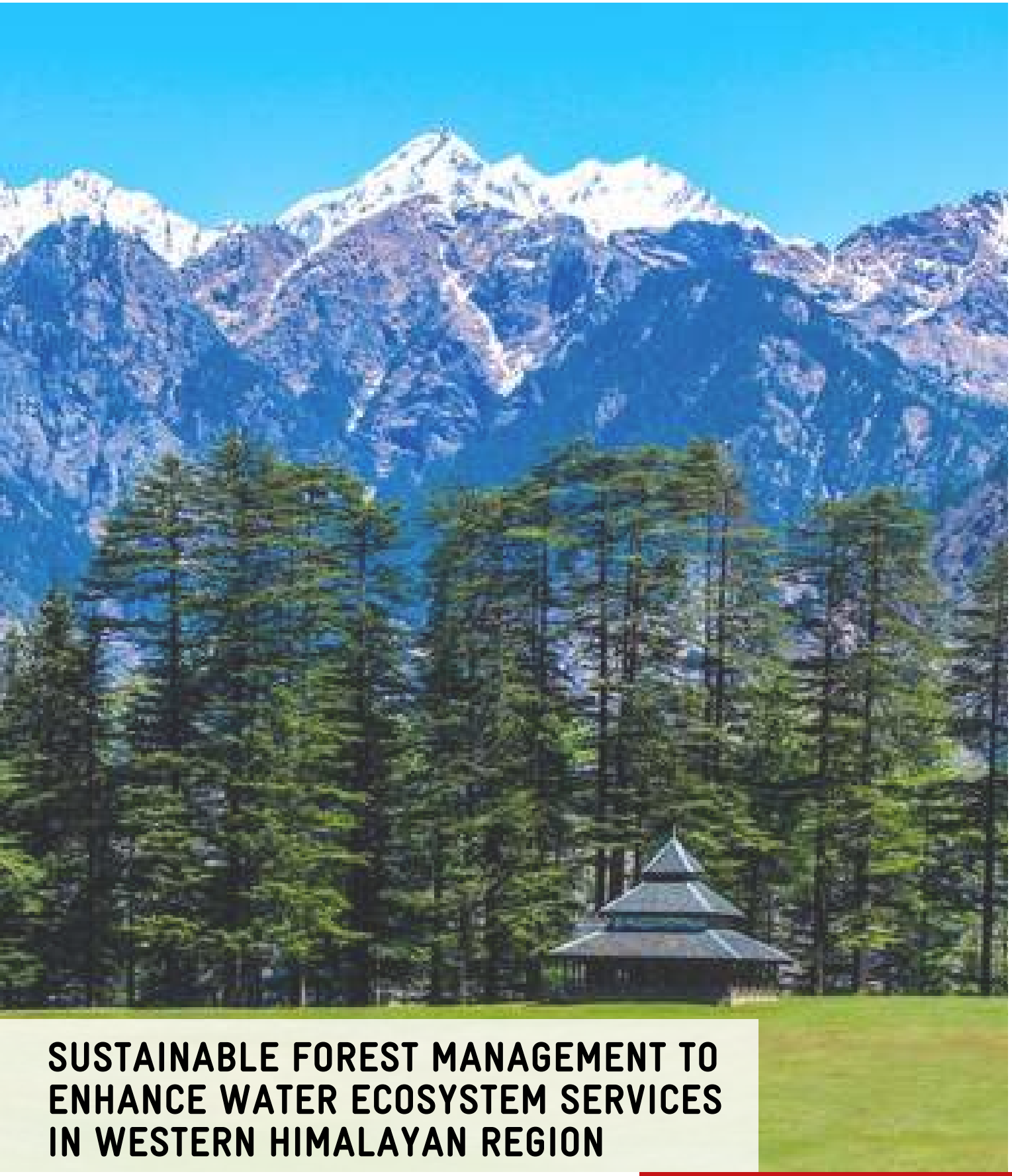

SUSTAINABLE FOREST MANAGEMENT TO ENHANCE WATER ECOSYSTEM SERVICES IN WESTERN HIMALAYAN REGION

A COMPENDIUM OF BEST PRACTICES

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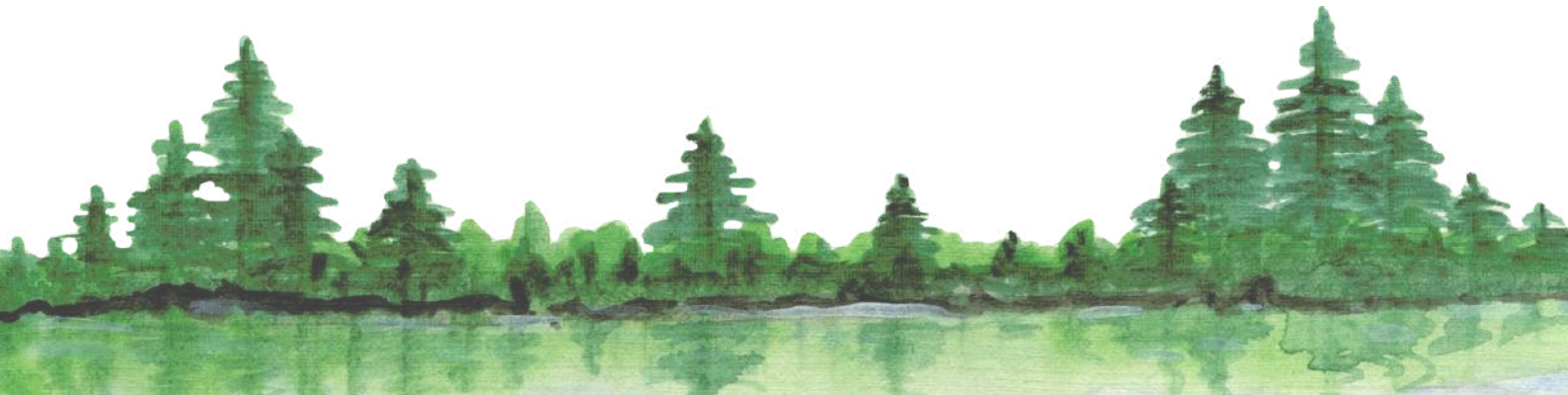
On behalf of the
German Federal Ministry for Economic Cooperation and Development (BMZ)

New Delhi, December 2024

Sustainable forest management of both natural and planted forests and for timber and nontimber products is essential to achieving sustainable development and is a critical means to eradicate poverty, significantly reduce deforestation, halt the loss of forest biodiversity and land and resource degradation, and improve food security and access to safe drinking water and affordable energy... The achievement of sustainable forest management, nationally and globally, including through partnerships among interested governments and stakeholders, including the private sector, indigenous and local communities and non-governmental organizations, is an essential goal of sustainable development...

Paragraph 45, Plan of Implementation of the World Summit on Sustainable Development (UN, 2002)



Executive Summary

Forests sustain the lives of 70% of terrestrial biodiversity. They provide a myriad of goods (e.g., fuel, fodder, minor forest products, edible fruits) and services (e.g., purification of air and water, control soil erosion, mitigation of floods and droughts, carbon sequestration) to mankind. As of 2012, approximately 1.6 billion people worldwide are living within 5 km of a forest, with 64.5 % of them in tropical countries (FAO, 2024). These services provide support to human wellbeing directly or indirectly. Therefore, maintaining and conserving ecosystem health is important to continue the supply of services.

India, being one of the mega biodiversity countries with 2.4% of world's land area, has diverse physical features and climatic conditions that have resulted in varied ecosystems. Forests are one of the ecosystems in India which constitute 24.62% of total geographical area of the country. India's rural and forest-fringe communities, numbering around 300 million, rely heavily on forests for their livelihoods. Despite this critical dependence, India's per capita forest land i.e., 0.06% is significantly lower than the global average of 0.64%. Concurrently, surging water demands driven by population growth and climate change pose unprecedented threats to sustainable development.

Clean water is one of the most important ecosystem services necessary for life on earth. Given the pivotal role of water in achieving the Sustainable Development Goals, it is imperative to recognise the indispensable function of forests as water regulators. Forests influence water in multiple ways and at multiple levels. They are widely recognised as recommended land cover for protection of water resources as they help in improving water quality and regulating water flow. The water related ecosystem services of forests include irrigation, drinking water, fish production and wood production (provisioning services), flood regulation, climate regulation, erosion control, water purification (regulating services) and canopy interception and evapotranspiration (supporting services). Forests have been a driver for forest management.

The Western Himalayan Region has a rich and diverse ecosystem and is also fragile in nature. It is special for its natural wealth, water bodies and traditional knowledge. The neighbouring mountainous communities are dependent upon this region for meeting their livelihood security. These communities have long standing traditions of conservation and management of these natural resources.

The Western Himalayan region is known as the "water tower of Asia", as most of the northern river systems and perennial rivers originate from the Himalayan region. Groundwater in the form of springs is sustaining and providing water to many people living in surrounding lowlands. These springs help the communities to meet their need of drinking, irrigation and domestic needs. Water can be accessed through these springs without any energy source requirement. These springs are fed by the aquifers, which constitute a system of rocks/rock material capable of storing and transferring water to these springs. The aquifers in the Himalayan region due to the discontinuity prevailing in hydrogeological structure are localised and are unique to this region.

In the Western Himalayan region especially in Uttarakhand state, springs are considered a symbol of heritage, not in the way they are identified but in the way they are managed traditionally. The inherent value of forests and water are deeply embedded within the religious belief and practices of the communities. They have developed their rules for managing and harvesting water through traditional technologies. One of the examples is Naula management practice followed in Uttarakhand which is considered as prime source of drinking water and sacred site where sculptures of local deity are usually carved onto the walls of Naula. Integrating traditional practices in modern practices, scientific knowledge and technology will help in addressing contemporary challenges and ensure long term sustainability.

In hilly areas women carry the brunt of the struggle for survival of their household unlike men who migrates in search of jobs. They play a central role in management and safeguarding water for their family. Because of this role, women have considerable knowledge about water resources including water quality and quantity. Therefore, involvement of women will help in effective water governance.

Incentivising ecosystem service providers through land management practices—known as Payment for Ecosystem Services (PES) is one of the essential approaches which guarantee regional Sustainable Development across the globe. The government provides incentives to the States through schemes like Jal Jeevan Mission (JJM) which is a decentralized, demand-driven, community-managed water supply scheme that aims to improve the lives of rural people by providing clean tap water supply to every home. Himachal Pradesh was one of the seven states which received performance incentives under this scheme. The state government is tirelessly working to provide 100% tap water connection in rural areas by 2024.

The piped water systems tap the groundwater (springs) or surface water (streams) for the connection. As per NITI Aayog report 2018, 50% of springs in hilly areas are drying up due to anthropogenic pressure and increasing demand of freshwater in rural and urban areas. Because of the reduction in spring discharge, these schemes are pumping up water from rivulets and borewells in the lower streams. This results in turbidity and many other water quality issues.

As a result of this, there is a need for revitalisation of rivers and maintain continuous flow in water sources by treating them in a phased manner through various soil and moisture conservation interventions like check dams, contour trenches, recharge pits etc. To achieve this, involving traditional knowledge, interventions of various line departments and multiple stakeholders needs to be integrated. There is a dire need to educate stakeholders and promote co-learning with local community to conserve and protect these water resources.

About the Compendium

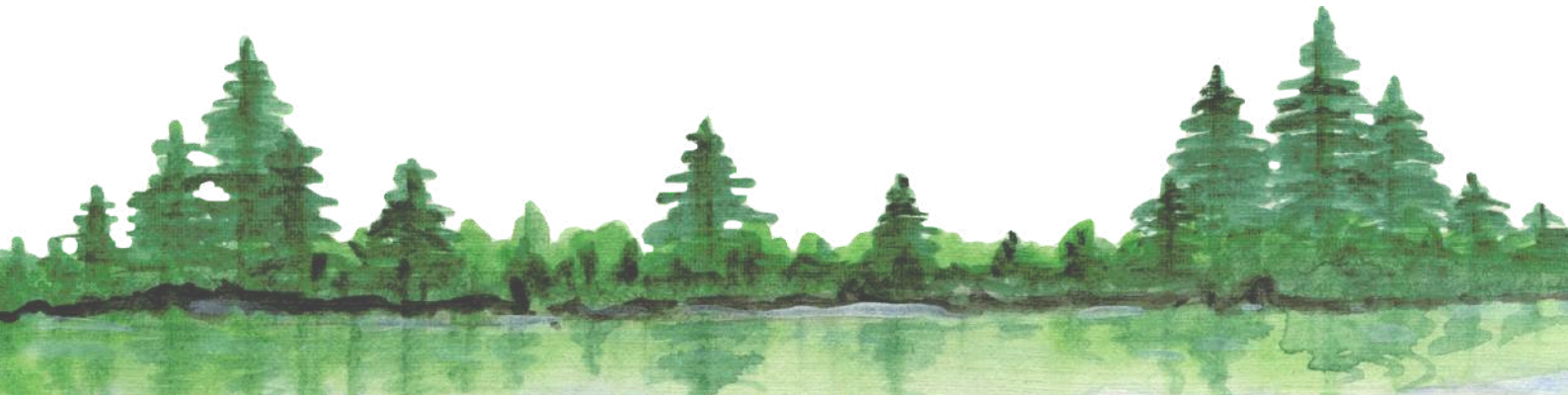
This document is a compilation of cases from the Indian Western Himalayas that provide information on best practices of forest ecosystem services through management in the region, with a focus on forest hydrological services. Analysing the factors that contribute to efficient management of these resources in the Western Himalayan context, this compendium highlights key features that have enabled the projects and practices to yield successful results.

The compendium aims to build practice-based knowledge and share practices that can be scaled up more widely. The overall purpose is to synthesise and document innovative and good practices on traditional practices, PES, forest protection, women-led initiative, spring rejuvenation and market linkages.

It takes into consideration the partnerships, traditional rules and regulations, governance mechanisms, forest department interventions and use of science-based methods to ensure water sustainability and forest protection.

Way Forward

It is expected that this compilation can help disseminate and promote the adoption of the key practices and processes to manage forests for water and other ecosystem services. Throughout the compilation, the field forestry practitioner's perspective, challenges and opportunities in management of forests is kept in mind. The compendium of best practices would be used as a knowledge product by relevant stakeholders, policy makers and field practitioners. It shall be useful for replication in different states across India. Further, the compendium is expected to strengthen cross-learning across Indian States and foster partnership among different stakeholders. Such compendium could be used for ready reckoner for field practitioners to refer to best physical measures as per field conditions, and what tools can be used to gain optimum efficiency, the establishment of Incentive-based mechanisms (IbMs) and cross-sectoral linkages.



Abbreviations and Acronyms

BMZ	-	German Federal Ministry for Economic Cooperation and Development
CDM	-	Clean Development Mechanisms
CER	-	Certified Emission Reductions
CHIRAG	-	Central Himalaya Rural Action Group
DFO	-	Divisional Forest Officer
FES	-	Sustainable Management of Forest Ecosystem Services
GBNIHESD	-	Govind Ballabh Pant National Institute of Himalayan Environment
GFGs	-	Global Forests Goals
GIZ	-	Deutsche Gesellschaft für Internationale Zusammenarbeit GmBH
GPs	-	Gram Panchayats
ICIMOD	-	International Centre for Integrated Mountain Development
IIT	-	Indian Institute of Technology
INR	-	Indian Rupee
IPH	-	Irrigation and Public Health Department
JFMC	-	Joint Forest Management Committee
MHWDP	-	Mid-Himalayan Watershed Development Project
NGOs	-	Non-Governmental Organisation
NTFPs	-	Non-Timber Forests Products
PDD	-	Project Design Document
PES	-	Payment for Ecosystem Services
PMC	-	Palampur Municipal Corporation
PMU	-	Project Management Unit
PWGI	-	Palampur Water Governance Initiative
SARAA	-	Spring and River Rejuvenation Authority
SDGs	-	Sustainable Development Goals
SLM	-	Sustainable Land Management
UNFCCC	-	United Nation Framework Convention on Climate Change
USD	-	United States Dollar
VFDS	-	Village Forest Development Society

Table of Contents

1. Introduction

Forests cover 30.6% of the global land cover (FAO, 2018) and are recognised for their integral role in climate regulation, providing multiple ecosystem services, contributing to improved livelihoods, building social and ecological resilience to change, and serving as a repository of biodiversity, storing carbon and as a wildlife habitat. (MEA, 2005). Amongst these, a strong interdependence can be seen between forests and water (Bruijnzeel, L.A., 2004; Birgé et al., 2016; Ellison et al., 2017; van Meerveld et al., 2021). Forests play a pivotal role in the hydrologic cycle by affecting rates of transpiration and evaporation, and influencing water routing and storage, thus, providing roughly 75% of the global accessible freshwater resources (FAO, 2018; Creed and Noorddwijk, 2018).

The forest and tree cover of India has increased in recent years from 24% of the geographical area in 2013 to 25.17% in 2023 transforming country's forest into a net sink owing to national policies aimed at conservation and sustainable management of forests and to bring 33% of its geographical area under forest cover eventually.

Table 1: Forest and Tree cover of India

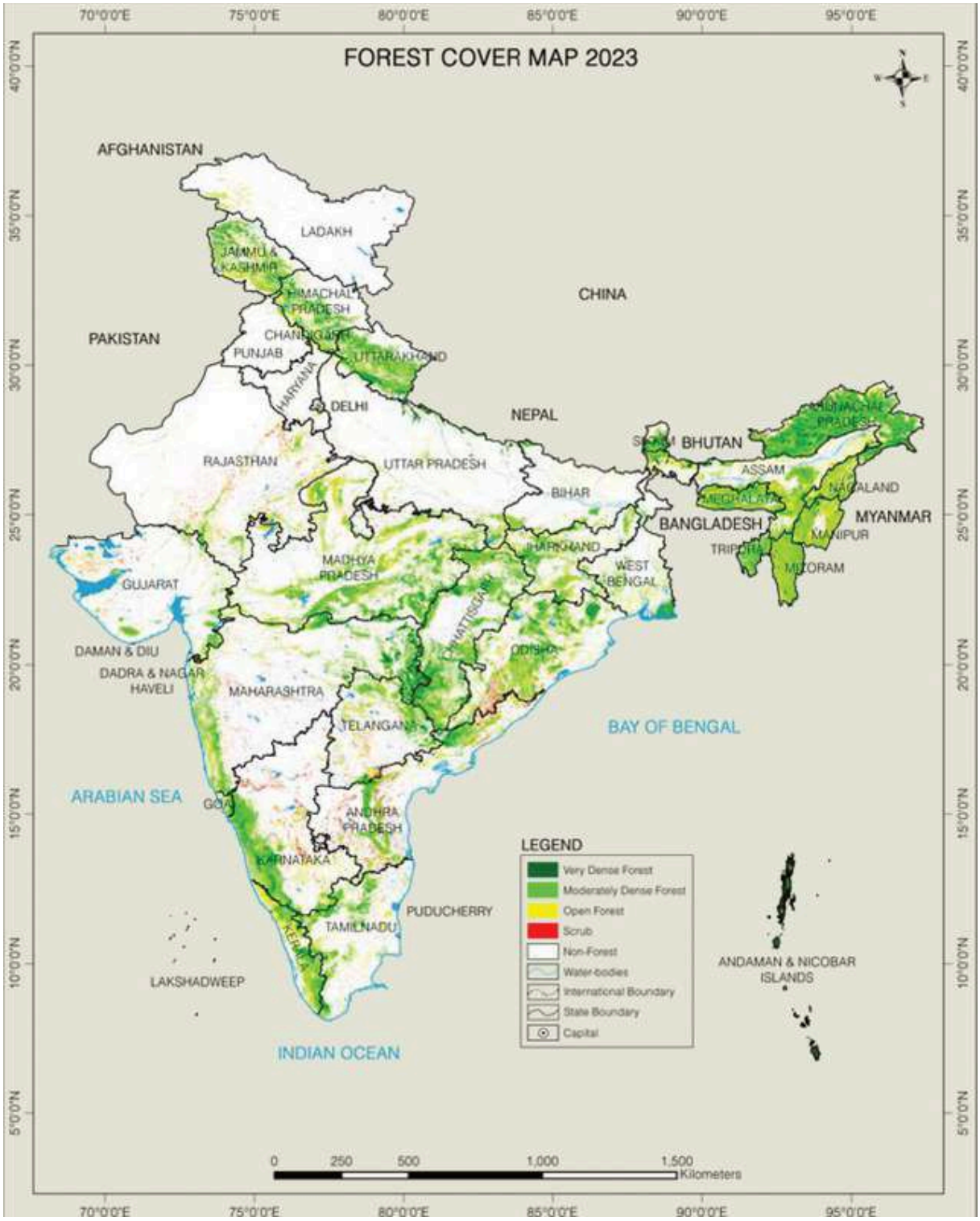
Class	Area	Percentage of Geographical Area (in sq. km)
Forest Cover	7,15,342.61	21.76
Tree Cover	1,12,014.34	3.41
Total Forest & Tree Cover	8,27,336.95	25.17
Scrub	43,622.64	1.33
Non- Forest	24,16,489.29	73.50
Geographical Area	32,87,468.88	100

(Source: ISFR, 2023)

While these services are vital for human well-being, the increasing impacts of climate change, scarcity of water, and uneven precipitation patterns, forest management must carefully consider how different interventions will impact the supply for water. With both climatic and anthropogenic stressors, the forest ecosystem health and its ability to supply goods and services is directly impacted, having negative livelihood and socio-economic consequences particularly in rural and mountainous areas. Therefore, there is a growing concern to halt ecosystem degradation for human well-being; and many scholars

have discussed a need for multi-functional ecosystem management in both programs and policies with interface of ecosystem service valuation (Merlo and Briales, 2000; Wunder 2005; Cubbage et al. 2007; TEEB 2010).

This publication documents examples of outstanding contributions to improve forest ecosystem services, water availability and livelihood for the communities. These practices have the potential to be upscaled and can be used to motivate and inspire other actors to initiate and successfully enhance ecosystem services.



(Source: ISFR, 2023)

What is an Ecosystem Service?

An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the non-living environment interacting as a functional unit.

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling.

Forest Ecosystem Services

According to UNECE (2018) Forest Ecosystem Services (FES) can be classified into four categories (Provisional, Regulating, Habitat or Supporting and Cultural and Social). For the Himalayan region a total of 28 FES which included 8 provisioning, 9 regulating, 4 cultural and 7 supporting Services (Fig 1).

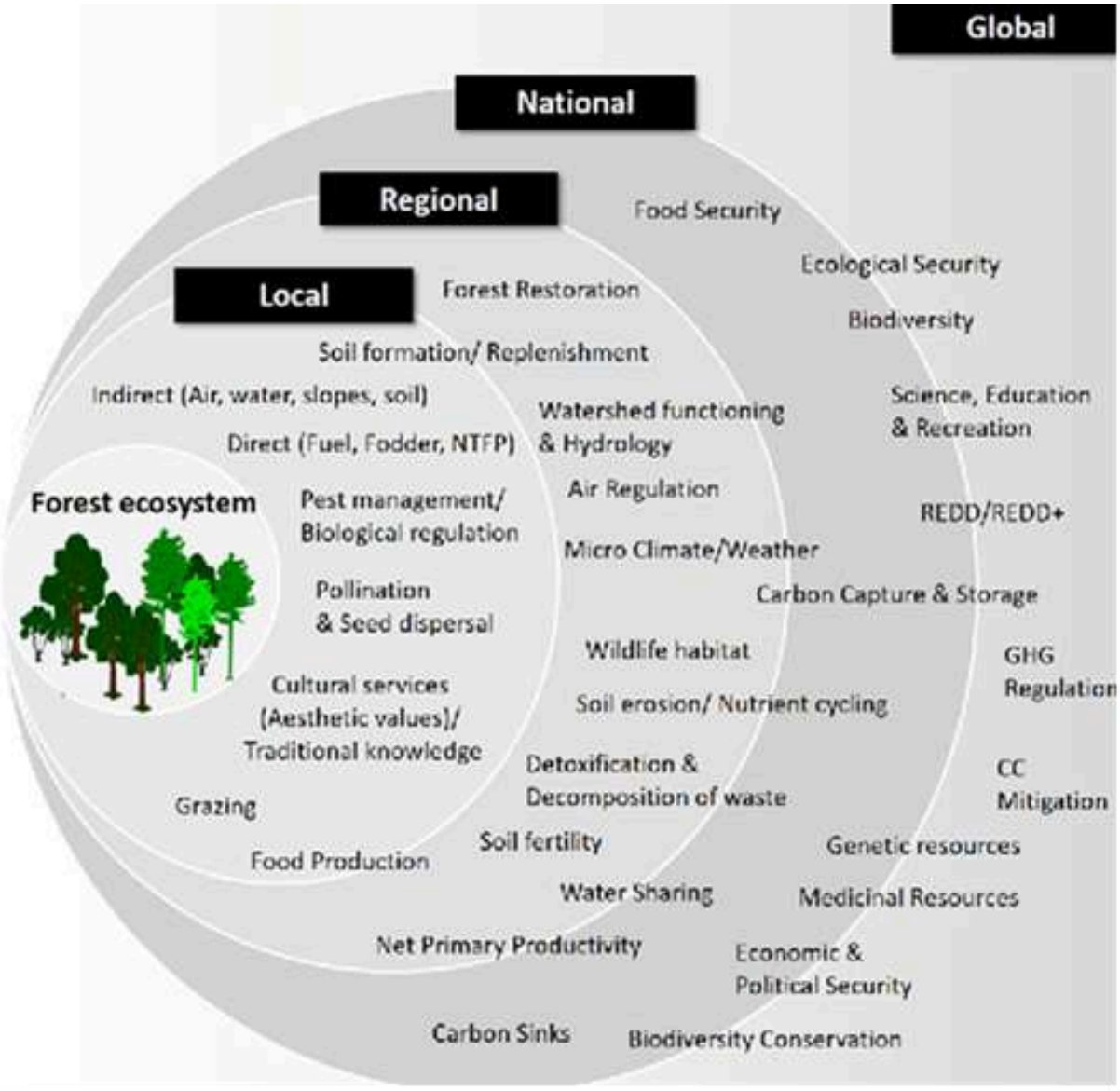


Figure 1: Distribution of ecosystem services on three levels (local, regional, national and global) (Joshi & Joshi, 2019)

2. About the Project

The project 'Sustainable Management of Forest Ecosystem Services (FES)' is implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in India on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) in partnership with the Indian Ministry of Environment, Forest and Climate Change (MoEF&CC) at the national level.

The project is being implemented in four Indian states: Himachal Pradesh, Uttarakhand, Uttar Pradesh and Madhya Pradesh. It aims to strengthen forest and agroforest management to integrate the FES approach with emphasis on water availability.

Figure 2: Project Implementation States

The orientation towards sustainability in the FES concept serves both directly to the sustainable availability and protection of natural resources. The project supports increased orientation of forest and agroforest management towards FES, with a focus on water availability. It also contributes to climate resilience since climate change is endangering the availability of ecosystem services.

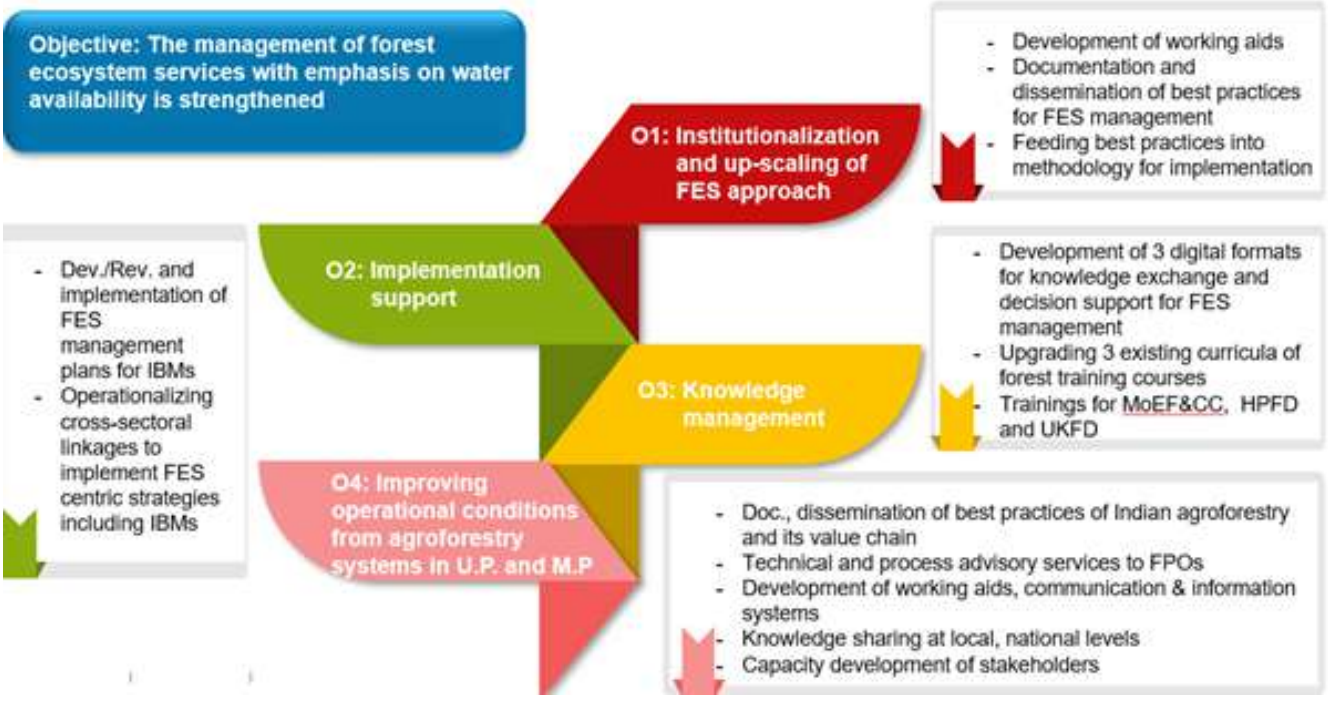


Figure 3: Overview of FES Project Objective and Outputs

This compendium is developed under the FES project specifically under Output 1 of the project focusing on institutionalising and up-scaling of the FES approach especially on the documentation and dissemination of best practices for FES management.

In India, forests are managed for multiple ecosystem services, and not just for timber. About 65 % of the country's timber requirements are met from the trees grown outside forests (Submission on Agroforestry Operational Guidelines 2016). This compendium shows good practices for the management of forests and trees for providing multiple ecosystem services. Forests are managed for a bundle of ecosystem services, not only for timber but also for firewood, fodder, climate change mitigation, protection against erosion or spiritual values and others (benefits received from FES).

3. Methodology

The compendium documented case studies implemented in Western Himalayan states of India i.e. Himachal Pradesh and Uttarakhand by initiatives taken up by the local communities, women participation, NGOs and State Government.

The assessment was done to strengthen the effectiveness of the development programme, guide and support decision-making and policymaking, guide future project development, and assist in developing an organised system for innovative approaches to sustainable forest management through lessons learned and best practices. Extensive secondary research on each case study to understand the relevance, challenges, implementation strategies and subsequent impact.

Based on the initial findings, interview of the relevant authors was done to validate the findings. Following the interviews, the final report was completed, focussing on lessons learned, best practices and impacts.

4. Best Practices

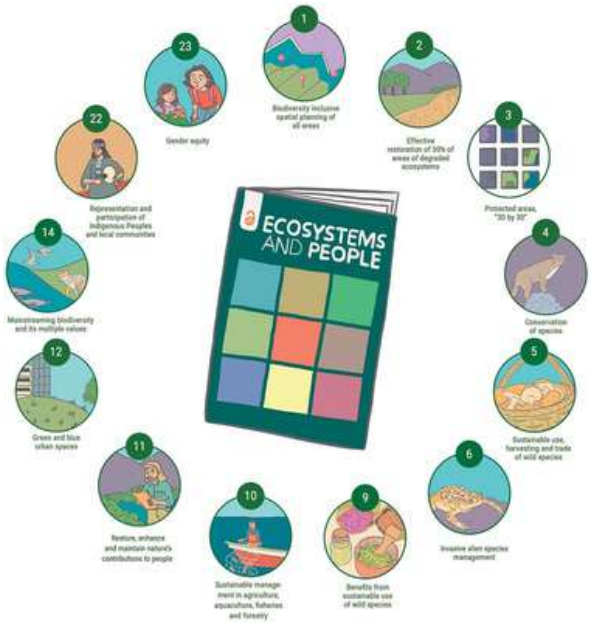
The term Best Practice is prevalent across disciplines and sectors for evidence-based policy decision making. In this report best practices are defined as methods or techniques that, through experience and research, are proven reliably to lead to the desired result and which need to be shared and adopted to benefit more people (WHO, 2017). Furthermore, best practices can be applied at different scales and in different environmental conditions.

In the current context case studies from Himachal Pradesh and Uttarakhand have been taken on the basis of available evidence and defined criteria. These case studies are context specific and by no means set standards to be generalised across the Western Himalayan region. At the same time the process followed, lessons learnt, and gaps identified by the implementing agencies which are collectively documented later in the recommendation section which provides information on the basis of our own understanding deliberations with experts and considering the biophysical, socio-ecological and political economy around forests and water. Attributes considered in selection of Best Practices:

Attributes	Description
Effectiveness	The intervention(s) must work and also produce the desired results that are preferably measurable
Efficiency	Must produce results with optimum use of time and resources
Relevance	Must address the priority of the community
Social and Ethical Soundness	Must respect the current rules of ethics for dealing with human populations. Must confirm to the social beliefs and ethical standards of the local community
Sustainability	Must be maintainable with the use of existing or locally available resources to ensure sustainability
Possibility of Replication	Must be replicable
Involvement of Partnerships	Must involve reasonable collaboration between stakeholders
Community Involvement	Must involve the participation of the affected communities
Political Commitment	Must have support from the relevant national or local authorities

5. Alignment with India's International Goals and Targets

The activities under each case studies addresses both the global as well as regional forest agenda in terms of major contemporary issues in forest management that includes restoration of degraded land, improving quality of life for forest communities, incorporating traditional practices in forest management and improving sustainable forest management.



The Sustainable Development Goals were adopted by UN member states in 2015 as a part of the '2030 Agenda for sustainable development' to improve global approaches to sustainable development. The case studies contribute to three SDGs i.e. SDG 6 and 15 with particular emphasis on Targets dealing with water, forest ecosystems and climate change.

These case studies could also be used to fulfil the National Indicator Framework (NIF) developed by Ministry of Statistics and Programme Implementation (MoSPI) for monitoring the Sustainable Development Goals (SDGs) in India. This framework provides a comprehensive set of indicators to track progress towards achieving the SDGs at the national level.

The ten case studies contributed to achieving some of the Global Forest Goals that were established under the UN Strategic Plan for Forests 2030, with six goals and 26 targets, most of which mirror the SDGs. The closest links across projects were to GFG 1 (Reduce forest loss), GFG 2 (enhance benefits from forests) and GFG 4 (increasing resources, technical and scientific support for SFM).

These case studies also contributed to the achieving target 10 (sustainable management of forest) and Target 11 (restoration and management of ecosystem functions and services) of Kunming Montreal Global Biodiversity Framework adopted to sets out an ambitious plan to implement broad based action to bring about a transformation in our societies in line with the 2023 Agenda for Sustainable Development and its SDGs.

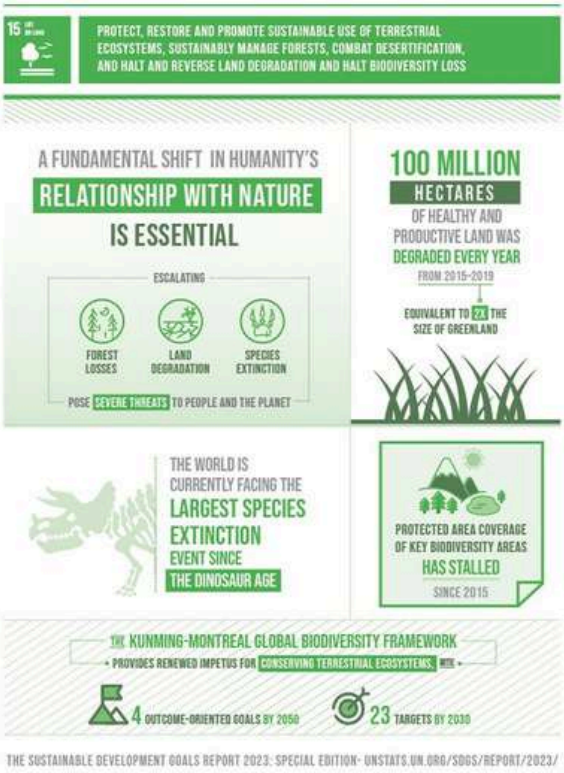
Global and National Indicator framework for SDGs

SDG 6: Ensure availability and sustainable management of water and sanitation for all		
S. No.	**Target**	**National Indicator**
1	**Target 6.1:** By 2030, achieve universal and equitable access to safe and affordable drinking water for all	**6.1.2:** Percentage of population using an improved drinking water source (Rural)
2	**Target 6.3:** By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	**6.3.2:** Proportion of Water Bodies with Good Ambient Water Quality
3	**Target 6.5:** By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	**6.5.1:** Degree of integrated water resources management
4	**Target 6.6:** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	**6.6.2:** Percentage of blocks/ mandals/ taluka over-exploited
5	**Target 6.a:** By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	National Indicator is under development
6	**Target 6.b:** Support and strengthen the participation of local communities in improving water and sanitation management	**6.b.1:** Proportion of villages with Village Water & Sanitation Committee [VWSC]

(Source: NIF, MoSPI)

SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss		
S. No.	**Target**	**National Indicator**
1	**Target 15.2:** By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	**15.2.1:** Progress towards sustainable forest management
2	**Target 15.4:** By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	**15.4.1:** Percentage change in forest cover in hill districts
3	**Target 15.a:** Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems	National Indicator is under development

(Source: NIF, MoSPI)



6. Case Studies

S. No	Case Studies from Western Himalaya	State
1	Naula Management in Nakina Village: the traditional water harvesting system	Uttarakhand
2	Patal Bhuvneshwar, a sacred natural site in Pithoragarh	Uttarakhand
3	Leading a Community Towards Water Security through Springshed Management	Uttarakhand
4	"I was never a Mason!": A story of how para-worker's effort is conserving landscape and taking charge of their life	Uttarakhand
5	Water Governance Initiative-Bohal, HP	Himachal Pradesh
6	Transforming Pine to Broadleaved Forests: A women led Van Panchayat makes it possible in Tikauri village	Uttarakhand
7	Women Forester of Amboya Village	Himachal Pradesh
8	From practice to policy – establishing the Spring and River Rejuvenation Authority	Uttarakhand
9	Springshed development in Thanakasoga Gram Panchayat, Sirmour District	Himachal Pradesh
10	Community based Spring Rejuvenation in Lambgada, Almora District	Uttarakhand

Case Study Locations

1. NAULA MANAGEMENT IN NAKINA VILLAGE

The traditional water harvesting system

This case study examines the factors that prompted the local level stakeholders to cooperate and enhance water availability, the interventions that were implemented, socio-economic and environmental impacts, and the feasibility to implement these measures in other mountain areas (Himalayan region) with similar issues.

Nainital District, Uttarakhand

Key Highlights

- **Improvement of the water discharge of three vital springs in Nakina Village.**
- **Convergence of multi-agency technical and financial support to enhance ecosystem services.**
- **Traditional water management was supported using hydrogeological studies and springshed management.**

Background

Naulas, essential sources of drinking water, are key hydraulic structures in Uttarakhand's hill regions. These traditional drystone masonry structures are typically four-sided with stairs on all sides, often featuring idols placed inside. In Nakina, Digtoli, and Bhurmuni villages, older community members still conserve and manage these resources. However, a shift toward non-farm employment has impacted traditional water management systems.

Key Interventions

1. **Spring Recharge Measures**	60 trenches, 1 large recharge pond, and 4 small ponds were constructed to capture surface runoff and enhance groundwater recharge, with annual maintenance and re-digging before the monsoon.
2. **Forest Protection & Regeneration**	A rubble stone wall with firebreaks was built to protect 97 hectares of community forest, supporting natural regeneration, planting broadleaved species, and establishing a fodder nursery.
3. **Infrastructure Development**	5 check dams and 5 check walls were constructed to control runoff, reduce erosion, and protect forest trails, with community participation incentivised through a compensation of $5.30 (₹400) per day.

Achievements

- Reduced flash flood impacts and downstream flooding.
- Increased spring water yield through soil and water conservation practices.
- Enhanced forest cover, improved vegetation, reduced soil erosion, and increased groundwater recharge.
- Regenerated 2 hectares of oak and broadleaf forests, improving biodiversity, carbon sequestration, and availability of fuelwood and fodder.

Impact

- Improved ecosystem services, including higher water yield, groundwater recharge, and restored local forests.
- Supported livelihoods by boosting agricultural productivity and resource availability.

Gaps/ Shortcomings

Traditional resource management relies heavily on local norms, cultural beliefs, and sacred practices, which policymakers often overlook.

Effective implementation requires technical support from scientific institutions, NGOs, and the Forest Department.

Similar initiatives need replication in villages where springs have dried up.

Lessons Learned/Success Factors

The Sarpanch's leadership in mobilising the community and designing effective strategies was crucial for success.

Financial incentives from Van Panchayat and the Uttarakhand State Forest Department, played a key role in motivating land users.

Combining local knowledge and scientific expertise was essential for the successful implementation of water and forest management practices.

Reviving the Naulas system was successful through respecting traditional rights and facilitating mediation in multi-stakeholder settings.

A traditional Naula spring

Replication Potential

Upstream catchment management, utilising sustainable land management practices that link to water recharge and spring rejuvenation, serves as a model that can be replicated in other Himalayan states of India.

References

1. Badola, Eva & Rawal, Ranbeer & Dhyani, Pitamber. (2017). Stories of Success: narratives from a sacred land https://qcat.wocat.net/en/wocat/technologies/view/technologies_5193/

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2. PATAL BHUVNESHWAR

A sacred natural site

This case study highlights the conservation of forests as sacred groves through local traditions, benefiting ecosystem services like fodder, fuelwood, tourism, and particularly hydrological services. With well-managed upstream areas, springs in the downstream region continue to supply essential water to dependent communities.

Pithoragarh District, Uttarakhand

Key Highlights

- **Importance of integrating local knowledge, traditional practices, informal rules, and cultural norms to conservation for a successful management system.**
- **A key factor in the success of the initiative is the community dedication to the forests and associated temple complex.**

Background

At the temple, the forest department, Van Panchayat, and temple committee collaborate to sustainably manage 400 hectares of sacred forest, ensuring access to key ecosystem services. The forest, home to Cedrus deodara (deodar), Quercus semecarpifolia (Khasru oak), and Quercus leucotrichophora (banj oak), supports springs that provide drinking water to local communities. The temple complex offers spiritual, cultural, and recreational benefits. Local communities contribute by collecting non-timber produce, supporting fire management, controlling grazing, and managing waste. Integrating local knowledge with forest regulations ensures effective, long-term management and sustained ecosystem services.

Key Interventions

- In 1979, local communities formed the temple management committee, with membership tenure revised every five years.
- In 1992, the forest department and gram panchayats demarcated community forests under the Forest Council Act of 1931 (Van Panchayat).
- Every five years, a 20-hectare forest patch is declared ‘God's forest’, restricting human interference, with a local forest guard recruited and funded by voluntary contributions.
- A 1996 Supreme Court ruling bans green felling in India's mountains.
- Strict grazing controls include penalties for non-compliance, plastic use is banned, and garbage collection centers are established.
- Mandatory contributions support forest fire control, while scientific studies link upstream land use to downstream water flows.

Achievements

- Enhanced recreational services have made the site one of the most visited religious sites in the state, with visitation rates around 800 persons per day during peak season.
- A study estimated that the average use value of these services to visitors is USD 211 (Nepal et al., 2017).
- Conservation and sustainable management of 200 hectares of forests are contributing to enhanced water recharge, benefiting downstream communities.

Impact

- Demonstrated potential to restore sacred natural sites by combining traditional knowledge, local institutions, and modern science.
- Provides economic benefits through consistent local employment as guides, shopkeepers, and hoteliers, driven by recreational services.
- Protecting and managing these sites can also enhances ecosystem services.

Gaps/ Shortcomings

There is a lack of monitoring and evaluation to ascertain changes and long-term impacts.

The impact of changes in the forest ecosystem on water regulation services, both in quality and quantity, is not documented.

Perception data from tourists regarding aesthetics and improvements in recreational services is not being collected.

Lessons Learned/Success Factors

The existing knowledge and religious beliefs of local communities associated with forests facilitated efficient integration with new legal frameworks and regulations, resulting in strong community participation in managing forests.

Cooperation among various formal and informal institutions effectively manages the temple complex and sacred forests.

Local community members willingly contribute cash to pay the local guard's salary for forest protection. They also participate in forest fire control.

Rules and regulations regarding green tree felling, NTFP collection, and grazing are effectively enforced.

The Patal Bhuvaneshwar temple premises

Replication Potential

This practice is widely applicable, especially in areas with informal institutions managing forests and water. When implementing new legal systems, these institutions should be considered, with a focus on studying existing rules and integrating informal practices for effective management. The practice also has applicability in other ecosystems.

References

1. Agnihotri, P., Singh, H. & Husain, T. (2012). Patalbhuvneshwar: a new sacred grove from Kumaon Himalaya. Current Science, 102 (6): 830-831.
2. Nepal, M., Das, S., Rai, R.K., Bhatta, L.D., Somanathan, E., Kotru, R., Khadayat, M.S., Rawal, R.S., and Negi, G.C.S. (2017). Valuation of ecosystem services in the Kailash Sacred Landscape. ICIMOD Research Report 2017/2. Kathmandu: ICIMOD

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3. SPRINGSHED MANAGEMENT

Community-driven initiative for water security

This case study showcases the impact of drying of springs on the local population, particularly women, with direct negative influence on domestic needs, work distribution and agricultural productivity. Through the utilisation of scientific knowledge, participation by local communities and capacity building measures the springs in the area were rejuvenated. This met their immediate water needs, improved sanitation measures and enhanced income through vegetable cultivation.

Nainital District, Uttarakhand

Key Highlights

- **Demonstrates nature-based, cost-effective solutions for water security.**
- **Success achieved through community involvement and local ownership.**
- **Integrated planning across water, energy, land, forest, ecosystem, and agriculture sectors enhances efficiency and reduces environmental impacts.**

Background

Water is fundamental to life and livelihoods. In the Himalayan region of Uttarakhand, natural springs are vital for communities like Pasauli village in the Nainital district. These springs, that have been sustaining for generations, are now depleting alarmingly, particularly during dry summers when water becomes even more precious. Pasauli villagers relied on these springs for domestic needs, agriculture and for their crucial income source. The springs' seasonal drying has severely impacted their lives. For the women of Pasauli, this means walking 2–3 kilometers every day, spending up to six hours just to fetch water. This highlights the urgent necessity for spring rejuvenation and springshed restoration measures.

Key Interventions

- Central Himalayan Rural Action Group (CHIRAG) collaborated with stakeholders to address water scarcity in Pasauli village, Uttarakhand.
- Conducted feasibility studies and engaged villagers for tailored project design and implementation.
- Formed a Water User Committee (WUC) and appointed a Key Resource Person (KRP) for community-led efforts.
- Adopted a financial model with WUC contributing 20–25% of costs, supported by Ashok Leyland Limited.
- Designed spring revival strategies through technical assessments and community participation.
- Built rainwater harvesting structures to boost spring yield and water storage.
- Trained villagers in sustainable water management and transferred ownership to ensure longevity.
- CHIRAG provides ongoing monitoring to maintain project success.

Achievements

- "Har Singh Naula" has remained consistent for three dry seasons post-intervention and an additional 11.82 lakh liters of water was recharged in 2023.
- With year-round water availability, water collection distance reduced from 2–3 km to 0.4 km. Vegetable farming has increased incomes by ₹8,000–₹10,000 per farmer.
- Rainwater harvesting tanks offset 4.5 lakh litres of demand on "Har Singh Naula" and helped promote soil moisture retention through tank overflow.
- Ashok Leyland Limited received a NOC and a water tariff discount from the Central Groundwater Board for supporting the initiative in the upper catchment of the Gola River.

Impact

- Water access improved, reducing travel distance for women and children from 2-3 km to 0.4 km.
- Increased water availability boosted sanitation, hygiene, and agricultural income (INR 8,000-10,000 per farmer).

Gaps/ Shortcomings

Scattered households in the village increase the cost per beneficiary compared to plain interventions.

MGNREGA convergence was not feasible due to complex and delayed execution mechanisms.

KRPs lack incentives for acquiring new skills and ensuring long-term monitoring effectiveness.

Lessons Learned/Success Factors

The success of the initiative was largely due to the meticulous community-driven approach to springshed management.

A 20-40% contribution in kind (*Shram daan*) from the communities was crucial in enhancing their involvement and investment in the intervention.

Regular training, exposure visits, workshops, and coordination with government entities at various levels significantly raised the awareness of community representatives and were essential in developing local leadership.

The KRP concept has established para-technical professionals within the community, ensuring ongoing technical guidance after CHIRAG's withdrawal from the sites.

The partnership between CHIRAG and Ashok Leyland highlights the potential of public-private collaborations, driven by government compliance mandates (CGWB for recharging extracted groundwater), to finance water security initiatives in remote areas.

Replication Potential

The project demonstrates scalability in similar Himalayan regions. ESG mandates can unlock corporate financing, while strategies like agroforestry and solar-based water lifting can complement such initiatives for broader impact.

References

1. Kolachalam, N. (2023, October 2). As the "water tower of Asia" dries out, villagers learn to recharge their springs. NPR. https://www.npr.org/sections/goatsandsoda/2023/10/02/1202745489/india-water-climate-change
2. Central Himalayan Rural Action Group (CHIRAG), & Central Himalayan Rural Action Group (CHIRAG). (2012, October 12). Spring water recharge programme: A study of the post-programme impact in the Kumaon region of Uttarakhand by CHIRAG. India Water Portal. https://www.indiawaterportal.org/articles/spring-water-recharge-programme-study-post-programme-impact-kumaon-region-uttarakhand

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4. "I WAS NEVER A MASON!"

How Para-Workers are Conserving the Landscape

This case study highlights how water scarcity in Uttarakhand's Okhaldunga region led to social tensions and economic hardship, particularly for women who traveled long distances for water. CHIRAG's spring rejuvenation programme addressed these challenges through community participation, technical solutions, and capacity-building initiatives, ensuring long-term sustainability.

Key Highlights

- **Para-professionals play a crucial role in remote communities, ensuring the sustainability of conservation efforts for natural resources.**
- **Building a cadre of para-workers promotes professionalism, awareness, and leadership within the community.**

Nainital District, Uttarakhand

Background

The Okhaldunga region of Nainital District in Uttarakhand faces severe water scarcity, profoundly impacting villagers' lives. For a prolonged period, the community struggled with limited water, leading to social tensions and discord. The situation worsened in summer when springs dried up entirely. Villagers, especially women, endured the arduous task of traveling to distant hamlets for essential needs like drinking and cooking. Agricultural yields declined due to insufficient rainfall, intensifying stress. Even winters provided no respite, with dry conditions persisting. The desperate need for water often incited competition among villagers, with some collecting water as early as 3 AM. This vital resource scarcity, which threatened the well-being and social cohesion of the Okhaldunga community, has been addressed by the para-professionals.

Key Interventions

- CHIRAG's rejuvenation project combines technical solutions, capacity building, community mobilisation, and financial investment to restore water sources.
- Experts assess water sources and design engineering and nature-based solutions tailored to the local geology, implemented by the community.
- Villagers are trained in Himalayan geology, water source maintenance, and fundraising to ensure sustainability.
- Local residents are trained as para-workers in geology, water monitoring, social mobilisation, financial management, and leadership, collaborating with technical experts in surveys and implementation.
- CHIRAG prioritises community ownership by selecting para-workers with the right skills, fostering leadership, and ensuring the sustainability of water interventions.
- Women's active participation is key, as demonstrated by their leadership in labour activities, including material transport, site preparation, and construction, exemplified by the Asswa Naula spring rejuvenation.

Achievements

- The additional water supports local agriculture, with beneficiaries potentially earning ₹20,000 – 25,000 through vegetable cultivation.
- Ms. Kiran Joshi, a para-hydrogeologist, independently mapped over 15 springs, contributing significantly to the Okhaldunga cluster's spring management.
- The work of Ms. Kiran Joshi and other para-workers has been recognized at regional and state-level workshops, with acknowledgment from scientists at institutions like CGWB and NIH.
- Para-workers assist neighboring villages in addressing issues related to drying springs and their rejuvenation.

Impact

- Employment generation and skill development for local communities.
- Increased agricultural opportunities and enhanced livelihoods.
- Women's involvement has strengthened their decision-making power.

Gaps/ Shortcomings

The skills gained by para-workers are not formally recognised, limiting their professional recognition.

Absence of Monetary Incentives: There is no financial compensation or recognition for the para-workers' contributions.

Limited awareness and complex procedures hinder the integration of para-workers into government schemes like MGNREGA and Skill India.

Lessons Learned/Success Factors

Timely training, exposure visits, and the use of working models and audiovisual media can simplify the dissemination of technical knowledge.

Providing allowances or stipends to motivated individuals can encourage more youth to participate in and contribute to conservation efforts.

Champions of change can be valuable human resources for implementing innovative nature-based solutions to address local problems on the ground.

The role of women is crucial and acts as a catalyst for broader family and community engagement. To encourage and empower them as champions of change, it is necessary to mandate or reserve certain positions for women.

Accrediting para-workers with certification, diplomas, or professional qualifications from institutions can enhance employment opportunities for talented and committed individuals in remote areas.

Replication Potential

Employing para-workers ensures the long-term sustainability of interventions. Recognising their contributions and allocating resources can help scale successful initiatives. Creating knowledge-sharing platforms for communities involved in spring rejuvenation fosters the exchange of best practices and supports ongoing monitoring, evaluation, and adaptation of community-led efforts.

References

1. Kolachalam, N. (2023, October 2). As the “water tower of Asia” dries out, villagers learn to recharge their springs. NPR. https://www.npr.org/sections/goatsandsoda/2023/10/02/1202745489/india-water-climate-change
2. Chicu Lokgariwar, & Chicu Lokgariwar. (2017, September 4). Catch them young. India Water Portal. https://www.indiawaterportal.org/articles/catch-them-young

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5. PALAMPUR WATER GOVERNANCE

An Initiative in Bohal

The Palampur Water Governance Initiative (PWGI) is a unique example of Payment for Ecosystem Services (PES) in India where the receiver of an ecosystem service pays the community for the protection and conservation of a spring recharge area. It is a valuable case study of local water management, where recipients of ecosystem services pay the community for protecting and conserving the spring recharge area.

Sirmaur District, Himachal Pradesh

Key Highlights

- **Women's sense of ownership led to the formation of the Mahila Mandal in 1990 to manage and protect local forests.**
- **Capacity building and sharing best practices for forest management brought a positive mindset shift among local youth.**
- **A long-term plan was developed to align forest management with ecosystem service provision.**
- **Recognising the roles of local communities and the forest department resulted in the establishment of a PES approach.**

Background

Himachal Pradesh relies on streams and springs for drinking water. Palampur, once abundant in water, now faces a decline in spring and stream discharge due to erratic weather and land use changes like forest degradation. The Palampur Municipal Corporation (PMC) sources water from Bohal spring, Neugal river, Bagha Nala, and a groundwater pump, serving about 5,000 residents and 10,000 daily visitors. Water discharge has dropped from 7-8 liters per second to 3-4 liters per second. Neugal water suffers from turbidity and contamination, while Bagha Nala is mainly used in the monsoons. Groundwater pumping is costly, making the regeneration of Bohal spring a priority for PMC.

Key Interventions

- Bheerni Forest, located within the Bohal spring catchment area, is managed by the local community with support from the Mahila Mandal, which was formed by village women.
- To address opposition from the youth club of Bandla Panchayat regarding the PES model, an exposure visit to Shimla Water Catchment Forest was organised to showcase forest management for water conservation.
- A hydro-geological assessment by ACWADAM identified the primary recharge zone for Bohal spring, leading to the protection and management of the forest's catchment area.
- PWGI conducted awareness campaigns to emphasise the importance of forest services beyond subsistence use, targeting both the forest department and local communities.
- A 20-year agreement was signed in 2010 between PWGI, the Forest Department, and the Village Forest Development Society (VFDS), committing PMC to pay ₹10,000 annually for the protection and management of Bheerni Forest.

Achievements

- Bohal spring, the primary water source for 3,500 people in Palampur, provides high-quality water that requires no treatment, ensuring long-term sustainability.
- The forest in the recharge area has become denser and more diverse, improving the Bohal spring's sustainability and benefiting the community with reliable clean water and a thriving environment.
- The PES agreement funded a forest watchman, promoting forest protection and strengthening community engagement.
- Decreased forest dependency, due to factors like LPG supply and alternative employment, reduced deforestation, protected wildlife, and allowed for sustainable farming practices.

Impact

Ensured a steady water supply from Bohal spring for 3,500 people, while forest regeneration improved sustainability.

It reduced deforestation, boosted local participation and collaboration between rural and urban areas in managing water and ecosystems.

Gaps/ Shortcomings

The Municipal Corporation's new administration has stopped payments as per the agreement, threatening the sustainability of the project. They need to be convinced to resume payments.

Involvement of multiple stakeholders, limited community participation, and a lack of convergent planning. Communities are unaware of existing springs and focus remains on finding new springs to meet rising population demands.

Lessons Learned/Success Factors

Local communities' intrinsic motivation to protect natural resources can be enhanced through Payment for Ecosystem Services (PES) agreements.

External factors, such as alternative livelihoods and LPG availability, reduce pressure on forests.

Symbolic payments can incentivise compliance with environmental regulations.

Water policies must balance sourcing new water with protecting existing sources for sustainable management.

Replication Potential

PWGI creates rural-urban and rural-rural linkages for securing water supplies and forest protection, building a more resilient water and watershed management system. It can be scaled to promote sustainable water practices, enhance climate resilience, and combat water scarcity in other regions.

References

1. Schmerbeck, Dr. J., Chauhan, S., Thakur, A. S., Aashima Negi, & GIZ. (2019). Himachal Pradesh Forest Ecosystem Services (HP-FES) Project Bohal Concise Micro Plan. https://indo-germanbiodiversity.com/pdf/publication/publication24-09-2020-1600926529.pdf

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6. TRANSFORMING PINE TO BROADLEAVED FORESTS

A women led Van Panchayat makes it possible in Tikauri village, Nainital

This case study is an example of women-led initiative to gradually convert a pine forest to a broad-leaved forest, resulting in an increase in supply of key ecosystem goods and services. With women members involved in decision making, implementation of activities, enforcing rules and regulations, and capacity building their leadership skills have increased. This resulted in a unanimous election of a women member as a village Sarpanch

Nainital District, Uttarakhand

Key Highlights

- **Women-led Van Panchayat successfully transformed pine forests into diverse broadleaved forests, improving biodiversity and water retention.**
- **Enhanced livelihoods through increased fodder, fuelwood availability, and additional income opportunities.**
- **Community ownership and governance strengthened by empowering women in leadership roles.**

Background

Tikauri is a small village in Nainital district, Uttarakhand, India, where 46 households rely on community forests managed by the Van Panchayat for fodder, fuelwood, and other resources. Before 2007, the forest primarily consisted of Chir pine (Pinus roxburghii), limiting fodder availability and contributing to higher temperatures. The Van Panchayat, led by women, sought assistance from CHIRAG, a regional NGO, to enhance biodiversity and improve resource availability through forest restoration.

Key Interventions

- CHIRAG collaborated with the Van Panchayat and Forest Department in 2008 to establish a community-managed nursery and initiate plantation activities.
- Women played a central role in planning, decision-making, enforcement of rules, and capacity building. Post a massive forest fire in 2014, local women demonstrated leadership in fire control and forest protection.
- Enrichment planting of broadleaved species, including fruit trees such as walnut and pear, replaced pine saplings.
- Forest management practices emphasised biodiversity, groundwater recharge, and carbon sequestration.
- Women-led enforcement mechanisms ensured compliance with sustainable practices.
- Financial sustainability was supported through fees and royalties, saving approximately INR 25,000 annually, and earnings from sapling production.

Achievements

- Improved ecosystem services, including higher fodder and grass availability for livestock and reduced forest temperatures.
- Increased wildlife activity and biodiversity, benefiting ecological balance.
- Local communities earned INR 215,000 from labour and INR 8.5 per sapling from plantation efforts.
- Households earned INR 120,000 annually by selling surplus grass and fodder.
- Election of a woman as the Sarpanch marked a milestone in gender empowerment.

Impact

Soil moisture content increased, which offers various benefits, including maintaining temperatures.

An increase in availability of fodder and grass has improved livelihoods by enabling year-round livestock feeding.

Women's leadership and socio-political capital have substantially grown in the village.

Lessons Learned/Success Factors

Learning and understanding local resource conditions, aspirations, and demands provide a foundation for effective management strategies, species selection, and land-based actions.

It is crucial to understand existing resource conditions, soil properties, moisture gradients, and climatic factors before initiating vegetation conversion or restoration.

Integrated insights from indigenous knowledge and scientific knowledge are invaluable for planning, implementation, and sustainability.

Replication Potential

Research suggests that Chir Pine-dominant forests in the Himalayan regions of India and Nepal may exacerbate water stress and provide limited ecosystem services. Converting these monocultures into diverse, sustainable ecosystems can enhance ecological resilience and water management. This approach is replicable in Uttarakhand and similar areas. However, forest conversion poses risks requiring careful assessment, including species selection and regeneration strategies. Thorough risk management studies are essential to ensure the success and sustainability of such ecological restoration efforts.

References

1. CENTRAL HIMALAYAN RURAL ACTION GROUP (CHIRAG), & Mehra, B. S., Ph. D. (2022). 35th Annual Report. https://chirag.org/wp-content/uploads/2022/12/CHIRAG-Annual-Report-2021-22.pdf

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7. WOMEN FORESTERS

From Amboya Village

This case study highlights the role of local community members, particularly the women from Amboya, in forest conservation and management. The women-led group in Amboya combined effective governance, strategic financial measures, practical physical actions, and ongoing capacity building to protect their forests. Their efforts both in protection and regeneration of forests as well as established a replicable model for community-based forest management.

Sirmaur District, Himachal Pradesh

Key Highlights

- **Over 80 hectares of degraded forest regenerated into dense Sal forests, improving groundwater recharge, biodiversity, and soil health.**
- **Recognition as the Best JFMC by the Himachal Pradesh Chief Minister in 2019.**
- **A replicable model of gender-responsive forest management driven by local governance.**

Background

Amboya village, situated 16 km northeast of Poanta Sahib in Sirmour district, Himachal Pradesh, faced severe forest degradation due to silvicultural felling during 1984-85. This resulted in depletion of Sal trees and pole crops, exacerbated by uncontrolled grazing, illegal logging, and tree lopping. Recognising the threat, local women, led by Maina Devi and Sumitra Devi, mobilised efforts to protect the degraded forests. In 2008, their group was formally registered as the '*Mahila Van evam Paryavaran Suraksha Samiti*, Amboya.' Their work earned recognition in 2019 when they received the Best Joint Forest Management Committee (JFMC) award, a certificate, and a cash reward of one lakh rupees.

Key Interventions

The women-led group in Amboya implemented a structured governance model with:

- Local rule-making prohibiting grazing, unauthorised cutting, and tree lopping.
- Patrol shifts using simple tools to monitor forests and deter violators.
- Regular meetings to discuss strategies and ensure transparency through recorded minutes.
- Firefighting efforts and invasive species removal, including Lantana camara, to restore biodiversity.
- Voluntary labor and minimal funding allocated to support a forest watchman.
- Capacity building through continuous learning and interaction with forest officials.

Achievements

- Protection by women foresters has resulted in a dense Sal Forest spread over 80 hectares of previously degraded forest nearly impenetrable on foot.
- Consequently, environmental services such as groundwater recharge, climate regulation and carbon sequestration, biodiversity conservation, and soil enrichment have been enhanced. Improved forests also contribute to cultural and spiritual values.
- An increase in forest biodiversity including wild animals such as barking deer, sambhar deer, spotted deer, ghoral, mongoose, snakes, leopards, and various birds is also evident in the area.

Impact

- Demonstrated the role of women-led governance in sustainable forest management.
- Improved forest health and ecosystem services through conservation practices.
- Strengthened local governance and decision-making processes.

Gaps/ Shortcomings

Limited participation from other community members, particularly men, highlights the need for inclusive conservation efforts.

Financial incentives and income generation opportunities are required to sustain motivation and participation.

Lessons Learned/Success Factors

Community involvement, local rules, and enforcement are critical for forest regeneration.

Empowering women enhances participation and leadership in conservation efforts.

Active patrolling and invasive species eradication significantly support forest restoration.

Financial rewards and recognition further incentivise community-led conservation.

Replication Potential

The initiative demonstrates the potential for gender-responsive participation in sustainable development in Himachal Pradesh and other similar regions of the Himalayas. Efforts to replicate this initiative should include mechanisms such as local rule-making, local monitoring, and local enforcement, particularly by women, to ensure the sustainability of forest management.

References

1. Abhilash. (2019, July 6). THE WOMEN FORESTERS OF AMBOYA. Abhilasha ifs. https://abhilashifs.blogspot.com/2019/03/the-women-foresters-of-amboya.html
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8. FROM PRACTICE TO POLICY

Establishing the Spring and River Rejuvenation Authority

The case study showcases the convergence of springshed and watershed techniques as landscape-based approach. It showcases the recent efforts of the forest department and local community members to rejuvenate the Heval river. This initiative has resulted in the establishment of a cross-sectoral committee on Spring and River Rejuvenation Authority (SARAA) at the state level.

Tehri District, Uttarakhand

Key Highlights

- **Water level increased** from 0 to 2000 lpm at Pujar Gaon.
- 34 out of 66 springs showed **improved discharge levels**.
- Created over **96,085 man-days of work** across 34 Gram Panchayats.

Background

The Heval River, originating in the Chamba Valley and terminating at the Ganga near Rishikesh, extends for 50 kilometers and encompasses a watershed area of 25,466.33 hectares. This area is predominantly forested and falls under the jurisdiction of the Forest Department. The initial phase of the innovation targets 16,000 hectares within the Heval sub-watershed, including 66 springsheds and 17 streams.

Up until the early 1980s, the Heval River maintained a significant water flow, which supported local agriculture and facilitated wood transportation to Shivpuri. However, a marked decline in water levels has since compelled local communities to abandon their agricultural lands and migrate in search of better livelihood opportunities. Over the past decade, the scarcity of drinking water and water for livestock has become acute, severely impacting households dependent on horse and mule raising for subsistence.

In 2016, the Forest Department initiated consultations with local communities and village leaders to develop and implement strategies for the rejuvenation of the Heval River. This initiative was spearheaded by the then Divisional Forest Officer, Mr. D.M. Meena, whose deep interest in water resource management through land-based actions significantly accelerated the process.

Key Interventions

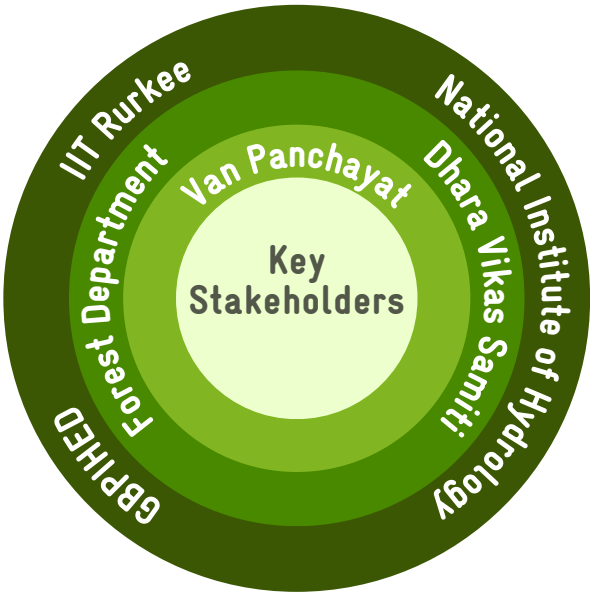
1. **Spring Survey & Mapping**	Collecting geohydrology, socioeconomic, and water flow data; delineating springshed areas for effective management.
2. **Hydrological Treatments**	Implementing recharge pits, check dams, and trenches to slow water flow, enhance natural storage, and reduce soil erosion.
3. **Tree & Grass Plantations**	Planting over a million native trees and grasses like vetiver for soil stabilisation and local community use.
4. **Interagency Collaboration & Awareness**	Coordinating with government agencies and promoting sustainable practices and school-level awareness for long-term environmental impact.

Achievements

- Established a cross-sectoral Spring and River Rejuvenation Authority (SARAA).
- Improved agriculture through increased water availability.
- Enabled vegetable cultivation and dairy farming, generating ₹20 million annually.
- Reduced women's workload and boosted economic activities.

Impact

The project revitalised agriculture, boosted incomes, improved water access, reduced women's workload, supported livestock rearing, and enhanced dairy production.



Gaps/ Shortcomings

- Lack of expertise within the team, warranted identification of correct expertise on hydrogeological mapping, trainings and treatment measures.
- Large intervention area required heavy monetary investment for restoration activities.
- Large manpower was required for afforestation plantation activities.
- Community mobilisation and awareness.

Lessons Learned/Success Factors

- Identifying recharge zones or water flow command areas is essential for spring and stream rejuvenation.
- Supporting income-generating activities such as dairy farming strengthens local engagement.
- Multi-agency coordination among relevant government departments ensures effective project implementation.
- Incentive-based models like providing fodder or cash rewards encourage community participation in conservation.
- Reducing irrigation water demand through crop diversification and intensification helps conserve water.
- Raising awareness and promoting best practices like reducing open defecation and managing grazing ensure sustainability.

A rejuvenated spring by sustainable water management efforts

Replication Potential

The initiative's success led to Spring and River Rejuvenation Authority's (SARAA) establishment as a policy framework in 2023. The approach is replicable in other Himalayan states due to its reliance on simple, cost-effective technologies suitable for diverse terrains.

References

1. Kulkarni, H., J. Desai and M. I. Siddique (2021). Rejuvenation of Springs in the Himalayan Region. In, "Water, Climate Change, and Sustainability", pp. 97-107.
2. Bagchi, D., S. Kannaujiya, P. K. Champati ray, A. K. Taloor and T. Sarkar (2021). "A study on spring rejuvenation and springshed characterisation in Mussoorie, Garhwal Himalaya using an integrated geospatial-geophysical approach." Remote Sensing Applications: Society and Environment 23. DOI: 10.1016/j.rsase.2021.100588

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9. SPRINGSHED DEVELOPMENT

Thanakasoga Gram Panchayat

This best practice highlights a participatory approach to springshed development in the Indian Himalayas, combining scientific understanding with community engagement. By integrating hydrogeological studies and water quality assessments, this method effectively identifies recharge areas and guides targeted interventions to rejuvenate springs.

Sirmaur District, Himachal Pradesh

Key Highlights

- **Rejuvenation of five critical springs, enhancing water availability.**
- **Adoption of SCI techniques increased wheat yield from 2.42 ton/ha to 3.9 ton/ha and straw yield from 3.3 ton/ha to 4.8 ton/ha.**
- **Increased water availability in springs and baoris during summer.**

Background

Thanakasoga village, located in the Sirmour district of Himachal Pradesh, faces water scarcity despite receiving an average annual rainfall of 1405 mm. Positioned in the lesser Himalayan region, the village's low-grade metamorphic rocks and sloping topography lead to high surface runoff, soil erosion, and reduced groundwater infiltration. With irregular piped water supply and drying springs, villagers struggled to meet domestic and agricultural water needs. The village faced water scarcity during dry seasons despite having two springs. Monsoon discharge ranged from 15–18 lpm but dropped to 1 lpm in summer. Irregular piped water supply forced women to spend hours collecting water, impacting crop production of wheat, maize, and vegetables.

Key Interventions

The Thanakasoga Gram Panchayat, in partnership with People's Science Institute (PSI), Dehradun, and other organisations, implemented a springshed development programme using Participatory Ground Water Management (PGWM) principles. Five springs across three villages (Dhyali, Thanakasoga, and Luhali) were selected, covering a recharge area of 13 hectares. Key measures included:

- Hydrogeological mapping to identify recharge zones.
- Construction of 350 Continuous Contour Trenches (CCT) and 565 Staggered Contour Trenches (SCT).
- Formation of Water Management Committees (WMC) and Water User Groups (WUG).
- Awareness campaigns through street shows and school programs.
- Promotion of System of Crop Intensification (SCI) techniques to improve agricultural productivity.

Achievements

- Spring discharge improved significantly: Thanakasoga (1.69 to 2.6 lpm), Dhyali (1.65 to 4.73 lpm), and Luhali springs.
- Access to water extended by 2-4 months during the dry season.
- Enhanced agricultural productivity through SCI, reducing water dependency and increasing yields.
- Bacteriological contamination reduced through social fencing.
- 54% of farmers adopted SCI techniques, promoting sustainable agriculture.
- Recognised as a replicable model under MGNREGA for recharge area treatment.

Impact

- Increased discharge in springs and reduced contamination.
- Women's participation in water committees led to enhanced community engagement.
- Increased biomass and biodiversity due to plantation activities.

Gaps/ Shortcomings

Difficulty in achieving consensus among diverse community interests.

Limited access to skilled personnel and training for hydrogeological studies.

Sustained interventions, such as desilting and plantations, required ongoing resources and effort.

Lessons Learned/Success Factors

The PGWM principles applied in this practice helped communities make more resilient decision making.

Social fencing measures indicate reduced bacteriological contamination in spring water.

SCI techniques increase crop yield while conserving water resources.

Pilots carried out helped better understand the impact of recharge interventions and Hydrological studies help undertake targeted measures and better utilisation of resources.

Replication Potential

Participatory springshed development, guided by hydrogeological and water quality studies, offers a scalable model for rejuvenating springs in the Indian Himalayas. With rising water demands and scarcity, integrating Participatory Ground Water Management (PGWM) principles enhances community resilience to climate change. Hydrogeological assessments help identify recharge areas and inform interventions, ensuring data-driven decisions. Combining community participation with scientific planning strengthens sustainability and facilitates replication in other Himalayan regions facing similar water challenges.

References

1. Participatory Springshed Development in Thanakasoga Gram Panchayat, H.P. (2012). In PSI's Experience [Report]. https://peoplesscienceinstitute.org/PDF%27s/EQMG/Briefing%20Paper%20on%20Thanakasoga-revised.pdf

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10. COMMUNITY-BASED SPRING REJUVENATION

Lambgada, Almora District

This case study highlights the role and leadership of the local change makers to ensure a sustainable supply of water to their villages. With efforts by the local community, local authorities and NGOs traditional water springs and springsheds were rejuvenated, using innovative technologies, and capacity building. The increased accessibility and availability of water has contributed to social cohesion and investment in communal resources. Communities take ownership and make collective contributions because they are convinced of the return on their investment in the form of water.

Almora District, Uttarakhand

Key Highlights

- **Promoted a sense of ownership among villagers by involving them in planning and implementation.**
- **Villagers contributed resources and efforts, demonstrating long-term commitment to water security.**
- **Established collaborative governance between local authorities, NGOs, and the community.**

Background

Dumrauli is a small village in the Lamgada block of Almora district in Uttarakhand, India. Until recently, water availability around the village was sufficient, with several springs (Naulas) providing adequate water. A total of 146 households directly depend on the nearby spring. In 2015, the village experienced an acute water shortage; some springs dried up, and water availability drastically reduced in the two remaining perennial Naulas. Faced with this challenge, the village leader approached local authorities for support for a water supply project and interventions to protect the traditional water springs and springscape. Local villagers also reached out to CHIRAG, a local NGO specialising in natural resources and water management, headquartered in the Mukteshwar area. In August 2018, an initial meeting with local villagers was organised to formalise the Naula revival scheme.

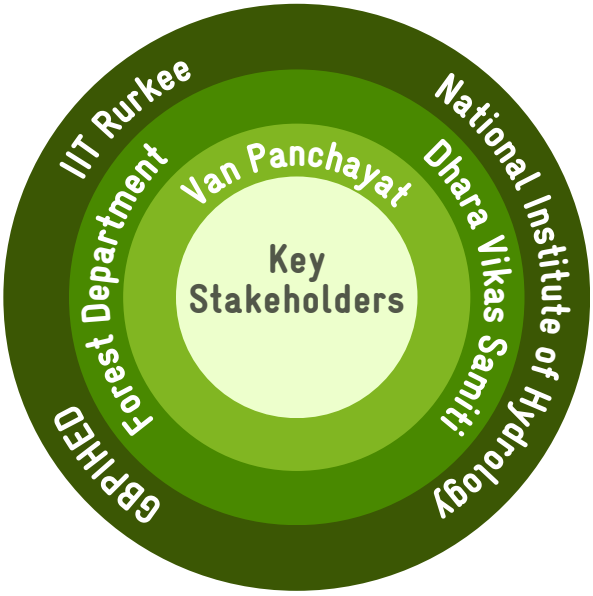
Key Interventions

The initiative involved establishing the Jaldhara Vikas Samiti, a Spring Water Management Committee under the Van Panchayat, to oversee the project. Key interventions included:

- Construction of gully plugs, percolation ponds, contour trenches, and water holding pits for groundwater recharge.
- Building a subsurface check dam downstream to maintain spring flow.
- Capacity-building programmes on social mobilisation, land management, and fund management for the committee.
- Introduction of rooftop water harvesting systems with recharge pits to enhance springshed recharge.
- Holistic vegetation and water management strategies to sustain water supply and promote biodiversity.

Achievements

- Spring flow increased from 0.59 lpm to 4.0 lpm, providing water year-round.
- Enhanced conservation of upstream forests, improving biodiversity and carbon sequestration.
- Improved access to livelihood resources, such as fuelwood and grass.
- Provided direct cash income of INR 107,000 (USD 1550) for local labor through springshed development activities.



Impact

Increased water availability benefited households and travelers along nearby highways.

Regular monitoring by CHIRAG ensured sustainability, with local Van Panchayat members receiving remuneration (INR 400/month) for data collection.

Strengthened local governance through community-led water management systems.

Lessons Learned/Success Factors

Isotope analysis is an effective methodology for understanding groundwater flow within the springshed (i.e., watershed of the spring).

Restoration and regeneration of indigenous broadleaved species and local grass species contribute positively to groundwater recharge.

Community engagement in each step of planning and implementation is vital for ensuring sustainability.

Providing technical support to the community for managing common property resources can improve water availability as well as regenerate the springshed.

External incentives may not always be necessary provided the communities are convinced about the return on investment in their own natural resources.

Replication Potential

The success of this model has informed policies such as Uttarakhand's Spring and River Rejuvenation Authority (SARRA). It offers replication potential in mountain regions of India, Nepal, and Bhutan by integrating scientific assessments, community participation, and localised interventions.

References

1. IndiaWater Portal. (2015, January 26). Studying their springs [Video]. YouTube. https://www.youtube.com/watch?v=BHuFCAndPMU
2. Central Himalayan Rural Action Group, RAIKWAL, B. S., Mehra, B. S., Kulkarni, H., BISHT, B. S., PALUR, S., . . . ATREE. (n.d.). SPRING ATLAS OF UTTARAKHAND. (Central Himalayan Rural Action Group, Advanced Center for Water Resources Development and Management, & CHIRAG), SPRING ATLAS OF UTTARAKHAND. Retrieved from https://chirag.org/wp-content/uploads/2019/07/SPRING-ATLAS-CHIRAG.pdf
3. Gupta, A., & Kulkarni, H. Report of working group I inventory and revival of springs in the Himalayas for Water Security. NITI Aayog, New Delhi (2017)

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11. ECOTOURISM FOR MOUNTAIN RESILIENCE

Dhanolti Ecopark, Tehri Garhwal, Uttarakhand

This best practice highlights a small-scale, community-led ecotourism model that delivers environmental conservation and livelihoods in mountain regions. It operates on a sustainable revenue-sharing mechanism, enhances ecosystem health, and offers replicable design for other socio-ecological contexts across Uttarakhand.

Tehri District, Uttarakhand

Key Highlights

- **The park spans approximately 13 hectares of reserved deodar forest and managed by an 18-member Dhanolti Ecology and Ecotourism Development Committee (DEEDC), including women.**
- **Generates revenue from visitor entry (₹25–₹50), adventure activities, and sapling donations (₹350/tree).**
- **Over 1,000 trees planted by tourists; 25+ locals employed as guides and caretakers.**
- **Combines conservation, visitor education, and economic upliftment.**

Background

Established in 2008, the Dhanolti Ecopark covers 13 hectares of reserved deodar forest at an altitude of 2,280 metres. It is managed by the Dhanolti Ecology and Ecotourism Development Committee (DEEDC), formed by local residents in partnership with the Forest Department. The initiative emerged from concerns about forest degradation and migration, and aimed to link nature conservation with sustainable tourism-based livelihoods.

Key Interventions

- Built eco-huts from bamboo and other local materials.
- Developed adventure activities such as flying-fox and Burma bridges.
- Introduced guided nature trails and an interpretation centre.
- Established a "memory sapling" programme, allowing visitors to plant trees in remembrance.
- Implemented community-led waste segregation, composting, and recycling systems.

- Regenerated degraded forest areas and improved soil quality.
- Enriched biodiversity and supported microclimatic stability.
- Reduced grazing pressure and illegal extraction from forests.
- Created local jobs in guiding, tourism services, and park maintenance.
- Enabled income generation for women and youth in the village.
- Boosted local earnings through steady tourist inflow.
- Promoted awareness and stewardship of the environment among visitors and residents.

- Reduced youth migration through local job creation.
- Improved forest health and landscape appeal.
- Influenced state policy on conservation-linked tourism.
- Set a replicable model for eco-based rural development.

Gaps/ Shortcomings

Infrastructure limitations lead to crowding during peak tourist seasons, and DEEDC's limited administrative capacity affects long-term planning.

Marketing and outreach beyond the regional level also remain weak, limiting off-season tourism potential.

Lessons Learned/Success Factors

Co-management between communities and government agencies ensures shared ownership.

User fees can sustainably fund conservation efforts.

Combining education with recreation boosts both conservation outcomes and tourist satisfaction.

Replication Potential

The replication potential of the Dhanolti model is high, especially in other forested areas of the Himalayan foothills. Similar projects have already been initiated in places like Simtola Ecopark in Almora district. Essential preconditions for replication include community willingness, forest land availability, and institutional facilitation. The model's adaptability and low capital requirements make it suitable for diverse eco-sensitive zones in India.

References

1. Kala, C. P. (2013). Ecotourism and sustainable development of mountain communities: A study of Dhanolti Ecopark in Uttarakhand State of India. Applied Ecology and Environmental Sciences, 1(5), 98–103. Participatory Springshed Development in Thanakasoga Gram Panchayat, H.P. (2012). In PSI's Experience [Report]. https://peoplesscienceinstitute.org/PDF%27s/EQMG/Briefing%20Paper%20on%20Thanakasoga-revised.pdf

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12. BIO-CARBON SUB-PROJECT OF MID HIMALAYAN WATERSHED DEVELOPMENT

Swarghat and Naina Devi Divisions, Himachal Pradesh

This case study highlights a successful integration of watershed restoration, climate mitigation, and rural development. Through community-led reforestation, it generates carbon credits that fund local livelihoods, strengthen governance, and promote ecosystem resilience.

Bilaspur district, Himachal Pradesh

Key Highlights

- **The project was the largest afforestation/reforestation (A/R CDM) project globally and India's first integrated watershed-carbon model that aligned to the Kyoto protocol in harvesting global environmental benefits by sequestering carbon from degraded lands.**
- **Cash incentives to farmers as sellers of carbon credits.**
- **Maintained 75% survival rate of plantations.**
- **₹1.9 crore carbon credit released post-audit (2014).**

Background

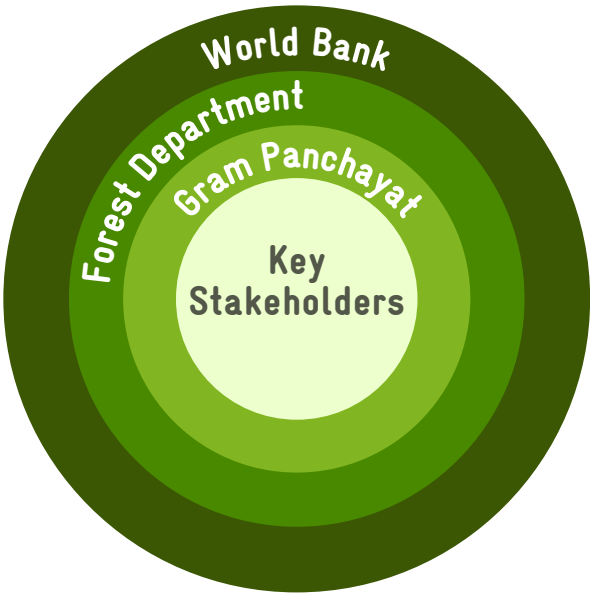
This sub-project of the Himachal Pradesh Mid-Himalayan Watershed Development Project was designed to mitigate climate risk through afforestation and reforestation across 5,000 hectares of degraded land. Registered under the Clean Development Mechanism (CDM) of the Kyoto Protocol, it enables communities to earn from carbon credits while restoring forests and water ecosystems. It supports forest-dependent farmers by meeting their needs for timber, fodder, and fuelwood, while offering income through carbon payments. Plantations, started in 2008 and maintained by villagers, cover key divisions including Swarghat and Naina Devi, with Kudini village as a notable example.

Key Interventions

- Afforestation on forest (2,943 ha), community (227 ha), and private land (46 ha) across 139 Gram Panchayats.
- 231 Village Forest Development Societies (VFDSs) involved; 4,374 members, including 1,424 women.
- Constructed 72 water harvesting ponds (capacity: 40 lakh litres each).
- Shared-cost installation of irrigation pump in Kudini village.
- Rent-based pond leasing to the Fisheries Department.
- Mixed-species planting to reduce pest and invasive threats.
- Regular monitoring by PMU; 147 sampling plots tracked.
- Training for forest staff on CDM compliance and monitoring.

Achievements

- 75% survival rate was maintained in all the three categories of degraded lands.
- Increase in biomass productivity by 46.25% in the form of dead wood and grass (estimated to be 120 tons per year). Grass production increased upto 5 tonnes per hectares in each parcel of land.



Impact

Villagers benefited from employment during plantation and long-term income through carbon payments made every five years. The project helped transition communities toward climate-smart land and water use. Italy funded the carbon credit disbursement through a 20-year agreement.

Gaps/Shortcomings

There is no M&E in place to measure water availability and other ecosystem services due to the plantations.

Lessons Learned/Success Factors

Lack of user rights to forests led to weak community ownership in Kudini, which affected their willingness to protect and manage the forest, including during fire incidents.

Success was seen where villagers were already organised and educated, highlighting the importance of social cohesion and local leadership in making the most of project interventions.

Even with nearby water sources and pumps, villagers did not act to douse forest fires, showing that infrastructure alone does not ensure effective use without motivation and capacity.

Replication Potential

The potential for replication is strong because recharge ponds are already a common feature in watershed management across forest areas. However, the key lies in how communities living near these ponds are organised to use the water effectively, particularly for irrigating fodder crops for cattle. This requires active cooperation with the Department of Irrigation and Public Health and support from non-governmental organisations to mobilise and guide local users. In Kudini, villagers shared that other nearby villages have begun adopting similar practices, such as building ponds and maintaining water pumps. They also recalled a visit from a delegation from Afghanistan, which highlighted Kudini's local governance system especially its way of managing conflicts and making decisions collectively as a useful model worth learning from.

References

1. World Bank. (n.d.). India – Himachal Pradesh Mid-Himalayan Watershed Development Project (P093720). Retrieved June 17, 2025, from https://projects.worldbank.org/en/projects-operations/project-detail/P093720

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6. References

- Rawat R.S., Gautam S. and Verma D. (2023). Sustainable Land and Ecosystem Management in India. Indian Council of Forestry Research and Education, Dehradun (INDIA) https://www.icfre.org/publication/publication65.pdf

- Dhiman, M. R., & Muthanarasimha, G. P. (2022a). Biodiversity Conservation of Western Himalayas: A Pluralistic approach. In IntechOpen eBooks. https://doi.org/10.5772/intechopen.107075

- Millennium Ecosystem Assessment (MEA) (2005). Ecosystems and Human Well-Being: Biodiversity Synthesis. Washington DC: World Resources Institute. https://www.millenniumassessment.org/documents/document.354.aspx.pdf

- United Nations. (2018). Forests and Water: Valuation and payments for Forest Ecosystem Service. United Nations publication issued by the Economic Commission for Europe (ECE) (Sales No. E.18.II.E.28). report, Economic Commission for Europe (ECE). Retrieved from https://www.etifor.com/it/wp-content/uploads/sites/2/2018/11/sp-44-forests-water-web.pdf

- Bruijnzeel, L. (2004). Hydrological functions of tropical forests: not seeing the soil for the trees? Agriculture Ecosystems & Environment, 104(1), 185–228. https://doi.org/10.1016/j.agee.2004.01.015

- Bruijnzeel, L. A. (2004). Hydrological Functions of Tropical Forests: Not Seeing the Soil for the Trees? Agriculture Ecosystems and Environment, 104, 185-228. https://doi.org/10.1016/j.agee.2004.01.015

- FAO, & Graziano Da Silva, J. (2018). FOREST PATHWAYS TO SUSTAINABLE DEVELOPMENT. THE WORLD'S FORESTS.

- Creed, I. F., & van Noordwijk, M. (2018). Forests, Trees and Water on a Changing Planet: A Contemporary Scientific Perspective. In I. F. Creed, & M. van Noordwijk (Eds.), Forest and Water on a Changing Planet: Vulnerability, Adaptation and Governance Opportunities: A Global Assessment Report (pp. 13-24). (IUFRO World Series; Vol. 38). IUFRO

- Rathod, R.; Kumar, M.; Mukherji, A.; Sikka, A.; Satapathy, K. K.; Mishra, A.; Goel, S.; Khan, M. 2021. Resource book on springshed management in the Indian Himalayan Region: guidelines for policy makers and development practitioners. New Delhi, India: International Water Management Institute (IWMI); New Delhi, India: NITI Aayog, Government of India; New Delhi, India: Swiss Agency for Development and Cooperation (SDC). 40p. doi: https://doi.org/10.5337/2021.230

- Jenkins, M., & Schaap, B. (2018, April). Forest Ecosystem Services. (United Nations Forum on Forests), Background Analytical Study. Retrieved from https://www.un.org/esa/forests/wp-content/uploads/2018/05/UNFF13_BkgdStudy_ForestsEcoServices.pdf

- Ellison, D., Morris, C. E., Locatelli, B., Sheil, D., Cohen, J., Murdiyarso, D., ... Sullivan, C. A. (2017). Trees, forests and water: Cool insights for a hot world. Global Environmental Change, 43, 51–61. https://doi.org/10.1016/j.gloenvcha.2017.01.002

- Kala, C. P. (2013). Ecotourism and sustainable development of mountain communities: A study of Dhanolti Ecopark in Uttarakhand State of India. Applied Ecology and Environmental Sciences, 1(5), 98–103. Participatory Springshed Development in Thanakasoga Gram Panchayat, H.P. (2012). https://peoplesscienceinstitute.org/PDF%27s/EQMG/Briefing%20Paper%20on%20Thanakasoga-revised.pdf

- World Bank. (n.d.). India – Himachal Pradesh Mid-Himalayan Watershed Development Project (P093720). Retrieved June 17, 2025, from https://projects.worldbank.org/en/projects-operations/project-detail/P093720