

Ensuring availability of drinking water to water users through payment for ecosystem services

A case study of the Baitadi Town Water Supply and Sanitation Project, Nepal

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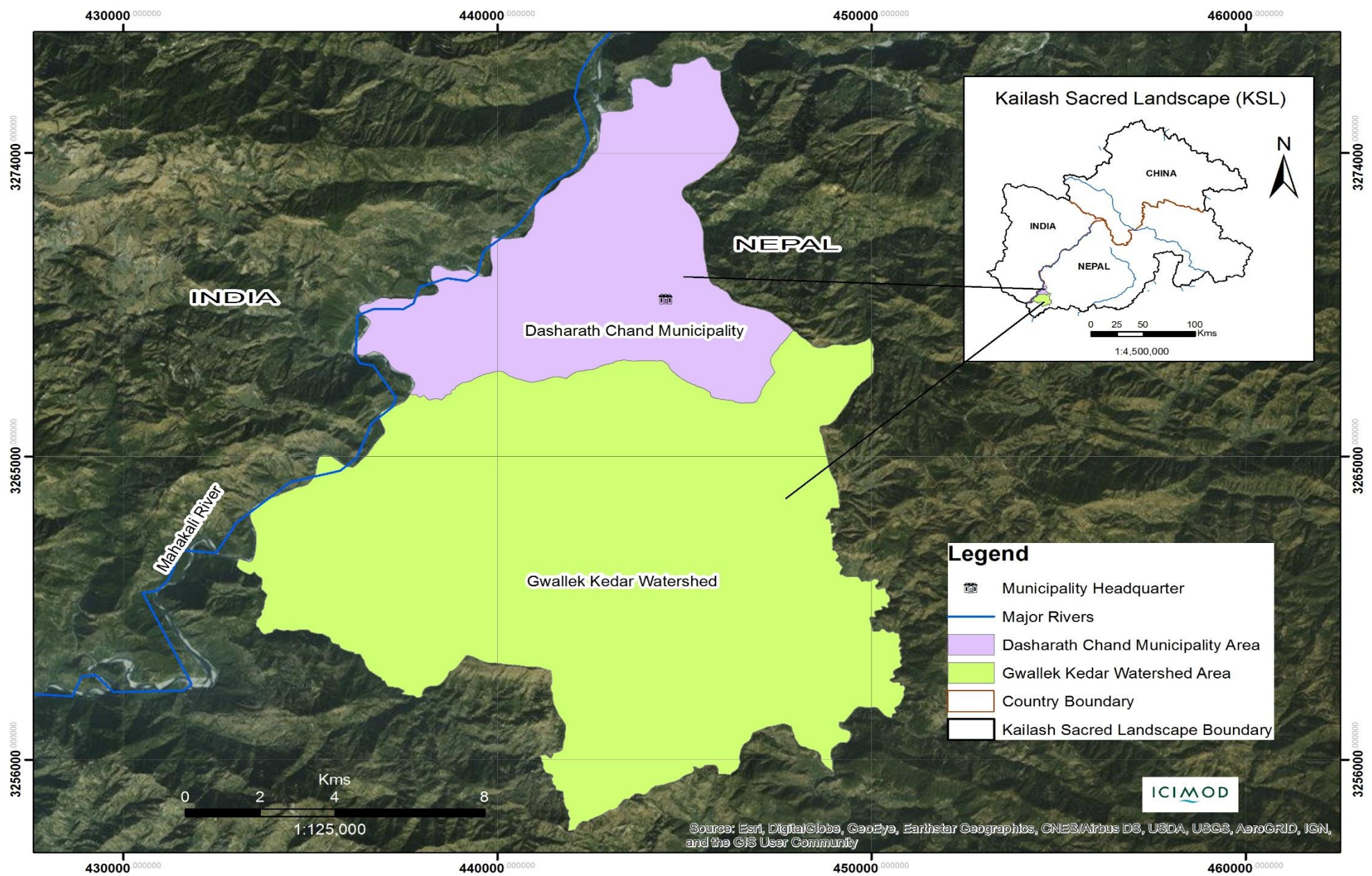


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Background

- Dasharath Chand Municipality, Baitadi
 - Public tap- shared by 8-10 households
 - Water supply irregular,
 - Household gets hardly ever exceeding 100 liters / day,
- New water supply project-under construction
- Source – Gwalek watershed

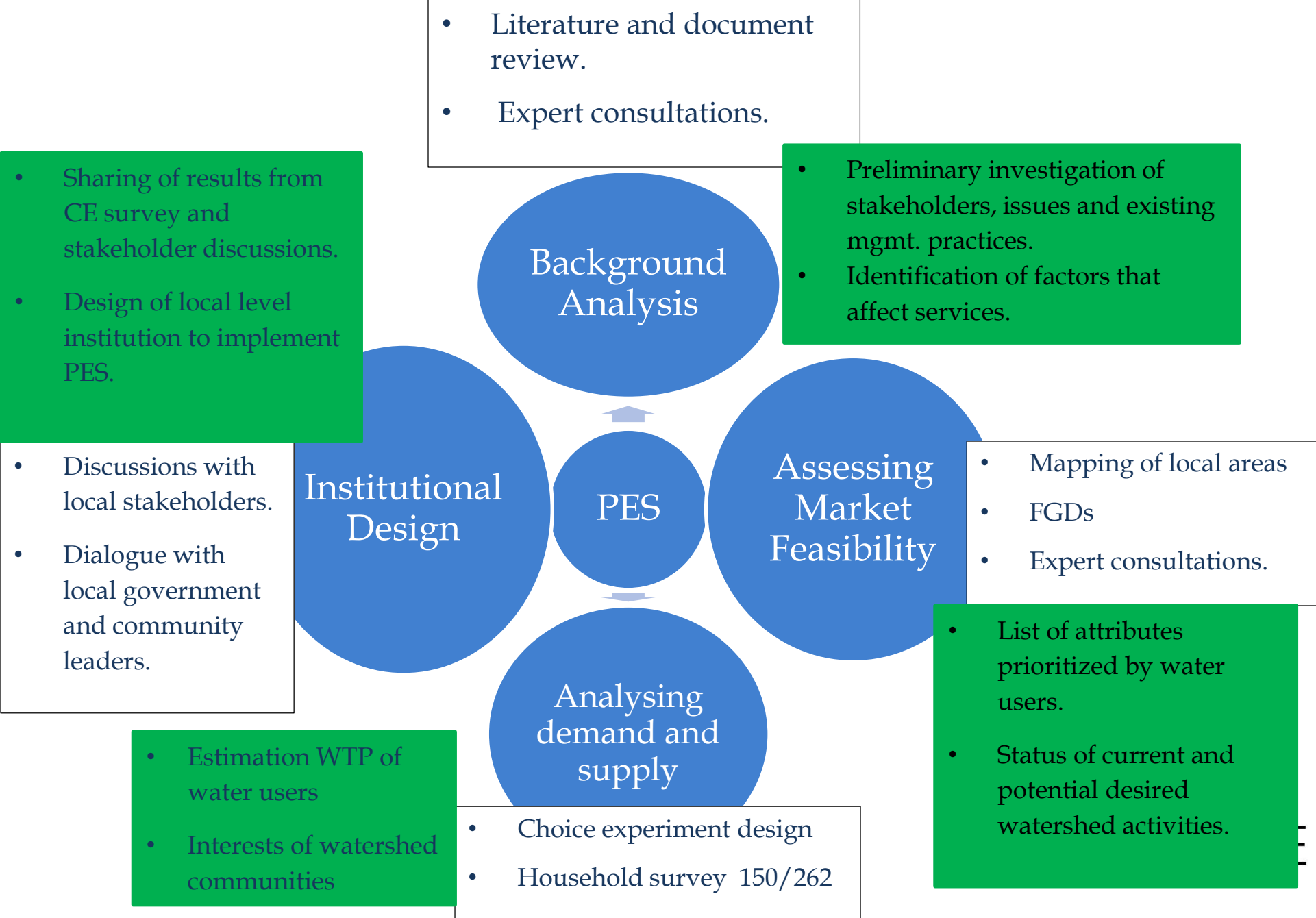


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Why PES in this context?

- to minimize obstruction from the watershed community to water diversion
- to encourage them to maintain the current quality of water in future



- Literature and document review.
- Expert consultations.

Background Analysis

- Preliminary investigation of stakeholders, issues and existing mgmt. practices.
- Identification of factors that affect services.

- Sharing of results from CE survey and stakeholder discussions.
- Design of local level institution to implement PES.

Institutional Design

- Discussions with local stakeholders.
- Dialogue with local government and community leaders.

PES

Assessing Market Feasibility

- Mapping of local areas
- FGDs
- Expert consultations.

Analysing demand and supply

- List of attributes prioritized by water users.
- Status of current and potential desired watershed activities.

- Estimation WTP of water users
- Interests of watershed communities

- Choice experiment design
- Household survey 150/262



Watershed Issues

Issues	Activities	Estimated annual Budget (NPR)
Sanitation	Public toilet construction (5 nos)	200,000
Increased use of chemical fertilizer	Off-season vegetable farming	500,00
Grazing	Grazing regularization	365,640
Drinking water distribution	Hiring personnel for water distribution	60,000
NTFP management	Training	50,000

Trends in Watershed Services Compared to Last 5 Years

Services	Response	Decreasing (↓)	No Change (↔)	Increasing (↑)
Drinking water (quantity)	150	111(74%)	12(8%)	27(18%)
Drinking water (quality)	150	14(9%)	134 (90%)	2(1%)
Irrigation water	50	46(92%)	4(8%)	-
Firewood availability	147	110(75%)	8(5%)	29(20%)
Fodder availability	150	112(75%)	9(6%)	29(19%)
Leaf litter availability	149	107(72%)	12(8%)	30(20%)
Timber availability	95	64(67%)	5(5%)	26(27%)
NTFP availability	14	3(21%)	11(79%)	-
Forest condition	138	16(11%)	118(86%)	4(3%)
Paddy productivity	25	25(100%)	-	-
Maize productivity	148	143(97%)	5(3%)	-
Millet productivity	6	6(100%)	-	-
Wheat productivity	149	144(97%)	5(3%)	-
Livestock holding	148	129(87%)	16(11%)	3(2%)
Forest cover (Conifer)	134	94(70%)	9(7%)	31(23%)
Forest cover (Broad leaved)	148	101(68%)	14(9%)	33(22%)
Cultivated area	139	95(68%)	43(31%)	1(1%)
Barren area	136	15(11%)	39(29%)	82(60%)

Attributes and their levels

Attributes	Description	Levels
Water quantity	This is defined as availability of water during the dry season on private tap since, after the new project, every household will be connected to the pipe-borne water supply system. Currently, there is no private tap and households get water from the public tap which is shared by 8-10 households.	<ul style="list-style-type: none"> i. 25 liter/person/day* ii. 50 liter/person/day iii. 75 liter/person/day iv. 100 liter/person/day
Water quality	Quality of drinking water from the new source. Given the current water quality, it is drinkable only after normal treatment such as boil and filter or use of tablet. The new drinking water project may have better quality water after the treatment in treatment plant. The maintenance of the water quality requires eco-friendly activities upstream.	<ul style="list-style-type: none"> i. Drink after filter or using tablet* ii. Drinkable from the tap
Water distribution system	The schedule of water distribution to household. Currently it is irregular.	<ul style="list-style-type: none"> i. Irregular* ii. Once a day iii. Twice a day
Water source management fee	A new fee for water source management, which is additional to the monthly water fee. This is given as monthly charge for water source protection and management.	<ul style="list-style-type: none"> i. NPR. 0/month* ii. NPR. 10/month iii. NPR. 25/month iv. NPR. 50/month v. NPR. 75/month

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Regression

Variables	MNL	RPL
Attributes		
Quantity	4.17e-2(1.98e-2)**	4.09e-2(1.94e-2)**
Distribution 1	4.46 (2.68)*	4.51(2.67)*
Distribution 2	4.00 (2.61)	4.03 (2.61)
Quality	0.876 (0.315)***	0.880 (0.319)***
Fee	-2.28e-2(8.02e-3)***	-2.25e-2(7.94e-3)***
Interaction of attributes and socio-economic variables		
Male × quality	-5.98e-2(0.179)	-5.98e-3(0.18)
Male× distribution 1	0.351 (0.194)*	0.353 0.195)
Male× fee	8.43e-3(3.40e-3)**	8.49e-3(3.47e-3)**
Family size× quantity	-1.47e-3(1.56e-3)	-1.48e-3(1.58e-3)
Family size × quality	-1.58e-2(3.14e-2)	-1.61e-2(3.17e-2)
Family size × fee	3.34e-4(6.25e-4)	3.28e-4(6.31e-4)
Income × quantity	-1.51e-2(7.23e-3)**	-1.49e-2(7.22e-3)**
Income× quality	4.76e-2(5.16e-2)	4.86e-2(5.19e-2)
Income× fee	8.47e-3(2.93e-3)***	8.39e-3(2.91e-3)***
Income×distribution1	0.927 (1.22)	0.922(1.23)
Income×distribution2	0.686 (1.20)	0.685 (1.20)
Urban residence ×quantity	-1.08e-2(7.74e-3)	-1.09e-2(7.82e-3)
Urban location× quality	0.158(0.178)	0.161(0.180)
ASC	-0.422 (9.22e-2)***	-0.425 (9.24e-2)***
Standard deviation of random parameter		
Fee (T)	-	1.12e-2 (3.97e-3)***
Log likelihood	-537.57	-537.63
Pseudo R ²	0.263	0.264

Implicit price and their confidence intervals (NPR)

Attributes	Implicit Price (confident interval)
Water quantity	1.90 (1.22-3.57)
Water quality	40.88 (26.27-76.86)

Background

Policy	HH Monthly WTP (NPR)	Total Annual WTP (NPR)	Required annual budget for watershed (NPR)
<ul style="list-style-type: none"> • Double the water availability • Improve water quality – drinkable without treatment 	69	1,175,760	1,175,640
Double the water quality	28	482,076	

Institution

Watershed Community

- Gwallek VDC ward 2-7
- Implement watershed management activities,
- Ensure water quantity and quality to municipal users

Monitoring Committee

- District Development Committee
- Municipality
- District Forest Office
- Drinking Water and Sanitation Division Office
- FNCCI

Water User Committee

- Support financially for watershed management,
- Coordinate with relevant organizations for additional sources if required,

Agreement

Monitoring, Advising

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Conclusions

- Incorporate PES designing with IEE/EIA,
- A tripartite institution to implement PES scheme,
- Multi-sectoral approach to manage resources,
- Land-use and ES relationship is complex – output based payment may put resource managers at risk,
- Payment should make for inputs – therefore, incentive payment for ecosystem services (IPES),

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