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Case Study Series:
Sustainability Solutions for Mountain People and Landscapes

# Re-imagining the Future of Micro Hydro-plants in Nepal

## (A Case Story)

Microhydro plant "Nisi II" in the valley of the river Nisi, Baglung District

For years, the micro-hydro plants of Baglung had done what they were built to do. As off-grid solution, they lit homes, powered mills, and gave remote communities a sense of energy independence. 100 kW Chachalghat MHP, 75 kW Girindi Khola MHP and 100kW Nisikhola-II MHP were no exception. Managed by local user committees, all three MHPs had operated for more than a decade, quietly serving their communities with limited outside attention. Regular struggle to maintain operational and financial sustainability has annual recurring headache.

### Then the grid was announced to arrive

Poles appeared along the ridgelines. Wires followed. Suddenly, the future of these community-based MHPs was even more uncertain. Grid electricity was perceived as cheaper and more reliable and backed by a national utility. For the user committees, the question was no longer how to improve their micro-hydro plants but whether they would survive at all: What would happen to their micro-hydro plants once the grid arrived?

> The Chairperson of Nisikhola II, Dhruba Regmi recalled, "Before grid interconnection, we sometimes stayed without electricity for 2–3 months during monsoon damage.

It was at this moment of uncertainty that the WISIONS Innovation Lab (IL) Project began working in Baglung.

### Listening before acting

In early 2023, the WISIONS IL Project team did not arrive with ready-made solutions in hand but had a clear idea

in mind that MHPs should be looked at from a holistic ecosystem approach rather than isolated standalone energy infrastructure. They began by listening and observing. In April-May 2023, four micro-hydro plants in Baglung district were visited through scoping missions that combined technical inspections, focus group discussions, key informant interviews, and direct field observation.

What emerged was a consistent picture. Most plants were operating at less than 35 percent of their installed capacity. Much of the Electro-mechanical equipment was more than a decade old and increasingly unreliable. The governance including record keeping, accounting, audit, conduction of annual general meetings was limited. Most MHPs could not clearly say how much electricity they generated or revenue earned through the sale of energy, making it difficult for committees to clearly understand costs, revenues, or system performance. Additionally, every monsoon brought new risks such as damaged canals, landslides, and emergency repairs. This early diagnostic work made it clear that the MHPs needed not only technical strengthening but a long-term sustainability pathway.

## Seeing the problem differently

One of the earliest realizations during community engagement was that the extent of underutilization of micro-hydropower plants was not well understood by the communities themselves. In many sites, households did not have individual electricity meters, and even MHP management committee members had only a limited understanding of how much electricity their plant was technically capable of generating, or how little of that potential was actually being used in practice. Electricity consumption was discussed in general terms, but rarely quantified.

To address this gap, the WISIONS IL Project facilitated Community Energy Management Toolkit (COMET) workshops in selected MHPs, including Nisikhola II and III in Baglung. Through these workshops, community members, MHP staff, and local entrepreneurs collectively explored how different appliances consumed power, how tariffs were structured, what peak demand looked like, and how electricity use might evolve under different scenarios. For many consumers, this was the first time they engaged with electricity as a system that could be measured, planned, and strategically managed.

> Chachalghat MHP operator Thaman Gurung described the fragility of their system: “If we had not connected the MHP to the grid, it would not have been possible for the plant to continue operating after 2–3 years due to financial and technical constraints.”

The results of the COMET simulations were unexpected even for the participants themselves. The exercises showed that even if current household electricity consumption were to double, total demand would still reach only about half of the installed generation capacity of the plants. Far from being fully utilized, the MHPs were operating well below their technical potential.


Local people during COMET workshop at Nisikhola III MHP

This moment proved to be significant. For the first time, surplus electricity was not simply perceived as wasted power or a sign of failure to stimulate local demand, but as a potential source of income. At the same time, communities were increasingly aware that the national grid was expanding into their areas. These two realizations created a shift in perspective: instead of focusing only on how to increase local consumption, committees began to consider whether surplus power could be strategically used or monetized.

## Introducing options, not answers

Rather than promoting a single pathway, the project team presented multiple options for improving the sustainability of micro-hydro systems. These included productive end uses, electric cooking, and grid interconnection. Short factsheets of each option were developed to structure discussions on each option. At this stage, grid interconnection was not framed as an inevitable or preferred solution, but as one possible response to the emerging challenges of declining standalone viability and increasing grid presence. Early reactions from MHP committees were cautious. Grid interconnection was seen as technically complex, financially risky, and institutionally unfamiliar. Many expressed concerns about regulatory procedures, upfront investment costs, and most importantly the potential loss of local control over their assets.

What gradually shifted the conversation was not direct persuasion, but exposure and learning. The project organized a three-day training program for representatives of 20 MHPs from Nisikhola, Badigad, and Tamankhola rural municipalities, focusing on the fundamentals of grid interconnection, regulatory requirements, and the evolving role of micro-hydropower plants in grid-connected contexts. An exposure visit to the already grid-interconnected Tarakhola MHP allowed participants to observe a functioning example and engage directly with peers who had already undergone the transition.

Training participants during exposure visit to Tara Khola Mini Hydro, Baglung

While participants consistently noted that three days of training were insufficient for fully grasping the technical and institutional complexities, the process had an important catalytic effect. By this time, few top leaders of the MHP user committee were convinced. However they could not convince other leaders and users. As immediate follow-on activity, senior leadership from the project team visited these sites, conducted meetings with larger audiences from MHP user committee members, operators and active consumers on financial and sustainability benefits of grid interconnection with projected financial numbers. Equally, the project team conducted awareness among these MHPs committee members on the availability of viability gap funding through Sustainable Energy Challenge Fund (SECF) for early moves. Also, the team highlighted the few prerequisites such as converting these MHPs from user committee managed to cooperative managed enterprise. But they need to act quickly to tap into this support as the SECF funding was ending soon. After this, for the first time, grid interconnection was no longer perceived as a distant or theoretical concept, but as a practical option that some MHPs could realistically pursue. This marked a critical shift, from awareness to intention and represented the first clear tipping point in the decision-making trajectory of the MHPs.

Shortly thereafter Chachalghat, Girindi and Nisikhola II & III formally expressed concrete interest in exploring grid interconnection further and initiating their own transition towards cooperative-based models that could feed electricity into the national grid.

At the local government (LG) level, recurrent annual budgeting for MHP rehabilitation has become an ongoing challenge. The project team engaged LG officials to explain the grid-interconnection modality and its potential to enhance long-term financial self-reliance. While the one-time cost of grid interconnection was high, even with 50 percent financing available through SECF, the team proposed that LGs provide partial support as a final capital investment to reduce the burden on MHPs. After several rounds of discussions and clarifications, Badigad rural municipality endorsed the approach and committed NPR 1 million each to support grid interconnection. In addition, the municipality played an active coordinating role by working closely with MHPs to build trust in the project team. This local government endorsement significantly improved communication and coordination with MHP representatives and users at the community level. This decision represented another critical tipping point, reinforcing confidence among both MHPs and local governments and accelerating the transition process.

## From interest to action and where it stalled

At this stage, the Sustainable Energy Challenge Fund (SECF), a financing mechanism administered by the Government of Nepal emerged as a critical external catalyst for the transformation pathway envisioned by the interested micro-hydropower plants. The availability of Viability Gap Fund (VGF) from NREP and REEEP/Green/GIZ channeled through SECF, covering up to 50 percent of eligible investment costs, made the idea of grid interconnection financially conceivable for MHPs that had previously perceived it as unaffordable.

The project team provided extensive handholding support to help MHPs navigate the SECF application process. This included assistance in preparing concept notes, conducting pre-feasibility and detailed feasibility studies, compiling required documentation, and coordinating with local governments and relevant agencies. As a result of this support, five MHPs submitted concept notes to SECF. Three were shortlisted and approved to proceed to full applications and were eventually awarded VGF support.

However, progress across the MHPs was uneven. One committee, Nisi III, submitted a concept note but did not proceed further in the process. The main barrier was not technical feasibility or lack of financing but limited managerial and governance capacity. The application process required sustained institutional effort, regular documentation, financial audits, collective decision-making, and consistent leadership. These requirements exposed structural weaknesses within the user committee, which struggled to maintain momentum once the initial enthusiasm faded.

This experience highlighted a critical insight: while financing mechanisms can unlock opportunities, only organizations with sufficient internal capacity are able to translate those opportunities into concrete action.

## Governance: The hardest transition

As the application process progressed, governance emerged as one of the most significant and underestimated challenges. To meet SECF eligibility requirements, MHPs needed to renew or activate their cooperative registration. The project team provided technical guidance on legal documentation, audit procedures, and compliance processes. Two MHPs successfully renewed their cooperative status and were able to proceed with SECF applications.

Even among these, progress was slower and more fragile than anticipated. Annual audits were delayed. Annual general meetings could not always be convened on time. In practice, many MHPs that were formally registered as cooperatives but remained inactive and continued to operate through user committees, with limited role clarity, weak financial oversight, and reliance on a small number of active individuals.

Formal organizational restructuring alone did not automatically translate into functional governance. The project team observed that transitioning from a user committee to a cooperative was not simply an administrative requirement, but a deeper cultural and organizational shift involving accountability, transparency, and shared leadership.

Recognizing this, the WISIONS IL Project conducted an eight-day intensive cooperative training program in May 2025 for the three MHPs, together with eight other MHPs from Baglung that were also interested in advancing toward grid interconnection. The training focused on governance structures, financial management, regulatory compliance, and leadership roles. This intervention was pivotal in strengthening institutional readiness and preparing MHP committees for the operational and administrative demands associated with grid interconnection.

Some Glimpses from MHP Cooperative Capacity Enhancement Training

As applications to SECF advanced for three projects: Nisi II, Chachalghat and Girindi, the project also supported MHPs in preparing for procurement and implementation. This included assistance with tender documentation, facilitation of pre-bid and bid opening meetings, and explanation of key clauses in Performance-Based Agreement (PBA) contracts. These three projects were awarded with the VFG from SECF. Through this process, the contractors were selected to carry out grid interconnection-related works.

In addition, GIZ organized a five-day technical training for MHP operators in July 2025 at an already grid-connected site including these three ongoing sites, providing hands-on exposure to post-interconnection operational requirements in one of the recent grids connected sites, Jumsa Khola at Palpa. This training was mainly focused on Grid synchronization, electrical safety, national grid codes and SOPs, control and protection systems. While these trainings did not immediately resolve all structural challenges, they significantly increased the confidence and preparedness of MHP stakeholders to engage with a more complex and regulated energy system.

## Working within a crowded ecosystem

Progress toward grid interconnection depended on many actors. WISIONS IL project played a facilitation and capacity-building role. Financing mechanisms were provided through SECF under Nepal's Renewable Energy Programme, 50% of the fund was supported by the British Embassy Kathmandu for Girindi and from European Union funded REEEP/Green implemented by GIZ for Nisi II and Chachalghat. Additionally in the case of Chachalghat and Girindi 10% of the total investment was mobilized by Badigad Rural Municipality and the remaining 40% was managed by MHPs themselves via loan/equity.

According to Chairperson of Chachalghat MHP, Man Singh Paija: "Some community members believed connecting to the grid meant the MHP had been sold to NEA." This misinformation required repeated consultations and awareness efforts.

Regulatory and technical coordination involved AEPC, the Nepal Electricity Authority (NEA), and local governments. The MHPs especially struggled with NEA's procedural requirements. These collaborations expanded possibilities but also added complexity. Processes slowed as responsibilities overlapped and timelines diverged. MHP committees were required to engage simultaneously with multiple agencies, each with distinct documentation standards, technical criteria, and administrative procedures. The experience demonstrated that collaboration is essential for enabling grid interconnection, but that coordination costs are high. Without clear role definition, streamlined procedures, and sustained facilitation, institutional complexity can become a barrier, particularly for community-managed systems with limited administrative capacity.

## Breakthrough

Recognizing these challenges, the WISIONS IL Project was **extended until July 2026** to support implementation and ensure that the experiences could be also reflected and lessons extracted. This extension proved decisive.

On November 17, 2025, Nisikhola-II, Chachalghat, and Girindi MHPs successfully interconnected with the national grid and began selling electricity to the Nepal Electricity Authority (NEA). This milestone marked a historic transition: user committee based MHPs in Baglung evolved into grid-connected cooperatives, securing a new revenue stream and redefining their role in Nepal's energy landscape. This transition is not only bringing mere additional revenue, but bringing hope, resilience and longevity to the MHPs and rural livelihood.

In Girindi, interconnection meant stability, appliance use, and economic opportunity. Chairperson Bel Bahadur Thapa stated: "I hope that all Micro Hydro Projects in Nepal are connected to the national grid to ensure their long-term sustainability."
He added a policy appeal: "Since these MHPs were constructed through the hard work and financial contributions of local communities and government aid, I urge the government to provide stronger financial support, preferably increasing assistance from 50% to at least 75% to help keep them sustainable and operational."

## Lessons Learned

Reflecting on these consistent sustained efforts from the project and continuous engagement by the MHPs with stakeholders, we can draw on interesting learnings from this case:

- Ensuring communities have control and ownership of MHP assets is more important than financial viability, sustainability and commercialisation. Only then will they consider any options or solutions.
- Grid interconnection decisions are driven as much by governance capacity as by technical feasibility.
- Early diagnostics and demand-side analysis can fundamentally change how communities perceive their systems.
- Financing mechanisms can spark interest but that's not all. Sustained coordinated effort is required and only robust organizations can sustain momentum.
- Cooperative registration is necessary but insufficient without deeper changes in governance practices, leadership, and accountability.
- Long-term, practitioner-led handholding is essential when community-managed systems face structural transition.
- Multi-actor coordination significantly increases transaction costs; without strong facilitation and clear institutional roles, procedural complexity can delay or derail otherwise viable initiatives.
- Misaligned timelines across financing agencies, regulators, and local governments create implementation risks that are particularly challenging for small community organizations to manage independently.

## Implications for the future

The case story is not one of completion, but of triggering revealing realities, opening options for hundreds of similar MHPs in Nepal struggling for survival, and testing the limits of community governance structures. It demonstrates that the future of Nepal's micro hydropower lies not in survival at the margins but in strategic transformation, from isolated, fragile community assets into resilient, revenue generating energy enterprises. By combining early diagnostics, demand-side intelligence, cooperative governance, and grid interconnection, the Baglung experience proves that surplus power can be converted into long-term financial sustainability without surrendering community ownership. The transition from committee to cooperative reshapes microhydro from a social service into a locally controlled market actor, capable of financing maintenance, climate resilience, and rural entrepreneurship. For future programmes, the message is clear: grid interconnection will succeed only where institutional capacity, governance reform, and sustained handholding are treated as core investments, not add-ons and where microhydro is positioned as an integral part of Nepal's evolving, inclusive energy system.

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This case study is part of the series "Sustainability Solutions for Mountain People and Landscapes," developed within the WISIONS Innovation Lab Nepal. The aim is to promote an integrated approach to strengthening the livelihoods of people living in mountain communities. Each factsheet provides information on specific sustainability solutions in the fields of energy and landscape management that have shown promising potential or improving the livelihoods of mountain people but have a low level of adoption in Nepal and other mountain regions. The information is tai- lored to the specific context of Nepal's mountain landscapes and offers practical insights and guidance for scaling up the application of these solutions. Additionally, it presents an integrated approach that begins with an understanding of the opportunities and challenges faced by mountain communities, enabling the systematic deployment of synergies between solutions from the energy and landscape sectors.


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### Authors:
Nisha Jaishwal, Badri Nath Baral



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