

Capacity Building in the Water-Energy-Food-Environment Nexus in Nepal: Achievements and Future Direction

Safa Fanaian, Sanju Koirala, Santosh Nepal, Vishnu Prasad Pandey, Sita Aryal, and Manohara Khadka

December 2025



The authors

Safa Fanaian, Researcher - Social Sciences, International Water Management Institute (IWMI), Kathmandu, Nepal (s.fanaian@cgiar.org)

Sanju Koirala, Researcher - Social Science-Water and Natural Resources, IWMI, Kathmandu, Nepal (s.koirala@cgiar.org)

Santosh Nepal, Researcher - Water Resources and Climate Change, IWMI, Kathmandu, Nepal (s.nepal@cgiar.org)

Vishnu Prasad Pandey, Professor, Department of Civil Engineering, Institute of Engineering, Tribhuvan University, Nepal (vishnu.pandey@pcampus.edu.np)

Sita Aryal, Executive Director, Federation of Community Forestry Users Nepal (FECOFUN), Bhaktapur, Nepal (sita.fecofun@gmail.com)

Manohara Khadka, Country Representative – Nepal, IWMI, Kathmandu, Nepal (m.khadka@cgiar.org)

Acknowledgements

This work was conducted under the CGIAR Initiative on NEXUS Gains and finalized with support from the CGIAR Policy Innovations Program. We would like to thank all funders who supported this research through their contributions to the CGIAR Trust Fund (www.cgiar.org/funders).

The work was carried out by the International Water Management Institute (IWMI) with the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT). We are also grateful for the support from the Department of Water Resources and Irrigation in Nepal, the Government of Nepal, GREAT International, Governance Lab, Institute of Engineering (IoE) of Tribhuvan University, and the Federation of Community Forestry Users Nepal (FECOFUN).

CGIAR Policy Innovations Program

CGIAR's Policy Innovations Program delivers evidence-based recommendations to strengthen policies, markets and institutions, thereby improving millions of lives in Bangladesh, Egypt, Ethiopia, India, Kenya, Malawi, Nigeria, Pakistan, Rwanda, Sri Lanka and 10+ other countries in the Global South.

Citation

Fanaian, S.; Koirala, S.; Nepal, S.; Pandey, V. P.; Aryal, S.; Khadka, M. 2025. *Capacity building in the water-energy-food-environment nexus in Nepal: achievements and future direction*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Policy Innovations Program. 18p.

© 2025, International Water Management Institute (IWMI). All rights reserved. IWMI encourages the use of its material provided that the organization is acknowledged and kept informed in all such instances.

Front cover photo: Certificate of training provided to participants in a leadership training program in Kathmandu Nepal. (*photo*: Infocus Media Nepal)

Back cover photo: Group consultation during the WEFU workshop (*photo*: Infocus Media Nepal)

Disclaimer

This publication has been prepared as an output of the CGIAR Initiative on NEXUS Gains and the CGIAR Policy Innovations Program and has not been independently peer reviewed. Responsibility for editing, proofreading, and layout, opinions expressed, and any possible errors lie with the authors and not the institutions involved.

Contents

Summary	3
1. Introduction	3
2. Program Process: Predevelopment, Methods Applied, and Events Conducted	4
2.1. Predevelopment scoping	4
2.2. Methods applied for developing capacity development content	5
2.2.1. Co-creation of university courses	5
2.2.2. WEFE nexus leadership development	6
2.2.3. GESI responsiveness	7
2.3. WEFE nexus events	7
3. Outcomes and Learning	9
3.1. Outcome	9
3.1.1. Institutionalization of the WEFE Nexus in academia	9
3.1.2. Capacity building	9
3.1.3. Leadership development	9
3.1.4. Curriculum and programmatic integration	9
3.1.5. Policy uptake and institutional application	10
3.2. Learning	10
3.2.1. Gender considerations	10
3.2.2. Localization of the WEFE nexus	11
3.2.3. Institutional participation	11
3.2.4. Curriculum development and implementation of courses	12
3.2.5. Leadership learning	12
3.2.6. Sustaining WEFE integration in practice	12
4. Conclusion	12
References	13
Annex A. Courses Developed for the Initiative.	14
Annex B. Courses Institutionalized for Universities.	14
Annex C. WEFE Leadership Five-part Training Module.	14
Annex D. Events Conducted.	15

Capacity Building in the Water-Energy-Food-Environment Nexus in Nepal

Achievements and Future Direction

Summary

This report documents the purpose, processes, and achievements of the Water–Energy–Food–Environment (WEFE) nexus capacity building initiative implemented in Nepal since 2022. Its primary purpose is to present how the program was codesigned and delivered, what outcomes it generated, and what lessons were learned to guide future institutionalization of WEFE approaches in Nepal. The initiative was developed to address limited intersectoral collaboration and gaps in technical and leadership capacity across government, academia, and civil society, with a strong focus on gender equality and social inclusion.

Through sensitization workshops, professional training, academic course development, locally tailored tools, and leadership and mentoring programs, the initiative enhanced capacities at multiple levels and strengthened understanding of integrated resource management. More than 1,491 participants, including 579 women, engaged in 37 events such as sensitization workshops, professional training, and mentorship programs. Key achievements include the integration of WEFE concepts into university curricula, enhanced technical and leadership skills among practitioners, and the creation of Communities of Practice (CoP) that continue to support cross-sector engagement. The program also contributed to policy coherence by informing discussions on irrigation policy, gender-responsive planning, and climate-related decision-making.

The experience highlights the importance of long-term mentoring, institutional ownership, and locally relevant learning resources for sustaining the WEFE approach. Going forward, priorities include supporting faculty development, expanding undergraduate engagement, developing Nepal-specific case studies and tools, and strengthening CoP as ongoing platforms for collaboration, innovation, and inclusive governance.

1. Introduction

Water, Energy, Food, and Environment (WEFE) are interconnected in many ways worldwide. In Nepal, these interconnections are more direct and intertwined via increasing hydropower generation, agricultural development that integrates renewable energy, modernization of irrigation, and policies that promote utilizing and conserving natural resources in an consolidated manner. Water is an essential and common thread that runs through all sectors, including electricity, food production, and to sustain life (for people and nature) in Nepal. While there are provisions for WEFE integration within the Constitution of Nepal (2015), in practice, the sectors have limited collaboration (Pokharel and Shrestha 2024). This gap led to the initiation of a WEFE nexus focus, i.e., building key connections across sectors to maximize synergies among the WEFE nexus to minimize social, economic, and environmental trade-offs and conflicts in Nepal (Uhlenbrook and Ringler 2021).

A significant gap in initiating the WEFE nexus approach in Nepal was the limited capacity and opportunity for state and non-state actors across water, energy, forestry, biodiversity, and agriculture sectors to pursue integrated solutions (Buchy et al. 2022; Great International 2024). From 2022 to 2025, the CGIAR Initiative on NEXUS Gains sought to bridge this gap by targeting capacity development for actors working across WEFE sectors (with special emphasis on enabling women leaders) and creating spaces for cross-sectoral interactions (Buchy et al. 2023; Great International 2024).

The NEXUS Gains initiative in Nepal had a two-pronged goal: first, to strengthen capacities for developing and implementing nexus solutions among key stakeholders of all genders and at various levels; and second, to help participating institutions better understand and adopt the WEFE nexus concepts. This two-pronged goal aimed to reduce sectoral segregation, minimize trade-offs, and enhance synergies to achieve Sustainable Development Goals (SDGs) through transformations in food, land, and water systems (Khadka et al. 2022). The initiative was implemented in collaboration with the Department of Water Resources and Irrigation in Nepal, the Government of Nepal, GREAT International, Governance Lab, Institute of Engineering (IoE) of Tribhuvan University, and the Federation of Community Forestry Users Nepal (FECOFUN) (Paudyal and Chapagain 2024).

This report presents the codesigned predevelopment process, implementation strategies, achieved outcomes, and key insights from capacity building initiatives undertaken in Nepal since 2022, to embed the WEFE nexus approach. It illustrates how global and local knowledge systems were integrated, outlines the challenges faced, and summarizes the lessons learned. The report also documents the mainstreaming of the WEFE nexus into academic curricula and professional training programs, as well as the establishment of active CoP. This document aims to inform policymakers, development partners, investors, educators, and practitioners, support the replication of successful practices, and guide policy actions toward institutionalizing the WEFE nexus approach.

2. Program Process: Predevelopment, Methods Applied, and Events Conducted

The WEFE capacity-building program was co-designed and implemented through an iterative, learning-oriented approach that enabled deliberate, context-specific learning and promoted equity and inclusion (Buchy et al. 2022). This section describes the co-design process.

2.1. Predevelopment scoping

A comprehensive pre-development scoping process was conducted to identify knowledge gaps, barriers for women, and context-specific delivery design required to promote systematic change in WEFE thinking and action. The process included a review of existing research programs and literature, and over 50 consultations with more than 80 diverse stakeholders across national, local, and community levels, including men, women, and youth (Buchy et al. 2022).

The scoping study revealed that professional training across universities and other capacity-building programs often occur within disciplinary sectors with limited exposure to intersectoral integration, co-creation, and co-management practices. Despite shared recognition of the climate crisis and the need for collaboration, bureaucratic systems remain inadequately equipped to work together and to promote coherent development planning. Many also mistakenly use "Integrated Water Resources Management" and "WEFE Nexus" synonymously. The scoping study also revealed that existing organizational structures lack the capacity to lead or apply a WEFE nexus approach and include policy mismatches characterized by overlaps, contradictions, and gaps in practice (Buchy et al. 2022).

While there was no significant difference in conceptual understanding of the WEFE nexus between men and women professionals, women across sectors face additional barriers such as underrepresentation in leadership roles and limited decision-making authority. Mitigating these barriers requires confidence building, public speaking skills, and technical strengthening in nexus science, as well as engaging with men to understand gendered constraints such as patriarchal norms and the work burden for women in managing care work and professional jobs (Buchy et al. 2022).

To address these contextual and systemic barriers in WEFE nexus-related capacities, a holistic approach was adopted, centered on three avenues of engagement (illustrated in the center circle of Figure 1): sensitization of decision-makers, WEFE nexus-focused academic courses, and practitioner training. These engagements were supported by five streams of action (outer circles in Figure 1), which include; policy and practice reviews to develop localized learning tools, institutional partnerships to improve uptake, stakeholder-centric program design and mentorship for skills development, maintaining timing (i.e., when the event will occur) and the duration of events (time-span), and behavioral tools to foster knowledge uptake and systemic change (Paudyal and Chapagain 2024).

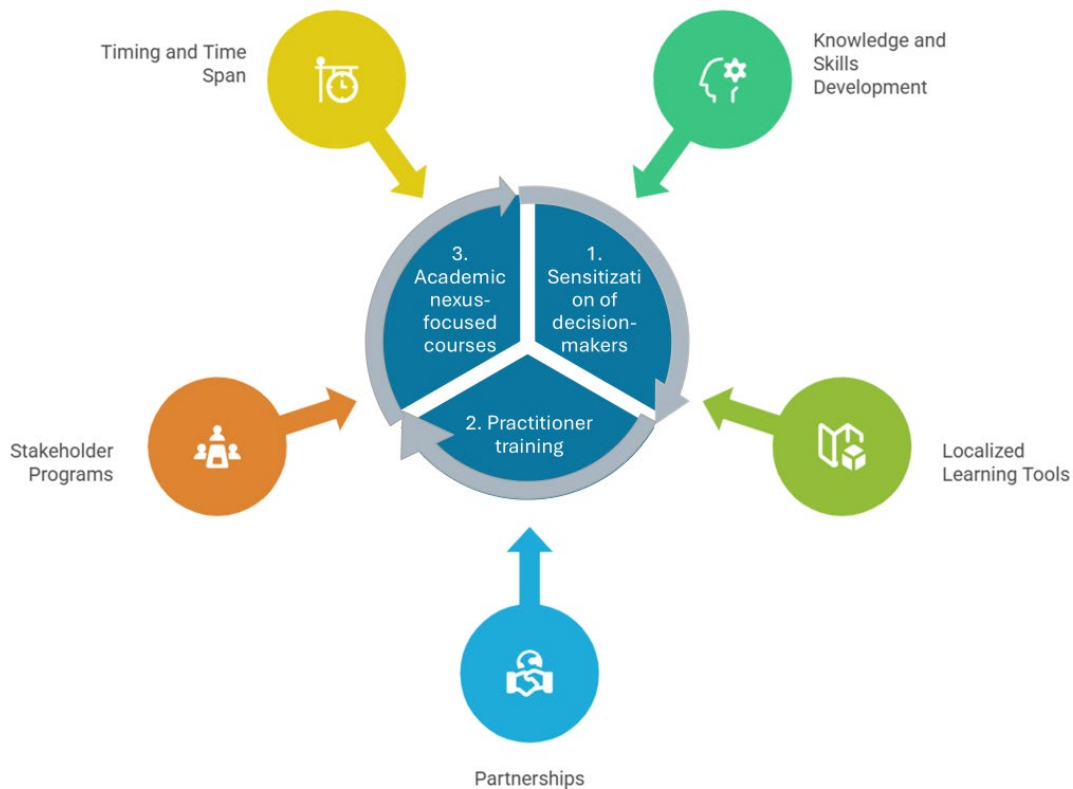


Figure 1. Process design and pathways for WEFE capacity building adapted from the process as defined in Buchy et al. (2022) and Paudyal and Chapagain (2024).

2.2. Methods applied for creating capacity development content

The content for the sensitization course, practitioner course, academic courses, and leadership development courses was created using an iterative participatory and inclusive co-design approach.

2.2.1. Co-creation of university courses

The course content design was initiated in 2022 in partnership with the Center for Water Resources Studies, Institute of Engineering (IoE), Tribhuvan University (TU) to develop a sensitization course, a practitioner course, and academic courses. A seven-member expert committee team was formed as the core team to develop these courses. The team included academics from; the Center for Water Resources Studies, Institute of Engineering, TU¹; Institute of Forestry, TU²; Agriculture & Forestry University, TU³; and experts from IWMI⁴.

¹ Vishnu Prasad Pandey, Tri Ratna Bajracharya, Bhola Nath Sharma Ghimire, and Suraj Lamichhane, Center for Water Resources Studies, Institute of Engineering, Tribhuvan University, Nepal and Center for Energy Studies, Institute of Engineering, Tribhuvan University, Nepal

² Rajesh Kumar Rai, Institute of Forestry, Tribhuvan University, Nepal

³ Rishi Ram Kattel, Agriculture & Forestry University

⁴ Sanju Koirala, International Water Management Institute, Nepal.

The core team members consulted with and co-developed university-level curricula in collaboration with diverse local experts, academics, and students from various disciplines. The courses (course details in Annex 1) were developed over the span of a year, during which they were tested and refined based on collective feedback and practical experience. WEFE sector experts from Nepal's academic institutions, government organizations, and Civil Society Organizations' (CSO) design workshops. They supported the capacity development process, adding depth of knowledge and localized experiences for the participants, and programmatic interventions. The academic and practitioner courses were piloted as workshops at the universities, with feedback integrated into revisions (CWRS 2023a, 2023b, 2023c).

As the academic, sensitization and practitioner courses were finalized, the first Training of the Trainers (ToT) program was organized in 2024 in Nepal, to provide feedback and refine the ToT content, ensure institutionalization, and sufficient capacity to expand WEFE-related capacity-building efforts. This ToT program brought together 16 academics and practitioners from Nepal, Pakistan, and Uzbekistan.

“The course is useful for one’s career growth, offering a diversified skill set and strategic insight. Nexus-trained engineers excel in interdisciplinary projects, collaboratively addressing complex challenges across water, energy, food, and ecosystems. Possessing enhanced problem-solving abilities, they are well-suited for leadership roles, making informed decisions with long-term impacts”. Student, Institute of Engineering, Tribhuvan University

2.2.2. WEFE nexus leadership development

Following the recommendations of the scoping exercise, a focus on the WEFE nexus leadership capacity-building program was designed and implemented. The WEFE Nexus Leadership Development course was conceptualized and implemented by Governance Lab and GREAT International, in partnership with IWMI and the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT). The program aimed to cultivate WEFE nexus champions who can promote the adoption and application of people centered WEFE approaches, while fostering greater gender equality and social inclusion among professionals working in these sectors (Khadka et al. 2022).

The WEFE Nexus Leadership Development course was developed in consultation with thematic experts and comprises of a five-part module (Annex 2), designed for facilitation in a participatory manner. The course was also designed to be flexible and incorporate the needs of the participants. After each module session, participants were consulted to refine the next session. Its specific objectives were to:

1. Strengthen technical expertise, as well as the analytical, advocacy, and negotiation abilities of WEFE sector professionals to enhance their understanding and practical application of WEFE nexus approaches.
2. Build the transformational leadership skills of both women and men across WEFE sectors, enabling them to engage effectively in policy dialogues, decision-making, planning, and implementation related to the nexus.
3. Establish robust, collaborative networks that support the co-creation and execution of WEFE nexus solutions.
4. Leverage the strengths of women professionals while cultivating a pool of practitioners who recognize and can address systemic barriers to gender equality and social inclusion within WEFE sectors.

The course employed adult learning methodologies, including transformative and experiential learning, complemented by mentorship. The program was targeted primarily towards women from government departments, NGOs, CSOs, natural resource management networks, and the private sector. The WEFE Leadership Development program was designed as an iterative and ongoing process.

An iterative and ongoing practice was also established to scale WEFE Leadership. A leadership and mentoring component was created as a six-month process to enable an iterative learning experience focused on young professionals—particularly women—to strengthen their negotiation, advocacy, and analytical skills through practical application. A mentorship process was included in the design of the leadership program to continue support for participants beyond the training and project period. These efforts are based on the importance of ensuring long-term mentoring and building a

critical mass within institutions to drive sustainable change beyond training programs (Khadka et al. 2022; Paudyal and Chapagain 2024).

2.2.3. GESI responsiveness

All capacity-building processes were anchored on the two core pillars of gender and inclusion. These two pillars were also reflected in the content development process, the course content, and the diversity of the participants. Predevelopment scoping consultations also highlighted key areas that require special attention to GESI, such as developing networking skills and leadership for women, which were addressed through leadership programs specifically designed for this initiative (Buchy et al. 2023; Buchy et al. 2022; Jalonen et al. 2022; Khadka et al. 2022). All the WEF-related courses and sensitization processes for professionals from CSOs, government agencies, and students integrated specific sessions that responded to issues of GESI using the social equity framework that consists of the 3Rs (Recognition, Representation, and Redistribution) (Jalonen et al. 2022; Khadka et al. 2022).

2.3. WEF nexus events

More than 37 structured activities (detailed list in Annex 3) were conducted since 2022, including sensitization workshops, practitioner trainings, academic course piloting, policy dialogues, and community-focused engagements delivered in partnership with government agencies, universities, CSOs, and development partners. Key event types, their participants, and the interconnection between activities are highlighted in Figure 2.

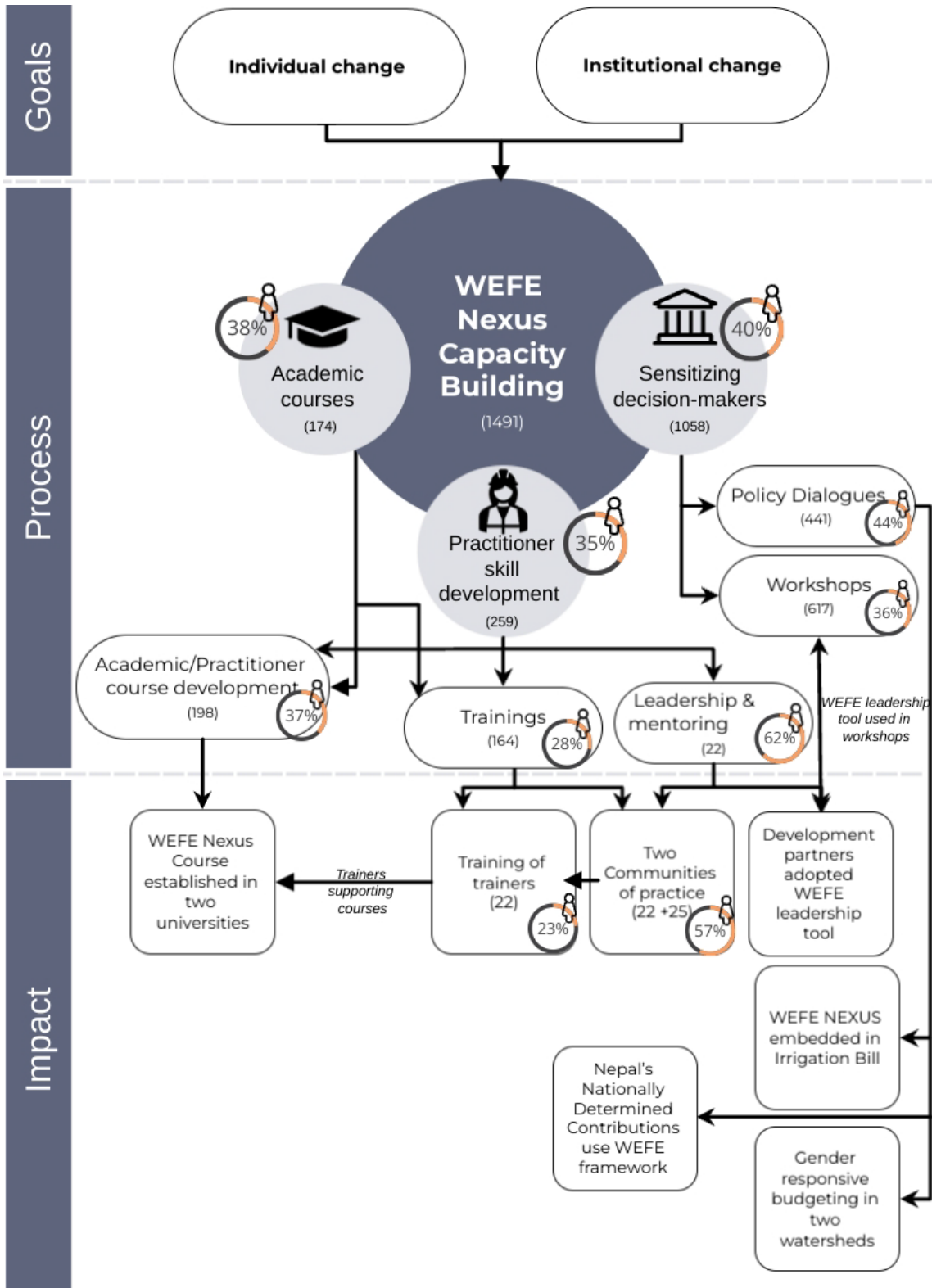


Figure 2. Road map of the goals, activity process, and outcomes for the WEF Nexus program. Numbers in brackets indicate the number of participants, and percentages in circles indicate the percentage of women participating in each event type (events list in Annex D).

Note: some individuals participated in multiple events; the overall total of 1,491 reflects unique participants.

3. Outcomes and learning

The intended outcome of the WEFE nexus capacity-building efforts was to initiate individual and institutional change by strengthening the technical expertise, leadership, and negotiation skills of men and women professionals from government agencies, NGOs, and CSOs, enabling them to effectively design, advocate for, and implement WEFE nexus initiatives. An evaluation of the capacity development activities of the CGIAR Initiative on NEXUS Gains (Paudyal and Chapagain 2024) implementation in Nepal was also conducted to understand the benefits generated and ongoing barriers. The expected outcomes were achieved through a multipronged process that yielded many positive impacts and spillovers over the two-and-a-half-year period. However, as with any process and its achievements, valuable learning has emerged from the challenges encountered.

3.1. Outcome

The initiative contributed to strengthening academic integration, leadership capacities, and cross-sector collaboration, with several institutional changes emerging across universities, government agencies, and civil society partners. Overall, the program contributed to creating a cascading impact on multiple national policies and actions. The detailed achievements in capacity development, leadership, and institutionalization of the WEFE nexus within universities and other professional spaces in Nepal include:

3.1.1. Institutionalization of the WEFE Nexus in academia

- The WEFE Nexus Leadership Development course is now part of the MSc curriculum as a 60-hour course titled “Climate Change, Water Security and Nexus” at the Institute of Engineering, Tribhuvan University.
- The Institute of Forestry, Tribhuvan University, also offers a 45-hour course titled “Water-Energy-Food Nexus” for all MSc-level students.

3.1.2. Capacity building

- Between April 2022 and July 2025, a total of 433 professionals (289 men, 144 women) from government agencies, academia, NGOs, and the private sector received specialized training and skill development in various areas, including academic course development, hydrological modeling, leadership, and negotiation processes.
- Among the 68 surveyed for feedback on skill development, “87% strongly agree or agree (i.e., 100% of student respondents, 95% of university faculties, 89% of government employees, 83% of CSO representatives, and 57% of media, private sector and others) that the interventions enhanced their knowledge about the concept of WEFE nexus, its importance, and relevance” (Paudyal and Chapagain 2024, 9).

3.1.3. Leadership development

- Advocacy, networking, and reflective learning were fostered among 22 participants (17 women and 5 men) through the WEFE Nexus Leadership Development course, which was implemented by Governance Lab and GREAT International.
- Leadership development led to the creation of a Communities of Practice (CoP): Institutional & Academic Integration CoP – 22 members (17 women, five men).
- An evaluation of this program (Paudyal and Chapagain 2024; Koirala 2024) and follow-up activities highlighted that participants gained confidence in applying WEFE nexus frameworks in their institutions and projects,
- The evaluation (Paudyal and Chapagain 2024) also highlighted that CoPs acted as multipliers, sharing knowledge within organizations and communities, and continued to strengthen collaboration across water, energy, agriculture, and environmental sectors.
- The program encouraged inclusive, system-oriented leadership and evidence-based decision-making.

3.1.4. Curriculum and programmatic integration

- Multiple courses were developed, including a sensitization course on WEFE for policymakers (Pandey et al. 2024a), three modules for postgraduate students (Pandey et al. 2024b), and five modules on WEFE nexus approaches for early to mid-career professionals (Pandey et al. 2024c).
- A total of 164 participants (118 men and 46 women) participated in academic and professional course development activities.

- SWAT+ hydrological modeling elements were integrated into the master's curriculum of the Central Department of Hydrology and Meteorology at Tribhuvan University, where the modeling approach helps trade-off and synergies among sectors, encouraging the sustainable management of natural resources (Pradhananga 2024).
- A CoP on integrated Water Modelling was created with 25 members (10 women, 15 men).
- A training manual and tool was developed for the WEFE Nexus Leadership Development course. In 2024, it was adopted in Oxfam's Transboundary Rivers of South Asia (TROSA) program as a capacity-building approach to strengthen stakeholders' ability to manage natural resources in the Rangun Watershed, Mahakali River Basin, Sudurpashchim Province, Nepal

3.1.5. Policy uptake and institutional application

- The WEFE nexus concepts are now embedded in Nepal's Irrigation Policy (2023).
- The training has informed gender-responsive budgeting in municipalities such as Barahatthawa Municipality in Madhesh Province and municipalities in the Rangun Watershed.
- IWMI also responded to the request of parliamentarians and conducted multiple strategic consultations for the Parliamentary Committee on Infrastructure Development on the draft Water Resource Bill 2024.
- Recognizing that the impacts of climate change are cross-sectoral, Nepal's third Nationally Determined Contributions—for the first time—emphasized the importance of coordination among key sectoral targets such as water, forest, food, energy, and biodiversity and ecosystem sectors to achieve effective mitigation and adaptation.
- Oxfam's TROSA project applied the WEFE leadership tool developed by the CGIAR Initiative on NEXUS to strengthen the capacities of municipal-level elected representatives, staff, and stakeholders in the Rangun Watershed.

3.2. Learning

This section presents key learnings based on experiences, illustrating how improvements in gender inclusiveness can be achieved through localized approaches, institutional engagement, curriculum design, leadership development, and strategies for sustaining momentum. These insights guide future efforts and the adaptation of the WEFE framework to diverse contexts.

WEFE capacity development efforts have successfully strengthened individuals' knowledge, skills, and attitudes toward the WEFE nexus approach. However, challenges remain in translating these capacities into practice due to gaps in technical expertise among stakeholders, a lack of Nepal-specific WEFE integration cases, tools, and approaches to guide decisions. Additionally, inconsistencies in sectoral policies and guidelines complicate the implementation of the WEFE nexus. Rigid planning systems and hierarchical organizational cultures have further limited intersectoral collaboration and innovation.

3.2.1. Gender considerations

- Women professionals who participated in sensitization and skill development events were better informed but still face barriers in WEFE integration due to a limited decision-making authority and the absence of a critical mass within their institutions to influence change. Sustained mentoring is vital to strengthen and maintain their role in championing WEFE-related processes.

Box 1. The 12 Ja's (Interconnections)

1. *Jal* (water)
2. *Jangal* (forests)
3. *Jamin* (land)
4. *Jaiwik Urja* (bioenergy)
5. *Jalaadhar* (watersheds)
6. *Jaiwik Mal* (organic fertilizers)
7. *Jaiwik Bibhidhta* (biodiversity)
8. *Jadibuti* (medicinal plants)
9. *Jalawaayu* (climate change)
10. *Janaawar* (animals)
11. Gender and social justice
12. *Janata ko Janajiwikaa* (people's means of living - livelihoods)

3.2.2. Localization of the WEFE nexus

- In expanding the WEFE nexus sensitization and training programs to another province (Sudurpashchim Province), participants and facilitators collaborated to adapt the concept into Nepal and to the local context, ensuring it reflected community realities and knowledge systems.
- Additionally, over the course of multiple trainings, participants adapted and developed Nepali-centric WEFE concepts, such as “12 Ja” which simplify and broaden the WEFE nexus, making it easier for local communities and practitioners to understand and apply in planning. The choice of the Nepali alphabet “Ja” was intentional, as it begins with Jal (water), Jungle (forest), and Jamin (land), which are the three core pillars of Nepal's natural ecosystems and rural livelihoods.
- The “12 Ja's” highlight culturally and ecologically important aspects of natural resource management in Nepal. The number 12—commonly used in Nepali culture to represent completeness, familiarity, and functional grouping—adds symbolic value and relevance. Together, the number 12 and the letter “Ja” create a simple yet meaningful framework for integrated resource management. The concept also provides special emphasis on promoting Gender Equality and Social Inclusion (GESI).



Figure 3. WEFE Nexus community of practice meeting, Nepal. (photo: Infocus Media Nepal)

3.2.3. Institutional participation

- A key to learning was the engagement of multiple participants from the same organization in capacity-building efforts. This approach can help satisfy ideas within an institution, fostering shared understanding and increasing the likelihood of institutional change toward WEFE integration. While cross-organizational diversity remains

essential, building a critical mass within specific units can enhance sustainability and internal momentum for change.

3.2.4. Curriculum development and implementation of courses

- Although multiple training and capacity development programs have been implemented for universities, faculty members remain unclear about how WEFE concepts will be applied in Nepal's context, as there are few cases to draw upon. Establishing a peer-to-peer learning process allows cross-learning and ongoing engagement.
- There is currently limited investment or financial support for students to test and research the operationalization of WEFE in Nepal's context. For practitioners, there is limited space within institutions to experiment with implementing WEFE concepts, as institutional structures remain rigid. Seed funds for community-level research projects, internships, or connections to the community of practices can facilitate implementation and institutional support for small-scale testing of WEFE concepts.

3.2.5. Leadership learning

- The evaluation of the WEFE Nexus Leadership Development course highlighted that while the training provided a strong foundation, ongoing mentorship and follow-up are essential to help participants apply their learning in real-world settings. Given the diverse backgrounds of participants, future programs should tailor content to different levels of expertise. Lastly, a robust monitoring and evaluation system is needed to track long-term behavioral and institutional changes and to assess the program's sustained impact. Building local case studies from Nepal has already been initiated (Great International, 2024).

3.2.6. Sustaining WEFE integration in practice

- To build on the progress achieved, future interventions should sustain multi-stakeholder engagement, foster GESI-responsive leadership, and strengthen Communities of Practice and post-training support. Investments in university partnerships, localized capacity building, and research on Nepal-specific tools and methods will help embed the nexus approach more effectively into policy and practice.
- Integrating the WEFE approach into postgraduate coursework has already generated new research opportunities. Extending this integration to undergraduate programs, especially in fields such as Sociology and Crisis Management, could help build a stronger foundational knowledge base (Paudyal & Chapagain, 2024).

4. Conclusion

The WEFE nexus initiative in Nepal has strengthened integrated thinking across water, energy, food, and environmental sectors by promoting inclusive capacity development and cross sector collaboration. These efforts have contributed to greater awareness of nexus approaches within universities, government agencies, and professional networks, while encouraging more gender-responsive and participatory practices.

Scaling the availability of Nepal-specific case studies, analytical tools, and practical models will also be vital for supporting evidence-based planning and in improving the applicability of the WEFE approach. A stronger enabling environment within institutions—including flexibility for experimentation, mechanisms for collaboration, and alignment across sectoral policies—would enhance the potential for nexus principles to be applied consistently in practice. Finally, sustaining CoP and other multi-stakeholder platforms will help maintain collaborative learning, encourage innovation, and promote ongoing dialogue between technical experts, policymakers, and practitioners.

Looking ahead, sustaining progress will require continued investment in faculty development, mentorship, and Nepal specific learning tools that support the practical application of nexus concepts. Expanding curriculum offerings, fostering institutional ownership, and strengthening CoP will be essential for embedding WEFE principles more deeply into organizational cultures and decision-making processes. Together, these steps can help ensure long term relevance, inclusivity, and a transformative impact of the WEFE nexus in Nepal.

References

- Buchy, Marlene, Marlène Elias, and Manohara Khadka. 2023. "Invisible Women: Barriers for Women Professionals in the Water, Energy, Food, and Environment Sectors in Nepal." *Frontiers in Sustainable Food Systems* 7. <https://doi.org/10.3389/fsufs.2023.1146187>.
- Uhlenbrook, Stephan, and Claudia Ringler. 2021. "An Integrated Approach to Realize Multiple Benefits across Water, Energy, Food, Forests and Biodiversity." *IFPRI*. <https://www.ifpri.org/blog/integrated-approach-realize-multiple-benefits-across-water-energy-food-forests-and-biodiversity>.
- Buchy, Marlene, Shrestha, S., and Shrestha, G. 2022. *Scoping Study: Capacities and Needs for Strengthening Water–Energy–Food–Environment (WEFE) Nexus Approaches in Nepal*. Rome, Italy: Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT); International Water Management Institute (IWMI). CGIAR Initiative on NEXUS Gains.
- CWRS (Center for Water Resource Studies). 2023a. *Designing Capacity Building Curriculum for Water-Energy-Food-Ecosystem (WEFE) Nexus, Final Report Submitted to IWMI Kathmandu, Nepal*. Kathmandu: Institute of Engineering, Tribhuvan University.
- CWRS (Center for Water Resource Studies). 2024b. *Sensitization Course Implementation Report, Submitted to IWMI Nepal*. Kathmandu: Institute of Engineering, Tribhuvan University.
- CWRS (Center for Water Resource Studies). 2024c. *Implementing Sensitization Course and Orientation Training for Academic Course on WEFE Nexus, Final Report Submitted to IWMI Nepal*. Lalitpur: Institute of Engineering, Tribhuvan University.
- Great International. 2024. *Examining the Water-Energy-Food Security-Ecosystem Nexus Approach in Nepal: Learning from Some Case Studies Series 1*. Kathmandu, Nepal. <https://uploads.water-energy-food.org/GREAT2024-Nexus-Case-Studies-Nepal.pdf>.
- Jalonen, R., Zaremba, H., Petesch, P., Elias, M., Estrada-Carmona, N., Tsvuura, S., and Koirala, S. 2022. *Gender Equity and Social Inclusion in the Water-Energy-Food-Ecosystems (WEFE) Nexus: Frameworks and Tools for Moving from Resource-Centric to People-Centric WEFE Nexus Approaches*. Rome, Italy: Alliance of Bioversity International and International Center for Tropical Agriculture (CIAT).
- Khadka, Manohara, Koirala, Sanju, Buchy, Marlene, and Yangkhurung, J. 2022. *Developing Capacity for Water-Energy-Food-Ecosystems (WEFE) Nexus Actors, Including Emerging Women Leaders: Foundations of the WEFE Nexus Leadership Program in Nepal*. Kathmandu, Nepal: International Water Management Institute (IWMI); Rome, Italy: Alliance of Bioversity International and International Center for Tropical Agriculture (CIAT).
- Koirala, Sanju. 2024. *Women Defining Water, Energy, Food, and Ecosystems Leadership in Nepal*. Montpellier, France: CGIAR Initiative on NEXUS Gains.
- Government of Nepal. 2000. *Irrigation Rules, 2056*. Kathmandu: Government of Nepal. <https://faolex.fao.org/docs/pdf/nep27488.pdf>.
- Government of Nepal. 2015. *Constitution of Nepal (2015)*. Kathmandu: Government of Nepal.
- Paudyal, B. R., and Chapagain, B. 2024. *Evaluation of Capacity Development Activities of the CGIAR Initiative on NEXUS Gains in Nepal*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Initiative on NEXUS Gains.
- Pokharel, K., and Shrestha, A. 2024. "Emerging Possibilities Amidst Persisting Boundaries: Strengthening WEFE Nexus Governance in the Federal Governance System of Nepal." In *Examining the Water–Energy–Food Security–Ecosystem Nexus Approach in Nepal: Learning from Some Case Studies (Series 1)*. Kathmandu: GREAT International. <https://uploads.water-energy-food.org/GREAT2024-Nexus-Case-Studies-Nepal.pdf>

Pradhananga, Saurav. 2024. "SWAT+ Hydrological Modelling to Feature in Nepal's National Curriculum." *International Water Management Institute*. Last modified December 13, 2024. <https://www.iwmi.org/news/swat-hydrological-modelling-to-feature-in-nepals-national-curriculum/>

Annex A. Courses Developed for the Initiative.

- Pandey, V. P., R. K. Rai, S. Koirala, T. R. Bajracharya, B. K. Pokharel, N. Onta, R. R. Kattel, S. Dangol, M. Khadka, and M. Elias. 2024a. Towards the Integrated Management of Water, Energy, Food, and Ecosystems (WEFE): A Sensitization Course for Policy-/Decision Makers. 92 slides. <https://hdl.handle.net/10568/152242>.
- Pandey, V. P., R. K. Rai, S. Koirala, T. R. Bajracharya, B. K. Pokharel, N. Onta, R. R. Kattel, S. Dangol, M. Khadka, and M. Elias. 2024b. Climate Change, Water Security and Water-Energy-Food-Ecosystems (WEFE) Nexus Approaches – Part of a Post-Graduate Course: Training Modules 1–3. <https://hdl.handle.net/10568/152338>.
- Pandey, V. P., R. K. Rai, S. Koirala, T. R. Bajracharya, B. K. Pokharel, N. Onta, R. R. Kattel, S. Dangol, M. Khadka, and M. Elias. 2024c. Water-Energy-Food-Ecosystems (WEFE) Nexus Approaches – A Professional Course: Training Modules 1–5. <https://hdl.handle.net/10568/152339>.
- International Water Management Institute (IWMI). 2024. Training Manual: Developing Leadership Capacity for Water–Energy–Food–Ecosystems (WEFE) Nexus Actors. <https://hdl.handle.net/10568/162595>.

Annex B. Courses Institutionalized by Universities.

University	Master program	Course Credits	Title	Course Contents
Institute for Engineering, Tribhuvan University	Water Resources Engineering	4	Climate Change, Water Security, and Nexus (ENCEWR563)	<ul style="list-style-type: none"> • Climate system, climate variability/change, and drivers • Detection, attribution and projection of climate change • Climate change impact and risk assessment • Understanding water security and WEFE nexus • Operationalizing and managing WEFE nexus • Responding to climate risk, water insecurity
Institute of Forestry, Tribhuvan University	Foundational course for all six Master programs offered	3	Water-Energy-Food-Ecosystem Nexus (WME 503)	<ul style="list-style-type: none"> • Understanding of nexus • System interaction • Assessment tools • Nexus in practice • Nexus future perspective

Annex C. WEFE Nexus Leadership Five-part Training Module.

Block	Days required	Title	Sessions
Block 1	2	WEFE nexus approach	<ul style="list-style-type: none"> • Introduction to the WEFE Nexus • Expected domains of change within nexus thinking • Case studies on the application of the WEFE nexus approach • Developing a mentor-mentee relationship

Block 2	1	Gender, equality, and social inclusion (GESI) within the WEFE nexus	<ul style="list-style-type: none"> • GESI within the context of the WEFE nexus • Tenure rights of local communities, Indigenous peoples, women, and socially excluded groups in WEFE sectors • Opportunities in GESI mainstreaming • Panel discussion: Learning and sharing opportunities for inclusion and mainstreaming
Block 3	1	Transformational leadership	<ul style="list-style-type: none"> • Transformative leadership • Emotional intelligence, emotional regulation • Reflections on promoting leadership within WEFE sectors • Leadership strategies and tools • Examining the leadership arena
Block 4	1	Enabling environment for advancing transformative leadership and reaching national goals through a WEFE nexus approach	<ul style="list-style-type: none"> • Enabling environment for a gender-responsive workplace • Leadership in reaching national goals using a WEFE approach • Designing WEFE leadership sessions
Block 5	1	Leading by learning	<ul style="list-style-type: none"> • Future directions • Closing

Annex D. Events Conducted.

No.	Year	Event name	Academic/Skill development/Sensitization	Men	Women	Total participants
1	2022	Co-creation workshop for preliminary input into capacity-building curriculums for WEFE nexus, each targeted to policy-makers, mid-level professionals, and post-graduate students (In partnership with Centre for Water Resource Studies of the Institute of Engineering, TU)	Academic	24	9	33
2	2022	Stakeholders' consultation workshop for input on the developed WEFE courses	Academic	33	22	55
3	2022	Co-learning policy workshop on the importance of the water, energy, food, and ecosystems (WEFE) nexus for Nepal's development (IWMI and DOWRI)	Sensitization	19	10	29
4	2022	Inception workshop introducing stakeholders to WEFE nexus approaches	Sensitization	95	54	149
5	2023	A Multi-Stakeholder Dialogue at the provincial level on the Water-Energy-Food and Ecosystem (Forest and Biodiversity) Nexus Nepal Janakpur	Sensitization	22	44	66
6	2023	A Multi-Stakeholder Dialogue at the provincial level on the Water-Energy-Food and Ecosystem (Forest and Biodiversity) Nexus Nepal Surkhet	Sensitization	31	37	68
7	2023	A Dialogue with Civil Society Organizations on the Water-Energy-Food and Ecosystem (Forest and Biodiversity) Nexus in Nepal	Sensitization	34	31	65
8	2023	Policy dialogues (workshop) with members of parliamentarians and Policy Makers (activity under WP4),	Sensitization	29	24	53
9	2023	Designing of training and mentoring modules, piloting and delivery of training and mentoring sessions ⁵ (six modules spread over six months)	Skill Development	5	17	22
10	2024	WEFE Nexus Professional Course, Piloting with WEFE professionals	Skill Development	23	9	32
11	2024	Canal flow measurement and data sharing' orientation and training to gate operators	Skill Development	8	3	11
12	2024	WEFE Nexus Academic Course, Piloting with IOE students	Academic	10	3	13
13	2024	4th South Asia Hydromet Forum	Sensitization	5	1	6
14	2024	P25, Listening sessions with stakeholders	Sensitization	23	15	38

15	2024	One day Soil Moisture Measurement and Irrigation Scheduling with Chameleon WiFi Soil Moisture Sensor (Bardiya)	Skill Development	18	7	25
16	2024	NEXUS Gains Talks: Transformative leadership program for women professionals in the W-E-F-E Nexus	Sensitization	19	31	50
17	2024	Orientation training for faculty members of universities to deliver WEFE nexus course	Academic	17	5	22
18	2024	One-day refresher training on J2000 hydrological modeling in the Dudh Koshi basin	Skill Development	11	6	17
19	2024	Training on Canal Discharge Measurement and Data Sharing in Babai Irrigation System	Skill Development	20	3	23
20	2024	WEFE Nexus Sensitization Course Implementation	Academic	17	6	23
21	2024	Training on SWAT+ hydrological modeling of the Karnali river basin in Nepal	Skill Development	12	8	20
22	2024	Understanding the WEFE Nexus & GESI: Inter-ministerial Collaborative Workshop	Sensitization	15	17	32
23	2024	Awareness Workshop on the Importance of Environmental Flow Allocations in Nepal	Sensitization	21	11	32
24	2024	Science-Policy Dialogue on the Importance of the Environmental Flow Allocations in Nepal	Sensitization	25	9	34
25	2024	Workshop on Gender Equality and Socially Inclusive Water, Energy, Food, and Ecosystem Nexus in Sudurpaschim Province	Skill Development	30	19	49
26	2024	Stakeholder consultation workshop on draft Water Resources Bill 2081	Sensitization	26	13	39
27	2024	Experts dialogues with the lawmakers on draft Water Resources Bill 2081	Sensitization	35	18	53
28	2024	Meeting with DWRI on GESI action plan preparation	Sensitization	0	4	4
29	2024	Irrigation Policy Implementation Workshop	Sensitization	44	20	64
30	2024	Consultation Workshop on "National Irrigation Policy 2080: Priorities and Way Forward"	Sensitization	44	20	64
31	2024	Water Focused Climate Negotiations Training	Skill Development	24	11	35
32	2024	WEFE Community of Practice Meeting	Sensitization	8	10	18
33	2024	Community of Practice Training SWAT+ hydrological modelling in Karnali river basin at CDHM, TU	Academic	8	5	13
34	2024	Community of Practice Training: Climate change impact on water resources in Karnali using SWAT+ model	Academic	11	4	15
35	2025	Water Resource Bill 2081- Consultation Ws (MoEWRI+IDC)	Sensitization	24	10	34
36	2025	Refresher Training on GESI-responsive WEFE Nexus	Skill Development	18	7	25
37	2025	Irrigation Seminar: Water for Agri-Food System Transformation	Sensitization	119	41	160
Total				927	564	1491



CGIAR is a global research partnership for a food-secure future. CGIAR science is dedicated to transforming food, land, and water systems in a climate crisis. Its research is carried out by 13 CGIAR Centers/Alliances in close collaboration with hundreds of partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector. www.cgiar.org

To learn more about this program, please visit: <https://www.cgiar.org/cgiar-research-portfolio-2025-2030/policy-innovations/>

Contact

Safa Fanaian, Researcher - Social Sciences, International Water Management Institute (IWMI), Kathmandu, Nepal (s.fanaian@cgiar.org)

