giving 0, 1, 2, and 3 scores are  $R_0, R_1, R_2,$  and  $R_3,$  respectively, then,

$$G_{Ai} = (\text{Marks given to that goal}) / (\text{Maximum mark for that goal})$$

$$= (3 * R_3 + 2 * R_2 + 1 * R_1 + 0 * R_0) / (R_3 + R_2 + R_1 + R_0) * 3 \tag{1}$$

Then, Category-wise Performance Score of category A ( $CPS_A$ ) would be the summation of marks given to all the goals in that category, i.e.

$$CPS_A = \sum G_{Ai} \tag{2}$$

The different measurements of the evaluation criteria should be reduced to a standardized scale to be manipulated to treat them as standard measures. Heathcote suggested standardization and imposing weights for effective evaluation criteria for fully utilizing available community information and priorities, considering differences between alternatives to make a clear-cut final choice [25].

**Table 3** Score levels and weights imposed for PI calculation

Score level	Number of goals with this score level	Weight
Zero Score	$N_0$	0
Above 0–10%	$N_1$	1
Above 10–20%	$N_2$	2
Above 20–30%	$N_3$	3
Above 30–40%	$N_4$	4
Above 40–50%	$N_5$	5
Total performance score of a project (TPS)	$= \sum N_i * i$ for $i = 1, 2, 3, \dots, n$ , where $n = \text{Numbers of goals}$	

Upper Score levels are not shown as they are irrelevant. The highest possible weight is 10 for a score level of 90–100%

The scores are grouped to impose weights for PI calculation (Table 3).

The maximum performance score (MPS) of a project = Total Number of goals in the project \* Maximum weight. Since we have 65 goals in each project,  $MPS = 65 * 10 = 650$ .

$$\text{The performance index (PI)} = (\text{TPS} / \text{MPS}) \% \tag{3}$$

The maximum PI of a watershed project can be 100%. For the projects under study, individual PI is calculated.

*Breakup of Opinions and Percentage of Zero Score (PZS)*

This study has used four score levels denoted by  $S_i$  (Here,  $i = 0, 1, 2,$  and  $3$ ). The breakup of opinions is calculated as follows:

Percentage of zero scores ( $S_0$ ) =  $100 * \text{Number of responses with } i\text{th score} / \text{Total Response}$ . Accordingly, the percentage of zero scores ( $S_0$ ), percentage of one score ( $S_1$ ), percentage of two scores ( $S_2$ ), and percentage of three scores ( $S_3$ ) are obtained. For a good project,  $S_3$  should be high, and  $S_0$  should be low.

The percentage of zero scores (PZS denoted by  $S_0$ ) seems valuable as the zero scores are marking and do not indicate abstention. The higher the PZS, the lower the performance. For detailed investigation, the PZS can be calculated goal-wise, category-wise, and project-wise. Results derived from

the survey were cross-referenced amongst community members and watershed managers for validation.

## Results and Discussion

The Krippendorff’s Alpha for inter-coder reliability testing is 0.8, which indicates the acceptability of the goal category list.

### Performance Scores and Index

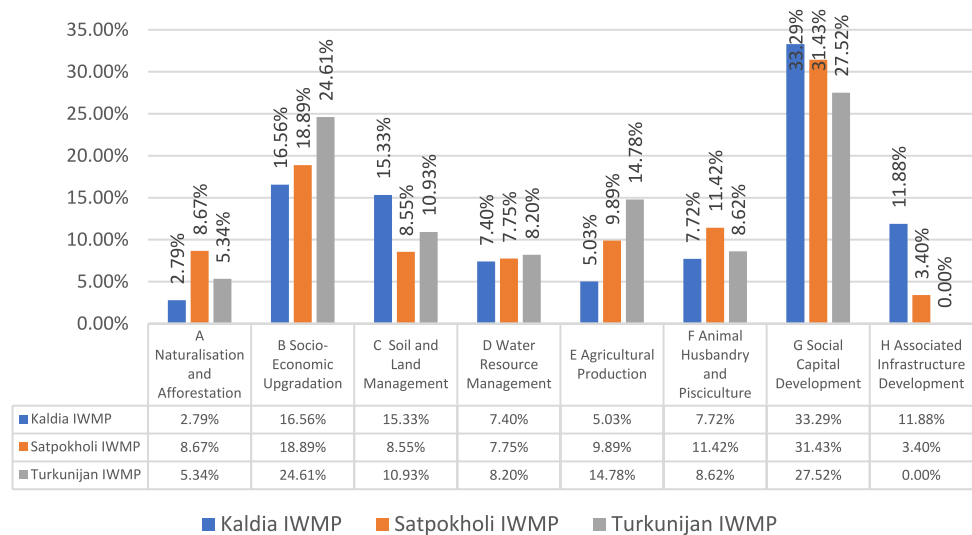
The goal-wise performance score of the three IWMP projects is calculated (Appendix 1: Goal-wise Performance Scores). The goal-wise and category-wise performance scores (Fig. 2) reveal stakeholders’ opinions on performance. It would tell watershed managers how each goal category is performing.

Of all the projects, the goal category ‘Social-capital Development’ has the highest performance (about 27–33%). This is obvious as users’ demand for different goals in this category is high. The category ‘Socio-economic upgradation’ has the second highest performance in all the projects (about 16–24%). The three low-performing categories are ‘Naturalisation and Afforestation,’ ‘Water Resources Management,’ and ‘Associated Infrastructure Development.’ One reason may be that the goals under these categories involve higher costs than the other categories.

Then, project-wise performance and PI are calculated (Table 4).

From the definition (see Sect. "Goal-wise, Category-wise Performance Score (CPS) and PI Calculation"), the maximum PI of a watershed project can be 100%. However, the IWMP projects studied have very low PIs. The Turkunijan IWMP has scored the maximum PI value of 29.54%. Out of 65 planned targets, a maximum of 22 targets have only a 20–30% score. The Kaldia IWMP has a PI value of 18.15%

**Fig. 2** Category-wise performance score of All IWMPs



**Table 4** The project-wise PI

Score levels	Weights	Kaldia IWMP		Satpokholi IWMP		Turkunijan IWMP	
		Number of goals with this score level	Weighted Score	Number of goals with this score level	Weighted Score	number of goals with this score level	Weighted Score
Zero Score	0	6	0	0	0	3	0
Above 0–10%	1	30	30	61	61	1	1
Above 10–20%	2	4	8	4	8	18	36
Above 20–30%	3	22	66	0	0	22	66
Above 30–40%	4	1	4	0	0	16	64
Above 40–50%	5	2	10	0	0	5	25
Total project score (TPS)			118		69		192
Performance index (PI)			18.15		10.62		29.54

and a maximum of 30 targets with a 0–10% score. Here, 62 targets out of a total of 65 targets obtained scores below 30%. The PI of Satpokholi IWMP is very low (10.62%), and all 65 targets scored below 20%.

Thus, the developed performance assessment framework has given us a clear picture of the functioning of the watershed projects studied to find out significant performance parameters (Table 5).

Policymakers might use the category-wise performance score to compare, remodel, and manage best practices. ‘Social Capital Development’ is the highest-performing category. This is reasonable because this category includes building community organizations, the primary objective of IWMP. In Satpokholi and Turkunijan IWMP, ‘Associated Infrastructure Development’ is the minor scoring category. This category is also anticipated because it is not a primary IWMP objective.

**Percentage of Responses at Different Score Levels**

The breakup of opinions against different score levels (Fig. 3) is shown below.

No person has given a maximum mark (3) to any goal in all three projects. This shows that project performances are far from the maximum. In Kaldia and Satpokholi, the maximum number of people gave zero scores to the goals

(S0 values are the highest, 63 and 89%, respectively), which shows their dissatisfaction with performances. In Turkunijan, S<sub>1</sub> and S<sub>2</sub> are the highest, and S0 is the lowest compared to the other two projects. It reflects better performance in Turkunijan compared to Satpokholi and Kaldia.

Similarly, the category-wise PZS (S<sub>0</sub>) values (Fig. 4) show stakeholders’ opinions on non-performance in different goal categories.

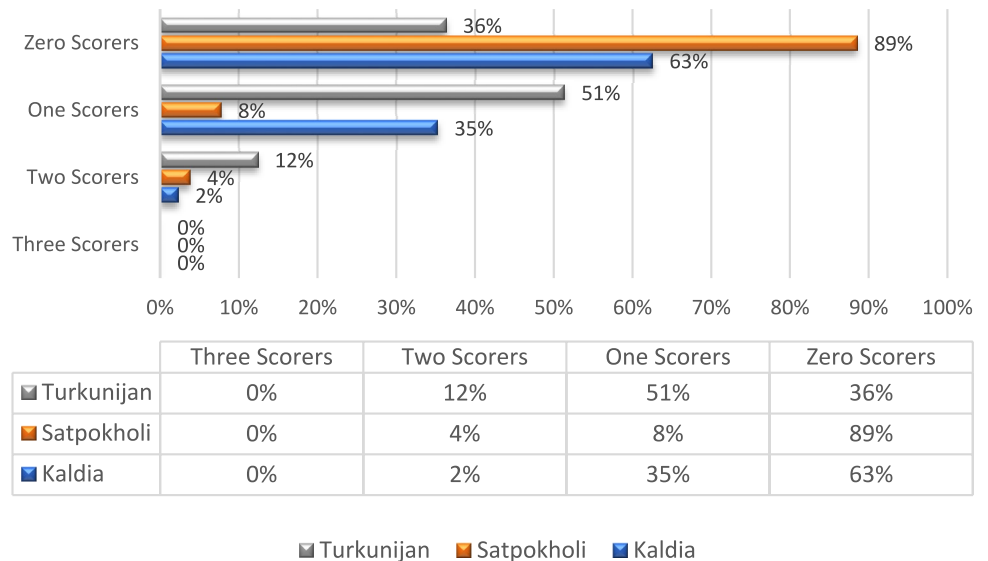
From the PZS values on goal categories, it is seen that the category ‘A’ (Naturalisation and Afforestation) has performed better (PZS being below 7% in all projects). The performance of categories ‘C’ (Soil and Land Management) and ‘H’ (Associated Infrastructure and Development) is also of the same level, except in Turkunijan IWMP, where the public expectation might be higher than the achieved. The categories ‘G’ (Social capital Development) and ‘E’ (Agricultural Production) have shown higher non-performance (with the PZS values ranging from 11 to 31%). Looking at this result, project managers may go for a detailed analysis of the performance score of the pertaining goals (already obtained by the applied methodology) to detect the bottlenecks (as described in Sect. ‘Performance Scores and Index’).

Project-wise, Kaldia has two lowest performing categories, ‘G’ and ‘E’ (PZS 26.33 and 23.01% respectively). Here, category ‘H’ and category ‘A’ show better performance by

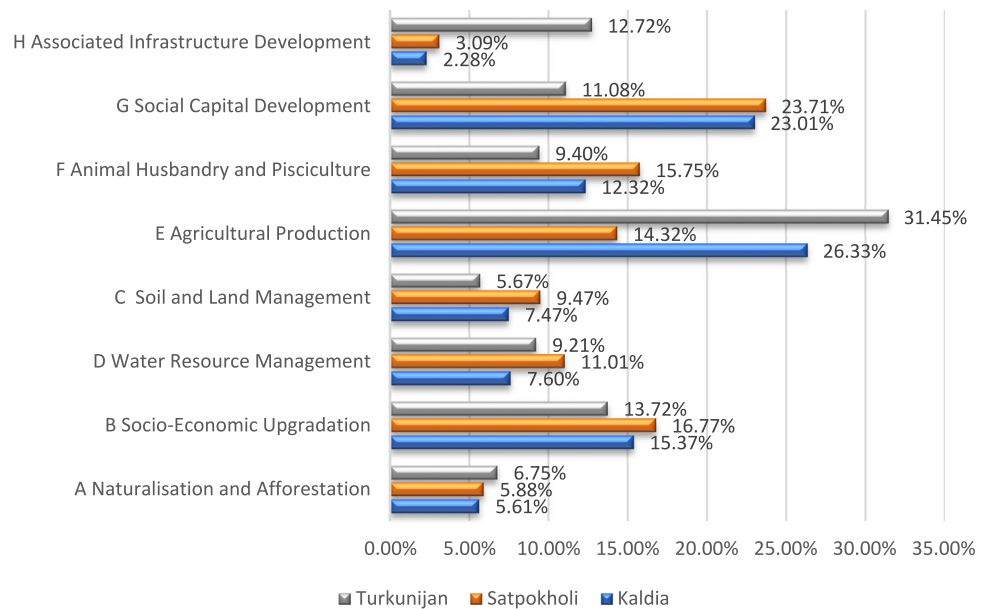
**Table 5** A few significant performance parameters

Parameters	Kaldia IWMP	Satpokholi IWMP	Turkunijan IWMP
Highest performing category	Social capital development	Social capital development	Social capital development
Least performing category	Naturalization and afforestation	Associated Infrastructure development	Associated infrastructure development
Performance index	18.15	10.62	29.54

**Fig. 3** Breakup of opinions with different scores Level-All IWMPs



**Fig. 4** Category-wise percentage of zero score for All IWMPs



PZS (2.28 and 5.61% respectively). In Satpokholi, category “G” is the worst performer, with the highest PZS of 23.71%. Here, category “H” is the highest performer (PZS = 3.09%). In Turkunijan, the worst performer is the category “E” (PZS = 31.45%). Here, the two top-performing categories are “C” (PZS = 5.67%) and “A” (PZS = 6.75%).

Some high and low-performing categories by PZS analysis are shown below (Table 6).

This concurs with the fact that Turkunijan is a recently completed project, and work on Satpokholi is delayed due to field-related reasons. Here, all 65 goals scored below 20%. In the Kaldia IWMP (PI 18.15%), a maximum of 30 goals has a 0–10% score. Validators agreed that works in Kaldia are different from the plan. According to validators, the PEF would facilitate baseline study and benchmarking of IWMP projects as desired by NITI Aayog (Table 7).

## Conclusion

This study aimed to design a participatory performance evaluation framework (PEF) for bridging the gap between achievement and planning goals in a watershed project. Per the research objective, a framework (methodology) is developed and validated in IWMP projects with similar protocols to show how participatory performance indexing is feasible to obtain a quantified performance score (Table 8). The framework variables are identified by analyzing the goals of the three selected projects with analogous settings operating in Brahmaputra

Valley, Assam. Using the framework, the performance indices (PI) of the Kaldia, Satpokholi, and Turkunijan IWMP projects are obtained to be 18.15, 10.62, and 29.54, respectively. Thus, the developed performance assessment framework presents a quantitative expression of the performances of the watershed projects studied. Hence, the developed methodology fulfills two necessities of watershed managers: (i) Expressing performance by a quantitative value and (ii) incorporating community perceptions for assessing project outcomes. Usually, watershed programs are assessed by accounting for the number of assets created or fund flow to the project in a top-down procedure. However, from the point of watershed effectiveness, performance evaluation should focus on the parity of the project goals and the accomplishment against them. Moreover, since watershed initiatives are community-based collaborative programs, meaningful evaluation procedures should incorporate the community’s perspective. Expressing performance quantitatively would help watershed policy-makers to dynamically calibrate and compare the effectiveness of different projects in the same regional settings (Table 9).

Besides providing project-wise performance scores and indexing, the developed framework has the potential to provide very essential community perceptions about various goal categories.

Although the NITI Aayog [2, 18] has proposed watershed guidelines with broadly relevant indicators to facilitate participatory practices in watershed management, there still needs to be a formulation for ground-level evaluation



**Table 6** Some high and low-performing categories by PZS analysis

Performance	Kaldia IWMP	Satpokholi IWMP	Turkunijan IWMP
High performing category	H and A	H	C and A
Low performing CATEGORY	G and E	G	E

incorporating community perspectives. Contextually, the framework developed in this study would be helpful for watershed project managers.

Presently, the developed methodology is applied to accommodate the perception of the watershed beneficiary group. Similarly, this methodology can also be used to capture the perceptions of different stakeholder groups.

The variables for the framework are selected with a broader view over a region to incorporate the most common and universal variables. Therefore, the framework and goal categories can be used for performance indexing of various projects in an analogous socio-economic setting with similar IWMP protocols. However, separate survey for data collection would be necessary for individual projects.

In evaluating performance, this study has refrained from setting any threshold or goal-post values. Therefore, the obtained results cannot be used for inter-project comparison. However, policymakers can arbitrarily choose such values for similar watershed projects to make the framework a performance-comparing tool. A series of in-depth case studies on various watershed projects should be launched to verify further and enrich the applicability and reliability of this PEF to enhance watershed effectiveness.

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**Data Availability** The datasets are submitted in SI files.

**Code Availability** We have used commonly available Real Statistics software and Microsoft Excel tools for data analysis. The applied statistical tests have full acceptance in the research community.

**Declarations**

**Conflict of interest** The authors declare that there is no conflict of interest.

## Appendix 1: Goal-wise Performance Scores

See Tables 7, 8, 9.

**Table 7** Goal-wise performance score for Kaldia IWMP

	Watershed Goals	Percentage Scores
<b>A</b>	<i>Naturalisation and Afforestation</i>	<b>0.241</b>
1	The vegetative cover of the project area is increased	0.065
2	The project restores the degraded ecosystem	0.115
3	As proposed, an additional forest coverage of 37 ha in Naljhara is realised	0.06
<b>B</b>	<i>Socio-Economic Upgradation</i>	<b>1.427</b>
1	183 SHG and farmers group has undertaken micro enterprises like handloom, pottery making, carpentry, mobile repairing, vermin compost, bamboo craft, tarja making etc	0.247
2	As planned, 70 UCs are formed	0.059
3	The project helped to improve human development	0.209
4	The project improves combined economic outcomes	0.224
5	The project helped to control distress migration	0.028
6	The Users Groups are being trained	0.033
7	The SHGs are formed with due diligence- including BPL members	0.43
8	The UGs are formed with due diligence- including BPL members	0.059
9	The UGs are active and alert	0.071
10	Rice production is raised through quality seeds, high yielding varieties	0.067
<b>C</b>	<i>Soil and Land Management</i>	<b>1.321</b>
1	The project has checked soil erosion/siltation	0.069
2	As proposed, four nos of RCC check dams, drop spillways, farm ponds, and earthen embankments are completed	0.247
3	As proposed, six water distribution canals are constructed in the project area	0.242
4	To arrest the runoff water, 15 earthen dams (involving 28,360 RM) are constructed	0.227
5	As proposed, the dams protect the paddy fields from inundation by the Naljhara River floodwater	0.054
6	The velocity of runoff water has decreased	0.233
7	Plantation on the roadside, river bank, and institutional campus is done	0.248
<b>D</b>	<i>Water Resource Management</i>	<b>0.637</b>
1	Hand pumps and tube wells for drinking water are realised	0.23
2	Rainwater conservation is encouraged	0.101
3	Groundwater recharge is encouraged through surface water storage, dug-out ponds, ring wells	0.033
4	The project provides alternatives for the rejuvenation of water bodies	0.052
5	Ten deep tube wells are constructed to recharge groundwater and meet drinking water needs	0.22
<b>E</b>	<i>Agricultural Production</i>	<b>0.433</b>
1	Provisions of using water pumps for Kharif crops are realised	0.048
2	As proposed, these will help 500 ha of cultivated field	0.24
3	Central nursery at the Mahavairab Mandir is realised	0.033
4	Production of rice is raised through the creation of irrigation potentials	0.027
5	There are efforts on the agricultural processing of different produce like cereals, oil seeds, fruits etc	0.026
6	There are efforts on agricultural marketing of different produce like cereals, oil seeds, fruits etc	0.013
7	There are efforts of crop demonstration programmes on different agricultural produce	0.014
8	The proposed one of the central nurseries with three lakhs horticultural species is realised	0
9	The plantation of bamboo is encouraged	0.021
10	As proposed rubber plantation of 108 ha is realised	0.013
11	As proposed, the 2 ha area of fodder grass is raised	0
12	The output has been sold or distributed to beneficiaries	0
<b>F</b>	<i>Animal Husbandry and Pisciculture</i>	<b>0.665</b>
1	The project has developed pisciculture	0.098
2	To facilitate fish rearing, firm ponds and fishery ponds are constructed	0.067
3	Poultry development is done	0
4	Piggery development is done	0

**Table 7** (continued)

	Watershed Goals	Percent- age Scores
5	Weaving development is done	0
6	The project helped to develop the rearing of livestock and poultry	0.252
7	133 units of SHG have taken up schemes of rearing cows, poultry, piggery, duckery, beekeeping etc	0.248
<i>G</i>	<i>Social Capital Development</i>	<b>2.868</b>
1	The project helped to improve gender equality	0.248
2	The project helped to improve social cohesion	0.082
3	The project helped to improve the nutritional need of users	0.04
4	The Self-Help Groups are being trained	0.229
5	The Watershed Committees are being trained	0.238
6	The project undertook participatory rural appraisal exercises	0.085
7	There is coordination between the project implementing agency (PIA) and beneficiaries	0.184
8	The watershed development team (WDT) is attentive to the project activities	0.173
9	There is a good collaboration of watershed managers with the village community	0.067
10	There is a good collaboration of watershed managers with gram panchayatas (GP)	0.026
11	The watershed committee (WC) is active and alert	0.237
12	The SHGs are formed with due diligence- including female members	0.397
13	The SHGs are formed with due diligence- including SC/ST members	0.438
14	The UGs are formed with due diligence- including female members	0.059
15	The UGs are formed with due diligence- including SC/ST members	0.08
16	The SHGs are active and alert	0.236
17	There is good collaboration with DRDA/ ZP cells	0.049
<i>H</i>	<i>Associated Infrastructure Development</i>	<b>1.024</b>
1	Playground improvement at SKKH School is done	0.25
2	Improvement of the Anganwadi centre at Sariha Chakla is done	0.261
3	Improvement of GP offices at Nityananda Panbari is done	0.262
4	Improvement of Samiti playground at Bamunpara is done	0.25
	<i>Total Score</i>	<b>8.615</b>

**Table 8** Goal-wise performance score for Satpokholi IWMP

	Watershed Goals	Percentage score
<b>A</b>	<b><i>Naturalisation and Afforestation</i></b>	<b>0.287</b>
1	The vegetative cover of the project area is increased	0.162
2	The project controls the degraded ecosystem	0.068
3	As proposed, additional forest coverage is realised	0.023
4	Plantation is encouraged	0.034
<b>B</b>	<b><i>Socio-Economic Upgradation</i></b>	<b>0.625</b>
1	1000 poor households are covered under SHG	0.085
2	UGs are formed to include 1000 persons	0.085
3	Watershed committees are formed to include 1000 persons	0.078
4	Exposure trainings (on NRM/Enterprise Promotion/ Productivity Enhancement) for 500 persons are held	0.046
5	The project helped to improve human development	0.068
6	The project improves combined economic outcomes	0.052
7	The project helped to control distress migration	0.032
8	The Users Groups (UG) are being trained	0.057
9	The SHGs are formed with due diligence- including BPL members	0.06
10	The UGs are formed with due diligence- including BPL members	0.028
11	The UGs are active and alert	0.033
<b>C</b>	<b><i>Soil and Land Management</i></b>	<b>0.283</b>
1	The project has checked erosion/ siltation	0.032
2	As proposed, three nos of RCC check dams are completed	0.032
3	As proposed, 35 water distribution canals are constructed in the project area	0.027
4	To arrest the runoff water, 11 earthen dams are constructed	0.027
5	The project had a vision for open space land and plotted land management	0.028
6	The velocity of runoff water has decreased	0.05
7	Plantation on the roadside, river bank, and institutional campus is done	0.087
<b>D</b>	<b><i>Water Resource Management</i></b>	<b>0.257</b>
1	The project contributed to the reduction of waterlogging	0.029
2	65 numbers of hand pumps installed as entry point activity	0.089
3	Rainwater conservation/harvesting is encouraged	0.043
4	The project provides alternatives for the rejuvenation of water bodies	0.023
5	Wells are constructed to meet drinking water needs	0.024
6	Groundwater recharge is encouraged through surface water storage, dug-out ponds, ring wells	0.049
<b>E</b>	<b><i>Agricultural Production</i></b>	<b>0.327</b>
1	As proposed, these will help 48 ha of cultivated field	0.046
2	Production of rice is raised through the creation of irrigation potentials	0.032
3	There are efforts in the industrial processing of different produce like cereals, oil seeds, fruits etc	0.046
4	There are efforts on agricultural marketing of different produce like cereals, oil seeds, fruits etc	0.046
5	There are efforts for low-cost go-down for storage of agricultural produce	0.019
6	Provisions of brick canals and water storage for Kharif & rabi crops are realised	0.027
7	Rice production is raised through quality seeds, high yielding varieties	0.036
8	As proposed, the horticulture, ginger, turmeric and banana plantation is raised	0.037
9	The output has been sold or distributed to beneficiaries	0.037
<b>F</b>	<b><i>Animal Husbandry and Pisciculture</i></b>	<b>0.378</b>
1	The project has improved pisciculture	0.024
2	To facilitate fish rearing, firm ponds and fishery 23 ponds are constructed	0.038
3	Fishery developments are done	0.059
4	102 goatery unit development are done	0.042
5	96 duckery unit development are done	0.028
6	102 poultry unit development is done	0.027
7	93 piggery unit development are done	0.032

**Table 8** (continued)

	Watershed Goals	Percentage score
8	93 weaving unit developments are done	0.053
9	The project helped to develop the rearing of livestock and poultry	0.032
10	56 units of SHG and 50 units of UGs have taken up schemes of rearing cows, poultry, piggery, duckery, bee-keeping, vermin compost etc	0.043
<i>G</i>	<i>Social Capital Development</i>	<b>1.04</b>
1	The project helped to improve gender equality	0.052
2	The project helped to improve social cohesion	0.069
3	The project helped to improve the nutritional need of users	0.05
4	The Self-Help Groups (SHG) are being trained	0.102
5	The Women Groups are being trained	0.141
6	There is coordination between the project implementing agency (PIA) and beneficiaries	0.068
7	The Watershed Development Team (WDT) is attentive to the project activities	0.057
8	There is a good collaboration of watershed managers with the village community	0.051
9	There is a good collaboration of watershed managers with gram panchayatas (GP)	0.125
10	The watershed committee (WC) is active and alert	0.019
11	The SHGs are formed with due diligence- including female members	0.075
12	The SHGs are formed with due diligence- including SC/ST members	0.075
13	The UGs are formed with due diligence- including female members	0.029
14	The UGs are formed with due diligence- including SC/ST members	0.059
15	The SHGs are active and alert	0.046
16	There is good collaboration with DRDA/ ZP cells	0.023
<i>H</i>	<i>Associated Infrastructure Development</i>	<b>0.113</b>
1	The project undertook participatory rural appraisal exercises	0.052
2	As proposed, fuel wood plantation is realised	0.06
	<i>Total Score</i>	<b>3.31</b>

**Table 9** Goal-wise performance score for Turkunijan IWMP

Watershed Goals		Percentage score
<i>A</i>	<i>Naturalisation and Afforestation</i>	<b>0.88</b>
1	The vegetative cover of the project area is increased	0.323
2	The area under forest/vegetation increases by 13 ha	0.14
3	The project restores the degraded ecosystem	0.228
4	As proposed, an additional forest coverage of 13	0.19
<i>B</i>	<i>Socio-Economic Upgradation</i>	<b>4.058</b>
1	150 SHG and farmers group has undertaken micro enterprises like handloom, pottery making, carpentry, mobile repairing, vermin compost, bamboo craft, tarja making etc	0.226
2	Works for 30 days for 169 persons (a total of 156,845 person-days) is created to reduce labourer migration	0.292
3	The project helped to improve human development	0.293
4	The project improves combined economic outcomes	0.322
5	The project helped to control distress migration	0.195
6	The Users Groups are being trained (Proposed 96 families)	0.167
7	The SHGs are formed with due diligence- including BPL members	0.387
8	The UGs are formed by watershed committees with due diligence- including female members	0.426
9	The UGs are formed with due diligence- including SC/ST members	0.34
10	The UGs are formed with due diligence- including BPL members	0.4
11	The SHGs are active and alert	0.381
12	The UGs are active and alert	0.311
13	In total, 18 Users Groups are formed	0.318
<i>C</i>	<i>Soil and Land Management</i>	<b>1.802</b>
1	The project has checked soil erosion/siltation	0.319
2	As proposed, check dams, drop spillways, farm ponds, and earthen embankments are completed	0.258
3	As proposed, water distribution canals are constructed in the project area	0.159
4	To arrest the runoff water, earthen dams are constructed	0.292
5	As proposed, the dams protect the paddy fields from inundation by flood	0.327
6	The velocity of runoff water has decreased	0.285
7	Plantation on the roadside, river bank, and institutional campus is done	0.162
<i>D</i>	<i>Water Resource Management</i>	<b>1.351</b>
1	Hand pumps and tube wells for drinking water are realised	0.213
2	Rainwater conservation/soil moisture retention is encouraged	0.254
3	Groundwater recharge is encouraged through surface water storage, dug-out ponds, ring wells	0.261
4	The project provides alternatives for the rejuvenation of water bodies/water budgeting	0.295
5	Shallow tube wells (54 proposed), ponds and hand pumps (proposed 22) are constructed to meet drinking water needs	0.327
<i>E</i>	<i>Agricultural Production</i>	<b>2.437</b>
1	Provisions of using water pumps for Kharif crops are realised	0.225
2	As proposed, these will help of cultivated field	0.285
3	Irrigation potential has been raised by 110 ha	0.144
4	The area under double cropping increased by 110 ha	0.156
5	The area under horticulture increases by 8 ha	0.195
6	Rice production is raised through quality seeds, high yielding varieties	0.266
7	Production of rice is raised through the creation of irrigation potentials	0.161
8	There are efforts on agricultural processing of different produce like cereals, oil seeds, fruits etc	0.158
9	There are efforts on agricultural marketing of different surplus produce like cereals, oil seeds, fruits/ milk etc	0.141
10	There are efforts of crop demonstration programmes on different agricultural produce	0.162
11	As proposed growth of cropped area (approximately 340 ha) is achieved	0.16
12	As proposed, cash crop like jute is increased	0.093
13	As the proposed wheat crop is increased	0.107
14	As proposed, crops like pulses and oil seeds are increased	0.183
<i>F</i>	<i>Animal Husbandry and Pisciculture</i>	<b>1.421</b>

**Table 9** (continued)

	Watershed Goals	Percentage score
1	The project has developed pisciculture	0.265
2	To facilitate fish rearing, firm ponds and fishery ponds are constructed	0.22
3	Milk production increases by two times	0.195
4	As proposed, training on weaving/ fishery (25 weaving units) and dairying (6 dairy units), goatery (26 units), and poultry (123 units) are realised	0.211
5	The project helped to develop livestock and poultry rearing for asset-less/marginal labourers	0.295
6	To help asset-less/marginal labourers SHGs (total 150–160) have taken up schemes of rearing cows, poultry, piggyery, duckery, beekeeping etc	0.236
<i>G</i>	<i>Social Capital Development</i>	<b>4.537</b>
1	The project helped to improve gender equality	0.285
2	The project helped to improve social cohesion	0.289
3	The project helped to improve the nutritional need of users	0.22
4	The Self-Help Groups are being trained (Proposed to promote 150)	0.182
5	Gram Sabha forms the Watershed Committees (17 numbers comprising ten members each) and is being trained	0.325
6	The project undertook participatory rural appraisal exercises like participatory modelling, transact walk, seasonality technique, matrix ranking, timeline etc	0.352
7	There is coordination between the project implementing agency (PIA) and beneficiaries	0.348
8	The Producers' Collective group is formed and is attentive to the project activities	0.363
9	There is a good collaboration of watershed managers with the village community	0.392
10	Watershed managers collaborate well with gram panchayatas (GP)/ DRDA/ ZP cells	0.422
11	The watershed committee (WC) is active and alert	0.482
12	The SHGs are formed by the watershed committee with due diligence- including female members	0.467
13	The SHGs are formed with due diligence- including SC/ST members	0.41
<i>H</i>	<i>Associated Infrastructure Development</i>	<b>0</b>
1	Children's parks and historic sites are developed	0
2	Roads and bridges are built/developed	0
3	Public utilities are built/developed	0
	<i>Total Score</i>	<b>16.486</b>

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