




# Training young water professionals in leadership and transdisciplinary competencies for sustainable water management in India

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## Abstract

Young water professionals (YWPs) have a critical role in ensuring how water resources will be managed to contribute towards the 2030 Agenda for Sustainable Development. To address the challenges of climate change, population growth, and urbanization, YWPs require leadership skills, transdisciplinary competencies, technical knowledge, and practical experience. This article presents the India YWP training program, led by Western Sydney University and the Australia India Water Centre (AIWC), aimed at developing a cohort of skilled YWPs and nurturing the next generation of water leaders in support of India's water reform agenda and the National Water Mission. The program engaged 20 YWPs, consisting of an equal gender representation, selected by the Ministry of Jal Shakti from various water management agencies and departments across India. The 11-month training program was designed to be transformative and interactive, and it

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used an online platform comprising online lectures, mentoring, and project-based learning facilitated by the AIWC team. The training methodology focused on engaged learning, incorporating online workshops, Situation Understanding and Improvement Projects (SUIPs), online group discussions, and mentoring. The SUIPs provided a platform for YWPs to work in pairs, receiving guidance from AIWC members, enabling them to develop practical skills and knowledge in real-world contexts. The program effectively enhanced participants' capacities in project planning, design, implementation, and management, while fostering critical thinking and problem-solving skills by adopting transdisciplinary approaches. Furthermore, participants demonstrated improved leadership, project management, time management, and communication skills. The training helped YWPs to equip them with a holistic perspective and stakeholder-focused mindset to address diverse water challenges from a holistic and long-term standpoint.

**KEYWORDS**

Australia-India Water Centre, leadership development, training, transdisciplinary ap, water management, young water professionals

## 1 | INTRODUCTION

India faces severe water challenges, with demand expected to increase substantially by 2030 (Kumar et al., 2022) unless major water management initiatives are undertaken. With the rapid growth of India's population coupled with changing climate scenarios, surface and ground water resources will face continued challenges. The increasing water demand is already impacting drinking water supplies and water for agriculture. Climate change is likely to exacerbate the water scarcity problem with increased instances of droughts and floods.

Water quality degradation is another major challenge due to the pollution from industry, agriculture, and urban development. It will impact the livelihood of communities and the livability of towns and cities. There will be challenges in maintaining and upgrading water infrastructures in both urban and rural areas to cope with water shortages, flooding, and other water-related disasters. Water scarcity can potentially increase competition for water access and cause conflicts between states and regions and even with neighboring countries (Joy et al., 2020; Kalair et al., 2019). These challenges highlight that water management is no longer

a technical task but has social, environmental, economic, policy, governance, political, and cultural dimensions. Hence, these challenges mean there is a need for transdisciplinary thinking and appropriate competencies and skills for water professionals to tackle future water challenges. The main principles of transdisciplinary thinking require starting with a socially relevant problem, collaboration, and participation between academic disciplines and diverse stakeholders, including community, government and non-government sectors, and the contribution to substantial knowledge about the issue (practical experience, scientific models, and results) and approaches (e.g., action research).

Transdisciplinary thinking goes beyond other approaches (multi-disciplinary or interdisciplinary) to problem-solving. Transdisciplinary thinking involves integrating knowledge and methods from multiple disciplines, but we also aim to transcend our disciplinary boundaries altogether. The focus is to create a holistic understanding of complex problems by engaging stakeholders from various sectors, including academia, industry, government, and civil society. The goal is to generate new knowledge and develop innovative solutions that address real-world issues by considering multiple perspectives and dimensions, such as social, cultural, environmental, policy, and ethical factors. By its very nature, transdisciplinary thinking and approaches often require a high level of collaboration, cooperation, and co-creation of ideas and knowledge by stakeholders throughout the entire research or problem-solving process. (Camkin & Neto, 2013; Ghodsvali et al., 2019; Icyimpaye et al., 2022; Mejía et al., 2023; Pohl & Hirsch Hadorn, 2007; Studer & Pohl, 2023).

The training of water professionals in the past has mainly been dominated by the old paradigms of engineering-based interventions to water issues and challenges. However, to tackle the complex water problems of the 21st century, YWPs need to be problem solvers, critical thinkers, effective communicators, and agents of change and consider multiple objectives, such as social, environmental, and economic objectives (Dehnavi & Al-Saidi, 2020; Lieblein et al., 2008; Nienaber & Jacobs, 2010; Maheshwari et al., 2014; Goedecke, 2015; Arora et al., 2015). One of the major benefits of the transdisciplinary approach is that it provides a platform for innovation and new concepts for transformation and change. Transdisciplinary thinking and practices can help the YWPs, who have qualifications and experience in a technical area, to think more broadly about a complex situation. Further, the approach can help develop new knowledge, skills, and thinking styles in YWPs to meet the world's increasingly complex water-related challenges (Camkin & Neto, 2013; Icyimpaye et al., 2022).

## 2 | WHY TRAIN YOUNG WATER PROFESSIONALS?

A large percentage of India's current population is young, having almost two thirds of its population in the working-age bracket of 15–59 years. Globally, about 40% of the population is under 25 years of age (Ioannidis, 2020). However, in the case of India, more than 50% of India's population (>500 million) is below 25 years (Senapati et al., 2022). The water challenges mentioned earlier and demographic characteristics suggest that investment in the next generation of water managers and leaders will be critical. Well-designed training and capacity-building programs can equip young water professionals to tackle water issues and challenges innovatively and effectively. Additionally, if trained in leadership and transdisciplinary approaches, YWPs can bring the much needed change in the workplace to tackle new and intractable water challenges of the 21st century and motivate and excite the next generation of water professionals to pursue the path of sustainable water management.

The YWPs have a critical role in ensuring the sustainable management of water resources for sustainable future development. For this to happen, YWPs will need appropriate leadership and transdisciplinary competencies, technical knowledge, discipline-based skills, and real-world experiences to meet the future challenges of a changing climate, population growth, and urbanization (Maheshwari, 2023). As the water sector evolves with new management challenges, preparing YWPs who know “what to do” and “how to lead and bring sustainable change” is crucial. An innovative YWP training can ensure that new knowledge and best practices are effectively passed on to the next generation of water professionals. A well-designed training can help encourage innovation, fresh perspectives, and innovative ideas for the water sector and support the development of sustainable water management solutions. Therefore, it will be critical to provide appropriate training to today’s YWPs as future water leaders and managers of the country (Cotton, 2021; Etgen et al., 2021; Goldman, 2021; Maheshwari et al., 2020).

### **3 | THE INDIA YOUNG WATER PROFESSIONALS (YWP) TRAINING PROGRAM**

The India Young Water Professionals training program was funded by the Australian Water Partnership (AWP), the Government of Australia, and supported by the Ministry of Jal Shakti and the National Hydrology Program, India. The program commenced in December 2021, during the COVID-19 pandemic, when travel restrictions were in place. Western Sydney University led the program for the Australia India Water Centre (AIWC, [www.aiwc.org.au](http://www.aiwc.org.au)). A total of 20 YWPs, 10 women and 10 men under 35 years of age working in government agencies across India, were selected by the Ministry of Jal Shakti for this training. The training program was online by necessity and designed to encourage interactive learning with an emphasis on “learning by doing.”

For this reason, the training had approximately 20% of the time commitment to online lectures, 20% to mentoring, and 60% to project-based learning supported by the bilateral AIWC teaching and learning team. Delivery of the course was through a range of modes with a focus on engaged learning: (i) online workshops, (ii) Situation Understanding and Improvement Project (SUIP), (iii) online group discussion and facilitation, and (iv) mentoring. This program aimed to build a group of trained young water professionals and the next generation of water leaders to support the water reform agenda and the National Water Mission of the Government of India.

### **4 | SITUATION UNDERSTANDING AND IMPROVEMENT PROJECTS**

The SUIP was the training program’s engine room. The YWPs devoted a significant part of their effort and time commitment (up to 60%) to developing their competencies and leadership qualities suitable for future tasks and workplace needs. Participants worked on a group project (two persons per group) over 10 months. They selected a SUIP topic relevant to the Ministry of Jal Shakti, the National Hydrology Project or their workplace. The SUIP provided a real-world experience and a platform to understand and develop solutions for a complex water management situation. Each project proposal was vetted for quality and feasibility, and each SUIP had a client interested in the SUIP and who could implement the project findings. Each SUIP also

had two academic supervisors, one from Australia and the other from India, with regular formal and informal meeting arrangements. The competency and leadership development through SUIP was supported through regular online workshops on relevant topics, coaching, mentoring, and some hands-on activities.

The YWP program was designed to develop transdisciplinary and systemic thinkers capable of identifying and improving a problematic situation. Transdisciplinary thinking involves thinking across disciplines by taking a broader understanding. The framework that helped the YWPs develop transdisciplinary thinking was the INSPECT—Investigate a situation's Natural, Social, Political, Economic, Cultural, and Technological perspectives (Bawden & Packham, 1993). Using the INSPECT model as an inquiry framework, YWPs were inspired to think about their SUIP from multiple dimensions of sustainability. This multi-perspective approach of the INSPECT was an integral part of the SUIP.

## 5 | DEVELOPMENT OF ONLINE E-LEARNING RESOURCES

A dedicated online learning portal using OpenLearning (<https://www.openlearning.com/>) was developed and offered the YWPs access to reading materials, videos, and presentations. It was continuously updated and used by the YWPs to access recorded lectures, workshops, and meetings. Other resources on the web portal included additional required reading materials, videos, website links, and optional reading lists. Another dimension of the web portal was the ability for the YWPs to share their resources and provide comments and further information directly to the website. A module with papers and guidelines was made available to help develop their personal brand and portfolio and communicate that to the outside world through social and business networks. The purpose of the portfolio of the YWPs was to demonstrate their strengths and professional development and use it for their career advancement.

Sections on the OpenLearning Platform included Transdisciplinary Approaches to Water; SUIP; Professional Development; Your Personal Brand and Portfolio; Water and Society; Review Workshops; and Miro Board Discussion Topics. A YouTube channel was specially developed for this YWP training program, and the recorded videos were made available. Some examples of topics covered in training and made available on the platform are given in Figure 1.

## 6 | DELIVERY OF ONLINE WORKSHOPS

A total of 32 workshops were delivered across the YWP program. Each workshop included two 1-h sessions, with one speaker presenting on a specific topic. The content of each workshop was designed to offer YWPs both technical and diverse theoretical information. It offered insights into recent and current research in Australia and India. The speakers provided links to resources and tools that can be applied to the SUIP or their work situations. Workshops also covered information on professional leadership, transdisciplinary approaches, developing SUIP and working with a client, and technical topics related to sustainable water resources management.

Workshop videos were made available on the OpenLearning platform, and workshops resulted in 60 h of training videos. Based on the feedback from the YWPs, the interactive approach used in the workshop presentations worked very well. The workshops topics included



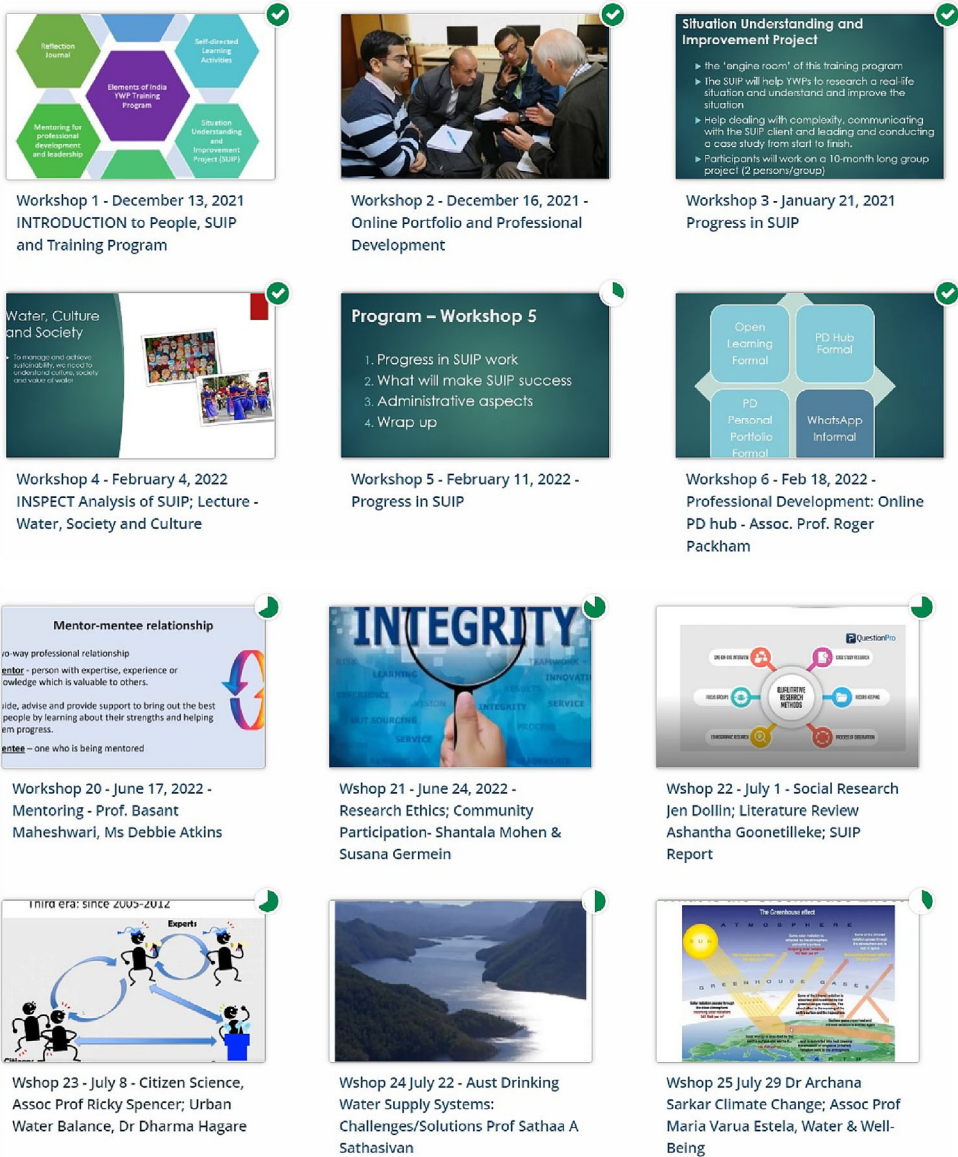


FIGURE 1 Screenshots of the OpenLearning platform developed for the YWP training

wastewater treatment; theories and processes for working on situations using a transdisciplinary approach; models for using recycled water and case studies; groundwater modeling and mapping; urban water challenges, barriers, approaches and opportunities; benefits and challenges of integrated urban/peri-urban water management; identifying scalable and sustainable responses in agriculture and food security; managing stormwater for water security; navigating science-policy boundaries; water, agriculture and food nexus; drinking water supply systems—challenges and solutions; climate change; and World’s Water Footprint—challenges and opportunities.

In addition to covering technical topics, workshop sessions also covered human research ethics, which guided the YWPs on working with communities and gathering information for

SUIPs; citizen science theories, models, and guidelines; social research tools and methods; connecting with communities—engagement and participation; water; and well-being. These workshops supported the YWP's use of transdisciplinary approaches that can be used in the SUIP and their work projects.

## 7 | MENTORING AND SUPERVISION OF YWPS

Monthly mentoring and supervision meetings were run during this training program to facilitate the learning and development of the participants to design and lead future water projects in their workplaces and career development. Mentors and project supervisors were assigned to each SUIP project group, consisting of two trainees per SUIP, to support YWPs' learning and development. A total of 20 mentors (10 each from Australia and India) and 20 supervisors (10 each from Australia and India) were recruited. Both mentors and supervisors are recruited from within members of AIWC partners and their network and have substantial water industry experience as mentors and research and development experience as supervisors.

The role of a mentor was to offer support and guidance to the YWP in their current work role and be someone through whom the YWP can explore professional challenges and opportunities. The mentor was a source of wisdom by sharing experiences and providing feedback and advice. The role of a supervisor was to guide the participants through the project by regularly reviewing their progress and providing advice on planned activities. This support also involved providing information and feedback and referring them to relevant literature and resource people. During the training program, one session was dedicated to mentors sharing wisdom about their career development and insight into managing challenges and working with people. Similarly, one session included supervisors discussing water careers and project management advice.

## 8 | FACILITATING YWPS IN THE CONDUCT OF THE SUIP

The YWPs' project-based learning was supported through monthly 2-h meetings called SUIP clinics, in which YWPs shared their progress and discussed achievements and challenges. The first hour allowed for a whole YWP group discussion where broader content applicable to all YWP was delivered, and the second hour was where the individual YWP project teams met in separate breakout rooms to talk in detail about the specific projects and get direct feedback from their assigned SUIP supervisors. YWPs delivered regular project updates, and SUIP supervisors offered helpful advice and support. In between these formal meeting arrangements, YWPs would undertake specific on-ground project work, undertake site visits, and meet with clients and stakeholders to discuss the project directions (Figure 2). As part of this process, YWPs produced literature reviews and prepared proposals for future fieldwork, which were evaluated by SUIP supervisors with feedback provided. In preparation for socio-economic data collection for their SUIP, YWPs were guided to prepare and submit a Human Ethics application for approval by the Human Ethics Committee of Western Sydney University.

Following the commencement of the fieldwork component, progress updates by YWPs in their SUIPs were supported through a series of online workshops on relevant topics, coaching by supervisors and some hands-on activities. YWPs gave an update on their project by outlining their progress and future planned activities. They also talked about challenges and achievements. The clinics provided an opportunity to listen to other SUIP projects and get feedback



**FIGURE 2** YWPs in action—collecting data and discussing the SUIP with their client (photo credit: Dr Alok Kumar Meher, Udeshya Kumar and Prachi Gupta)

from other YWPs and supervisors. The clinics also allowed YWPs to see how other project groups were progressing and benchmark against fellow YWPs, which served as a motivator in progressing their SUIP investigations.

## 9 | SKILLS AND COMPETENCIES OUTCOMES THROUGH THE SUIP

The SUIP helped YWPs research real-world situations and understand and improve the situation while internalizing water management concepts and approaches, dealing with complexities, communicating with the SUIP client, and leading and conducting a case study from start to finish. In completing the SUIP, participants developed the confidence to work on a project independently and acquired skills and competencies in critical thinking, communicating, researching, leading, and project management. The transdisciplinary approach and multi-perspective analysis used in the SUIP improved understanding of the wider issues of YWPs chosen topic, which importantly included gender, equity, diversity, and social inclusion (GEDSI) aspects. This INSPECT analysis then helped YWPs to develop holistic and realistic options and strategies for implementation by the client. Peer-to-peer learning also occurred during the SUIPs and was an important support network and benchmarking between YWPs. A critical outcome of this activity has been YWP's increased grasp of the transdisciplinary approach and its



ability to design projects for practical outcomes. Overall, the SUIP helped transform YWPs as transdisciplinary water professionals, future water leaders, and life-long learners.

The SUIP also helped YWPs realize that the water issues and the intensity of the problems were different for everyone. Spending time with people affected by water quality and its reduced availability gave them an appreciation of the critical need for an integrated and holistic approach to water management. A comment from a YWP below illustrates how it is not just technical information required to achieve sustainable water management but knowledge of the situation from a range of perspectives.

When I met my client during a field visit, I realised that the scale of the problem differed for different sections of society.

Many of the YWPs referred to the INSPECT approach as vital in shifting their thinking when they talked about their SUIP. The quote below illustrates the insight YWPs gained from taking a transdisciplinary approach to adapt from a technical focus to holistic thinking about the problematic situation.

When I interacted with villagers, they had different perspectives on the solution. I came to the village with what I thought was the technical solution, and once I understood their needs, I realised a different solution that was more aligned with their needs. It was a better option for them. Also, the solution was more cost-effective.

Transdisciplinary thinking and learning is not a replacement for established disciplinary practices but a complementary approach that supplements disciplinary viewpoints with new knowledge practices.

Involvement in the SUIP helped YWPs to develop confidence and skills in communication, project management and working with stakeholders (clients, farmers, and villagers). Several YWPs commented that working with people on the ground who were experiencing a water issue helped them to appreciate and understand the importance of developing feasible and practical strategies. The field visits enabled them to get a better picture of the situation.

At the end of the 10-month training, the Water Conclave in Delhi culminated the SUIP work and the training program (Figures 3 and 4). The YWPs reflected on their learning experience and development over 10 months. The Conclave included a review of the program to inform future programs. All YWPs gave short presentations of their SUIP, including actions and recommendations for their SUIP client. Since the training was virtual before the Conclave, YWPs could meet in person at the Conclave with the other YWPs, supervisors, and mentors and develop future networks and collaborations. A ceremony was held where they received certificates of training completion in the presence of officials from the Ministry of Jal Shakti, dignitaries and program sponsors.

## 10 | EVALUATING THE YWPS' LEARNING AND DEVELOPMENT JOURNEY

As this training program was about transdisciplinary competencies, we focused on “outside the technical knowledge box” learnings in the evaluation. We explored how YWPs had developed as critical, systemic, and transdisciplinary thinkers to lead sustainable water management



**FIGURE 3** One of the YWPs receiving the training certificate at the Water Conclave

practices in their workplace. The evaluation was based on six indicators listed in Figure 5, and evidence for these indicators was collected in the Water Conclave in New Delhi.

To better evaluate the potential learning outcomes, we collected qualitative and quantitative information complemented by narratives that capture “lessons learnt” and suggested changes to the project. The key evaluation performance questions aligned with the theory of change (Taplin & Clark, 2022). Detailed feedback from YWPs is summarized below under different areas of their development during this training program.

## 10.1 | Technical and professional development

The YWPs, through this training, were able to develop technical skills in several aspects of water management relevant to their future work. The key areas in which they strengthened their technical capacity included equity in water access, urban wastewater management, water governance, groundwater modeling, development of coastal reservoirs for water security, and wastewater treatment techniques. Other topics included managed aquifer recharge, participatory water management, and stakeholder engagement in water projects.

## 10.2 | Situation Understanding and Improvement Project

The SUIP was one of the key learning activities in this training. It helped YWPs strengthen their skills in



FIGURE 4 Two YWPs are presenting their SUIP work at the Water Conclave

- transdisciplinary approaches,
- leadership,
- problem-solving and critical thinking,
- project management,
- effective communication with a range of stakeholders and groups, and
- systemic thinking.

The YWPs found SUIP very engaging in the training program, which helped them to contextualize the theory. One YWP mentioned, “the SUIP was very interesting as it provided me with a greater understanding of the complexity of the water problem.” They learnt how to engage stakeholders, bring different perspectives together, and find a pathway to improve a problematic situation. The SUIP helped them have an open mind about problematic situations and possible pathways to improve the client’s situation. It helped them to learn that leadership is about enabling a process of bringing positive and sustainable change.

### 10.3 | Developing professional practice

The YWP training program strengthened YWPs’ professional practice of sustainable water management in several ways. The training helped the YWP realize the need for analyzing a complex problem using transdisciplinary and systemic approaches. The INSPECT analysis was a valuable framework for understanding the key aspects of the problematic situation and situation

improvement. Using such approaches changed their project vision and helped them see people's perspectives at the grassroots level. The training helped them realize the importance of involving stakeholders in understanding the problem and working towards improved water management practices. The training has also improved their skills in formulating project ideas, managing project tasks, maintaining professional ethics, keeping a work-life balance, and leading projects from start to completion. By working with clients and other stakeholders, the training improved their confidence to communicate with different stakeholders and their ability to manage conflicts in project work situations.

The training facilitated YWPs to recognize their professional strengths and future capacity-building needs through developing a professional portfolio. In particular, the training helped them to understand the importance of professional networking and the value of interaction with professionals in their work for lifelong learning and career advancement. Specific workshops during the training program helped them to understand their strengths and weaknesses and identify specific needs for ongoing skills development and training.

The training program strengthened YWPs' workplace critical thinking and problem-solving skills. It provided the YWPs with opportunities to develop skills for "out of the box thinking," and they learnt that understanding cultural and societal perspectives is critical in achieving sustainable water management. This thinking meant they transitioned from a technical focus on solving a problem to thinking holistically and systemically to improve a problematic situation. Through this training, a significant developmental change in YWPs was transitioning from a technical approach to a transdisciplinary approach to water management.

## 11 | CONCLUDING REMARKS

Water challenges are now multi-dimensional and require innovative approaches to achieve sustainable solutions. The YWPs will have a critical role in tackling future water challenges. However, they need appropriate leadership and transdisciplinary competencies, technical knowledge, skills, and experience to meet the future challenges of a changing climate, population growth, and urbanization. The YWP training program was conducted over 11 months and was successful and impactful. It was a piloting of a unique training program that focused on the following key competencies to help build leadership and effective water professionals for their future workplace: (i) problem-solving, (ii) transdisciplinary and systemic thinking, and (iii) effective communication.

The SUIP provided YWPs with opportunities to work with a client, learning how to learn and solve real-world problems. A detailed review of the program indicated that the training program has been very effective and unique. SUIP also helped reinforce the concept of a transdisciplinary approach while dealing with complex water issues. Based on the review and the feedback from the YWPs, mentors, SUIP supervisors, and the Ministry of Jal Shakti, it is recommended that the future training program can be of 14-week duration with details as follows:

- i. in-person workshop in India during Week 1;
- ii. online workshops, supervision, mentoring, and SUIP work during Weeks 2–11; and
- iii. advanced in-person training in Australia during Weeks 12–14.

The experience from the training highlighted that online interactive workshops for the training are effective but in-person training is also critical for effective program delivery.



FIGURE 5 Indicators for the monitoring and evaluation of the YWP Training Program

Therefore, a hybrid training program combining in-person and online training can be more cost-effective and appropriate for achieving desired outcomes. The ongoing support through a dedicated training facilitator, an effective online training portal, and the provision of learning resources was critical for the success of the YWP training program. The continued evolution of program design and commitment from supervisory members and participants made the YWP successful. Transdisciplinary competencies and their practical application to the real-world will surely see continued success as India embraces the challenges of sustainable development, livelihood, and well-being of communities.

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