

Embedding the Water-Energy-Food-Environment (WEFE) Nexus in University Curriculum: The Tribhuvan University Experience

Sanju Koirala, Manohara Khadka, Vishnu Prasad Pandey

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The Authors:

Sanju Koirala, Researcher – Social Science – Water and Natural Resources, International Water Management Institute (IWMI), Nepal

Manohara Khadka, Country Representative, IWMI, Nepal

Vishnu Prasad Pandey, Executive Director, Center for International Relations, Tribhuvan University, Nepal

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Summary

The technical brief highlights the institutionalization of the Water–Energy–Food–Environment (WEFE) nexus course at Tribhuvan University, Nepal, through collaboration with the WEFE NEXUS Policy's Area of Work (AoW4) under CGIAR's Policy Innovations Science Program. It underscores the need to move beyond siloed natural resource management toward integrated, interdisciplinary approaches that address climate change, sustainability, and the Sustainable Development Goals (SDGs). The curriculum was developed with participatory input from experts. The graduate-level course was piloted in 2024 and officially adopted in 2025. Parallel efforts expanded the course to the Institute of Forestry, supported by Training of Trainers programs. Future directions emphasize faculty capacity-building, student research support, and the integration of local case studies for practical learning.

1. Relevance and value of a WEFE nexus course

Natural resources management education – encompassing water, forestry, agriculture, and environmental disciplines – has evolved from a primarily technical orientation to one that emphasizes interdisciplinary collaboration, sustainability, and active community engagement. However, many courses in these fields at the university remain narrowly focused on a single sector, giving limited attention to others. This siloed emphasis fosters narrow expertise, overlooking critical interconnections between sectors and industries. As graduates carry this mindset into their careers, it can further entrench this fragmented approach, ultimately leading to inefficient and unsustainable natural resources management.

[The water-energy-food-environment \(WEFE\) nexus](#) approach challenges this siloed thinking by underscoring the interdependence among these sectors. It shows that actions taken in isolation – without considering cross-sector linkages – can heighten trade-offs and erode sustainability. In contrast, the WEFE nexus approach advocates integrated, holistic resource management to enhance resource efficiency, minimize trade-offs, and promote synergies.

As climate change accelerates, the WEFE nexus approach becomes even more critical. It offers a comprehensive lens for analyzing and addressing the interconnected impacts of climate change on water, energy, food systems, and ecosystems. Since the approach intersects with multiple sectors, adopting and mainstreaming it into natural resources management is crucial for [advancing the SDGs](#), including SDG 5 on gender equality and SDG 10 on reduced inequalities.

Introducing a dedicated WEFE Nexus course across natural resource–related disciplines is therefore essential. It encourages students to transcend single-sector mindsets. It equips them with the skills and perspectives needed to analyze complex, interlinked challenges and design sustainable strategies that deliver multiple benefits. By fostering cross-sector understanding and collaboration, such a course will [prepare the next generation of professionals](#) for collaborative resource planning, policymaking, and real-world problem solving.

2. CGIAR's contribution

Recognizing this need, the CGIAR Initiative on NEXUS Gains partnered with the Center for Water Resources Studies (CWRS) at the [Institute of Engineering \(IoE\), Tribhuvan University](#), to develop a graduate-level academic course, alongside two other courses focused on the WEFE Nexus: a sensitization course for policymakers and a professional course for early- to mid-career professionals. Supported by the CGIAR's [Alliance of Biodiversity International, CIAT](#), and the [International Water Management Institute](#), the three courses aim to build the capacity of both current and future professionals working in natural resource sectors, enabling them to become WEFE nexus thinkers and practitioners.

3. Institutionalizing the WEFE nexus course in academic curricula

NEXUS Gains signed a formal agreement with CWRS in July 2022 to develop all three courses (Figure 1). During the course development process, a seven-member core team of thematic experts from the WEFE disciplines was formed to co-design the curriculum using participatory methods. The process began with a co-creation workshop that brought together academics and thematic experts to provide input to the course development team. Once the courses were drafted, further expert consultations were held to refine and strengthen the content. The finalized academic course was piloted with graduate students at the IoE in January 2024.

Timeline of the water-energy-food-ecosystems (WEFE) nexus course at Tribhuvan University

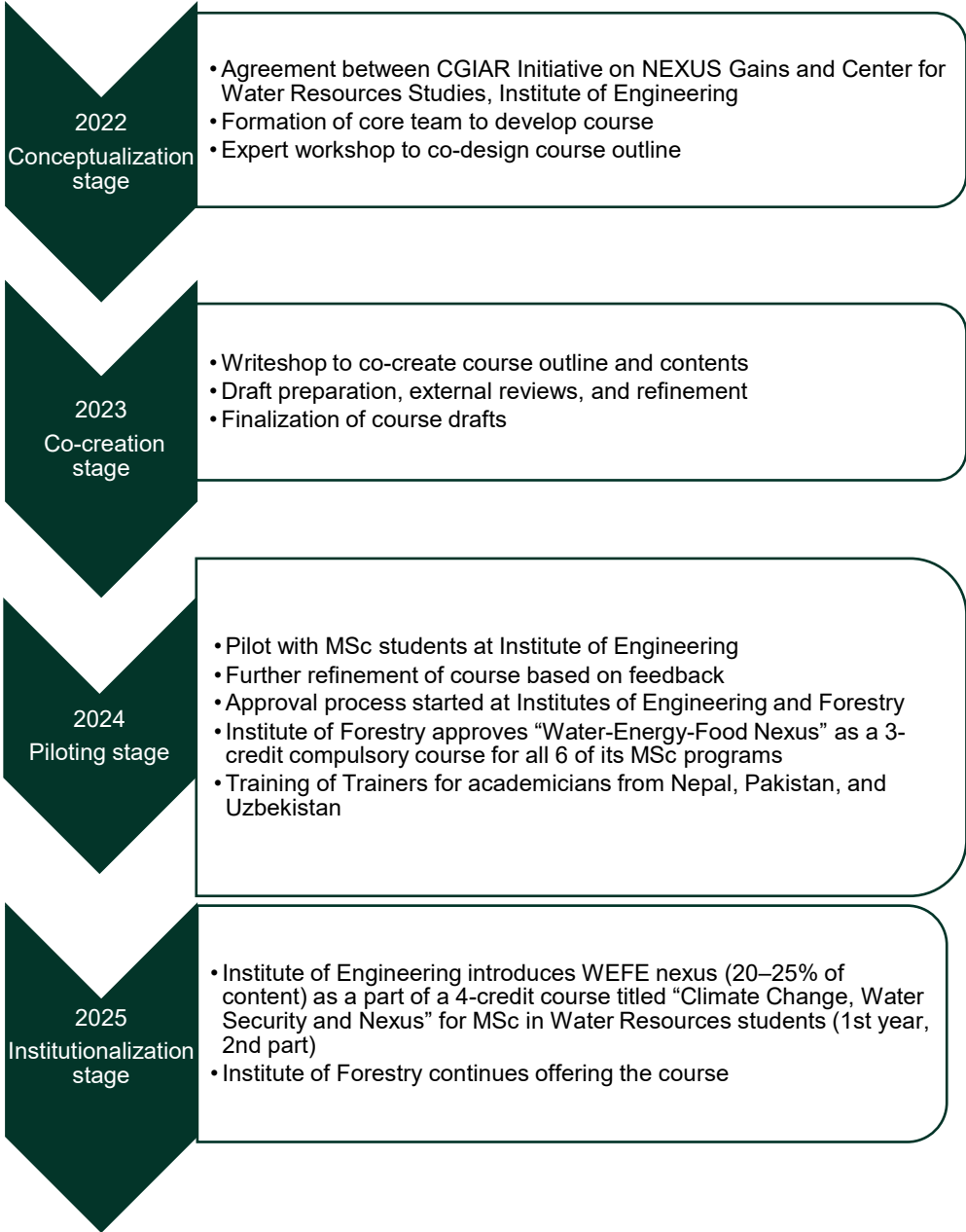


Figure 1. Students then provided detailed feedback on the content, delivery, and structure of the course modules. For instance, they stated:

“Climate change and water scarcity are burning issues that need to be addressed at present and in the future, and I hope that such a course will better position aspirants like us who seek career pathways in the water resources field.” [MSc Water Resources Engineering student, Institute of Engineering]

“The course is helpful 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.” [MSc Water Resources Engineering student, Institute of Engineering]

This feedback was again incorporated into the final version of the course. This subsequently, was adopted by the IoE in 2025, and was subsequently adopted by the IoE in 2025. Throughout the process, gender and social

inclusion specialists played a key role in ensuring a people-centric approach was integrated in the course. Right from the beginning, the IoE agreed to integrate the WEFE nexus as 20–25% of the content within a 4-credit course at the Institute. Accordingly, key decision-makers at the IoE were involved at various stages of course development to sensitize them to the significance of the course. After the WEFE nexus course was developed, the IoE revised an existing course in the MSc Water Resources Engineering Program, titled “Climate Change and Water Security”, as “Climate Change, Water Security and Nexus”, and this revision was approved by the Institute’s Subject Committee and Faculty Board. Subsequently, it was introduced in early 2025 after approval from the Tribhuvan University Academic Council. The final course focuses on 33% of its 60 hours on the WEFE nexus.

4. Spillover effect: Scaling out the WEFE nexus course to the Institute of Forestry

While developing the WEFE nexus course for the IoE, professors and experts from the Institute of Forestry (IoF) were also involved in the curriculum development process. Recognizing its value, as well as for forestry students, the IoF became interested in incorporating the course into its university curriculum, making it mandatory for all MSc students at the Institute. Accordingly, the IoF invited Prof. Vishnu Prasad Pandey, who led the drafting of the three courses, along with other professors, to prepare a full 3-credit course. The IoF course underwent revision to refine its content and preserve its essence, ultimately streamlining it to meet the academic requirements of IoF students. Entitled "Water-Energy-Food Nexus," the course received approval from the Academic Council of Tribhuvan University and has been offered since early 2024.

To further institutionalize the course implementation process, NEXUS Gains partnered with CWRS to organize a Training of Trainers program in Kathmandu from 9 to 10 April 2024. The program brought together 16 academicians from Nepal, Pakistan, and Uzbekistan to familiarize them with the course materials and share strategies for teaching WEFE concepts. The academicians also contributed to the course development, focusing on reinforcing core Nexus principles and applying pedagogical methods suited to diverse learning contexts.

5. Course highlights

The key contents of the WEFE nexus course offered at the IoE are summarized here.

Institute of Engineering course: Climate Change, Water Security and Nexus [60 hrs]

- 1. Climate system, climate variability/change and drivers [6 hrs]:** fundamentals of global climate system; climate change; interaction of climate components; drivers of climate change.
- 2. Detection, attribution, and projection of climate change [12 hrs]:** Climate change detection; attribution; climate models; future climate projection.
- 3. Climate change impact and risk assessment [12 hrs]:** Potential impacts of climate change across various sectors; methods/approach for impact assessment; climate risk assessment; uncertainties.
- 4. Understanding water security and WEFE nexus [12 hrs]:** Fundamentals of water security; measures of water security; trends in WEFE nexus resources; fundamentals of WEFE nexus.
- 5. Operationalizing and managing WEFE nexus [9 hrs]:** WEFE nexus assessment; case studies on nexus in practice; nexus decision support system; streamlining WEFE nexus as a common agenda.
- 6. Responding to climate risks and water insecurity [9 hrs]:** Frameworks for responding to climate change; climate change adaptation/mitigation; water security and nexus gain pathways; addressing bottlenecks for implementing inclusive solutions for WEFE nexus gains.

Similarly, the course offered at the IoF aims to build foundational knowledge of the WEFE Nexus within the context of climate change and natural resources management. The course combines theoretical lectures, field studies, and practical assignments, providing students with both conceptual understanding and much-needed hands-on experience.

Institute of Forestry course: Water-Energy-Food Nexus [45 hrs]

1. Understanding of nexus [6 hrs]: Stress in natural resources; system approach; WEFE nexus concept, principles, and entry points.

2. System interaction [6 hrs]: Water-energy; water-food, food-energy; interdependences and inter-linkages across multiple systems (e.g., water, energy, food, ecosystem/biodiversity): trade-off and synergies

3. Assessment tools [9 hrs]: Assessment process and information flow; various types of tools and data; scenario analysis and practical challenges.

4. Nexus in practice [6 hrs]: Dissecting nexus relationships in existing practices; case studies, risks, and costs to different social groups; policy and institutional reforms; gender equality, disability, and social inclusion (GEDSI) and indigenous knowledge.

5. Nexus future perspective [5 hrs]: Nexus governance; streamlining WEFE nexus as a common agenda; addressing bottlenecks for implementing inclusive solutions for WEFE nexus gains; monitoring, evaluation, accountability, and learning (MEAL) framework for nexus gains.

6. Supporting course delivery

The course materials developed under this Initiative are freely available through the [CGIAR NEXUS Gains Resource Repository](#), providing educators worldwide with open access.

7. Future directions

The integration of WEFE thinking into formal education marks a promising advancement—one that equips professionals to address complex sustainability challenges through collaborative, systems-based solutions.

1. **Strategic investment in research and tool development:** With limited financial resources, support from development partners and international research organizations is vital for Nepali universities. Stakeholders should invest in student- and faculty-led research projects to explore cases of WEFE operationalization in the Nepali context and develop context-specific tools and methods for such operationalization. Investments should also be made to examine and compile local and regional case studies to embed in the curriculum, making the content more relatable and practical for students.
2. **Capacity building of faculty and curriculum developers:** Although the course has been developed and is being adopted, some faculty members still lack conceptual clarity on WEFE tools. Organizing more Training of Trainers programs focused on WEFE principles and tools is therefore essential. Establishing peer-learning networks across universities would further enable the sharing of experiences and continuous improvement in teaching approaches.
3. **Student engagement and innovation:** Providing support to the students is essential for them to take forward WEFE nexus approaches. This can be achieved by providing seed funding for community-level research projects, facilitating internships and field placements with organizations implementing WEFE-related initiatives, and linking students to communities of practice on the WEFE approach to strengthen their professional networks and learning opportunities.



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Contact

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



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