# Overview and lessons learnt from open course material

## Deliverable D6.1

Final (Public)

WP6 PAVITRA GANGA Technology and Learning Network

Task 6.1 *Setting up specific workshops* and Task 6.2 *Developing open course material*

Lead beneficiary: IHE Delft

Authors: Saroj Sharma (IHE Delft), Paul Campling (VITO), Niko D'hont (VITO)……

| | |
|---|---|
| Approved by WP Manager | Saroj Sharma |
| Date of approval | 31/01/2024 |
| Approved by Project Coordinator | Paul Campling |
| Date of approval | 31/01/2024 |
| Due date of deliverable | 31/01/2024 |
| Actual submission date | 05/02/2024 |

| | |
|---|---|
| Project number (EU) | 821051 (H2020-SC5-2018) |
| Project number (India) | BT/IN/EU-WR/39/AJ/2018 |
| Project coordinator | Paul Campling, VITO |
| Scientific coordinator | Anshuman, TERI |
| Project website | https://www.pavitra-ganga.eu/en |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

| Dissemination level | | |
|---|---|---|
| PU | Public | **X** |
| CO | Confidential, restricted under conditions set out in Model Grant Agreement | |
| CI | Classified information as referred to in Commission Decision 2001/844/EC) | |
| **Deliverable type** | | |
| R | Document, report | **X** |
| DEM | Demonstrator, pilot, prototype | |
| DEC | Web sites, patent fillings, videos, etc. | |
| OTHER | Software, technical diagram, etc. | |
| ETHICS | ETHICS | |

| History | | | |
|---|---|---|---|
| Version | Date | Reason | Revised by |
| 0.1 | 09.01.2024 | First draft | Saroj Sharma |
| 0.2 | 31.01.2024 | Final | Paul Campling |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# SUMMARY

The objective of Work Package 6 "PAVITRA GANGA Technology and Learning Network" was to organize workshops, in joint cooperation with the relevant WPs of the project and other on-going initiatives in India. The main aim was to train the stakeholders in India and to share information, tools, techniques, and technologies developed in the project through workshop and developing open course materials based on the workshop to make them available for the wider audience. This report summarizes different activities carried out in the project under WP6 and the key lessons learnt.

In Task 6.1, "Setting up specific workshops", six specific workshops were organized each focusing on one or more of the three pillars of the project namely (i) wastewater treatment and resource recovery, (ii) water governance, and (iii) smart water management. The purpose of these workshops was to inform and train the stakeholders on different techniques and tools developed during the project and ultimately contribute to capacity building on wastewater treatment and reuse in India. In Task 6.2 "Developing open course material", the selected materials presented during 6 different workshops were restructured and put in the suitable form as an online learning open course material and made available to the public at PAVITRA GANGA project website. Each of these open course materials consists of collection of workshop presentations and videos, exercises for practice which can be downloaded from the project website as well as reference for the additional reading materials on the key topics covered. It is expected that this open course materials will help to disseminate the techniques and tools developed during PAVITRA GANGA project to the wider audience for the longer term (beyond the project period).

Key lessons from the workshops is that integrated wastewater management is key to sustainable development for which proper wastewater treatment aiming at resource recovery and water reuse is an essential element. In addition, policy and guiding frameworks need to establish detailed guidance on wastewater and sewage sludge treatment and reuse technologies (fit-for purpose treatment). This means that with a robust implementation framework involving the last mile connectivity of solutions will help in better upscaling and optimization.

Normally capacity building is not a component of research and innovation projects, but we believe this aspect was an important part of the dissemination process as it gave the opportunity to move beyond the more traditional approaches of dissemination (videos, brochures, websites etc…) and engage properly with water practitioners, stakeholders, academics and students.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# TABLE OF CONTENTS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# LIST OF FIGURES



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# LIST OF TABLES



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# CHAPTER 1 INTRODUCTION

The objective of Work Package 6 "PAVITRA GANGA Technology and Learning Network" was to organize workshops and develop open course materials, in joint cooperation with the relevant WPs of the PAVITRA GANGA project and other on-going initiatives in India. The main aim was to train the stakeholders in India and to share information, tools, techniques, and technologies developed in the project through workshop and developing open course materials based on the workshops to make them available for the wider audience. The specific objectives and two main tasks of this work package were:

- Task 1: Setting up specific workshops;
- Task 2: Developing open course materials.

Table 1 lists the six specific workshops as outlined in the project proposal, the related project key areas as well as the lead and contributor partners for each workshop.

*Table 1: Overview of six specific workshops*

| No. | Workshop name | Related project pillar theme | Lead partner | Contributing partners |
|---|---|---|---|---|
| 1 | Water Management Decision Support Systems | Smart Water Management | IRAP | VITO, CNR-IRSA |
| 2 | Safety Planning for Wastewater Reuse | Water Governance | IHE Delft & FHNW | TERI |
| 3 | Benchmarking Water Quality and Quantity and Use of Mobile Monitoring Solutions | Smart Water Management | AKVO | VITO, IRAP |
| 4 | MCD Models to Support Regional Water Management | Water Governance; Smart Water Management | TU Delft | IHE Delft, TERI |
| 5 | Innovative Technologies for Wastewater Treatment and Reuse/Recovery | Wastewater treatment and resource recovery | IHE Delft | IIT Delhi, IIT Kanpur, CNR-IRSA, TUD, VITO, FHNW, HBO |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

| | | | | |
|---|---|---|---|---|
| 6 | Indian Wastewater: Challenges and Solutions | Wastewater treatment and resource recovery; Water Governance, Smart Water Management | TERI & VITO | IIT Delhi, IIT Kanpur, HBO, TU Delft, CNR-IRSA, FHNW |

Based on the materials presented during different workshops, six open course materials were prepared and made available on the PAVITRA GANGA website. The open course material includes learners' schedule, learning objectives; presentations and videos of different topics covered in related workshop, some exercises for practice as well as references to additional reading materials on subjects covered. These open course materials can be accessed and downloaded from the PAVITRA GANGA project website after registration (https://pavitra-ganga.eu/en/pavitra-ganga-open-course-network).

To promote capacity building aspects of Pavitra Ganga we organised on 7 June 2023 a webinar with the six other EU-India Water Projects entitled "Capacity Building Actions to promote sustainable wastewater treatment and drinking water management in India". The webinar was an EU Green Week Partner Event and brought an overview of the capacity building actions from all involved projects. The recording of the webinar and the presentations slides of the webinar can be found on the Pavitra Ganga website:

https://pavitra-ganga.eu/en/joint-eu-india-water-projects-webinar-focuses-capacity-building

The report presents an overview of different thematic workshops conducted during PAVITRA GANGA project (in Chapter 2) as well as open course materials developed (in Chapter 3). Furthermore, the key lessons learnt from these workshops and open course materials are summarized in Chapter 4. The detailed schedule/programme of each workshop has been included in the Appendices.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# CHAPTER 2 OVERVIEW OF PAVITRA GANGA WORKSHOPS

## WORKSHOP 1: WATER MANAGEMENT DECISION SUPPORT SYSTEMS

The objective of this workshop was to demonstrate to participants the added value of modelling and monitoring tools to improve knowledge, understanding and information about water resources management, wastewater treatment and resource recovery at the urban and regional scale. Table 2 presents an overview of the key features of the workshop whereas detailed programme of the workshop is included in Appendix A1.

*Table 2: Overview of Workshop on Water Management Decision Support Systems*

| Workshop Name | Water Management Decision Support System |
|---|---|
| Lead Partner + Contact person for workshop | Dinesh Kumar (IRAP) and Paul Campling (VITO) |
| Contributing partners | CNR-IRSA, TERI |
| Key topics covered | - Setting up of the WEAP modelling protocol for urban and regional applications in India<br>- Use of scenarios to explore the impact of different management and mitigation strategies – example cases, Kanpur and New Delhi<br>- Other Applications of WEAP Model (Mahanadi, Sabarmati river basin, tank cascades in Sri Lanka, and the modelling outcomes),<br>- Challenges in Using Decision Support Tools in Water Management<br>- Use of sensors and dashboarding for water quality management in India and Europe |
| Mode of Delivery and Duration | Face to Face; 8 hours |
| Date and Venue | 22 Jan 2024 at India Habitat Centre, New Delhi (India) |
| Number of participants | 33 people |
| Website Report | https://pavitra-ganga.eu/en/workshop-unravels-practical-use-decision-support-tools-smart-water-management |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

*Figure 1: Photograph of Workshop 1 on Water Management Decision Support system*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

### WORKSHOP 2: SAFETY PLANNING FOR WASTEWATER REUSE

The objective of this workshop was to actively engage stakeholders in the development of the wastewater and water reuse safety plans by a) describing the basic principles of safe water reuse and fit-for-purpose wastewater treatment, and b) developing all the steps of the safety plan for the selected case study locations. Table 3 presents an overview of the key features of the workshop whereas detailed programme of the workshop is included in Appendix A2.

*Table 3: Overview of Workshop on Wastewater Safety Planning*

| Workshop Name | Wastewater Safety Planning |
|---|---|
| Lead Partner + Contact person for workshop | Claire Furlong (IHE Delft), Lena Breitenmoser (FHNW) |
| Contributing partners | TERI |
| Key topics covered | - Occupational health and safety associated to reuse of treated and untreated wastewater;<br>- Water reuse safety planning for agricultural and industrial reuse;<br>- Use of technology-based wastewater safety plans |
| Mode of Delivery and Duration | Face to Face; 3 hours |
| Date and Venue Duration (in days) | 15 Jan 2023 at ITC Grand Chola, Chennai (India) as a part of 13th IWA International Conference on Water Reclamation and Reuse (15th – 19th January 2023) |
| Number of participants | 20 people |
| Website Report | https://pavitra-ganga.eu/en/highly-appreciated-workshop-wastewater-safety-planning-iwa-conference-chennai |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.


*Figure 2: Photograph of Workshop 2 on Wastewater Safety Planning*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

## WORKSHOP 3: BENCHMARKING WATER QUALITY AND QUANTITY AND USE OF MOBILE MONITORING SOLUTIONS

The objective of the workshop was to illustrate how citizens can seamlessly integrate into the data-to-decision making process, highlighting the pivotal role digital tools play in this transformation. When citizens actively engage in data collection and monitoring efforts, they transform from passive recipients of development initiatives into empowered stakeholders and catalysts for change. Water quality monitoring was the focus of the digital tools and we collaborated with the Water Quality Network (INREM Foundation) to deliver this webinar. Table 4 presents an overview of the key features of the workshop whereas detailed programme of the workshop is included in Appendix A3.

*Table 4: Overview of Workshop on Benchmarking Water Quality and Mobile Monitoring Solutions*

| **Workshop Name** | **Benchmarking water quality and quantity and use of mobile monitoring solutions** |
|---|---|
| Lead Partner + Contact person for workshop | Isha Parihar (AKVO) |
| Contributing partners | VITO |
| Key topics covered | - How citizen participation can complement traditional monitoring methods<br>- Common challenges and best practices for data use in citizen science projects<br>- The key steps for designing and implementing a citizen monitoring system<br>- Examples and lessons learned from citizen science projects around the world |
| Mode of Delivery and Duration | Webinar; 1.5 hours |
| Date and Venue | 18 January 2024 |
| Number of participants | 214 registered participants |
| Website report | https://pavitra-ganga.eu/en/online-workshop-presents-citizen-led-water-quality-monitoring |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

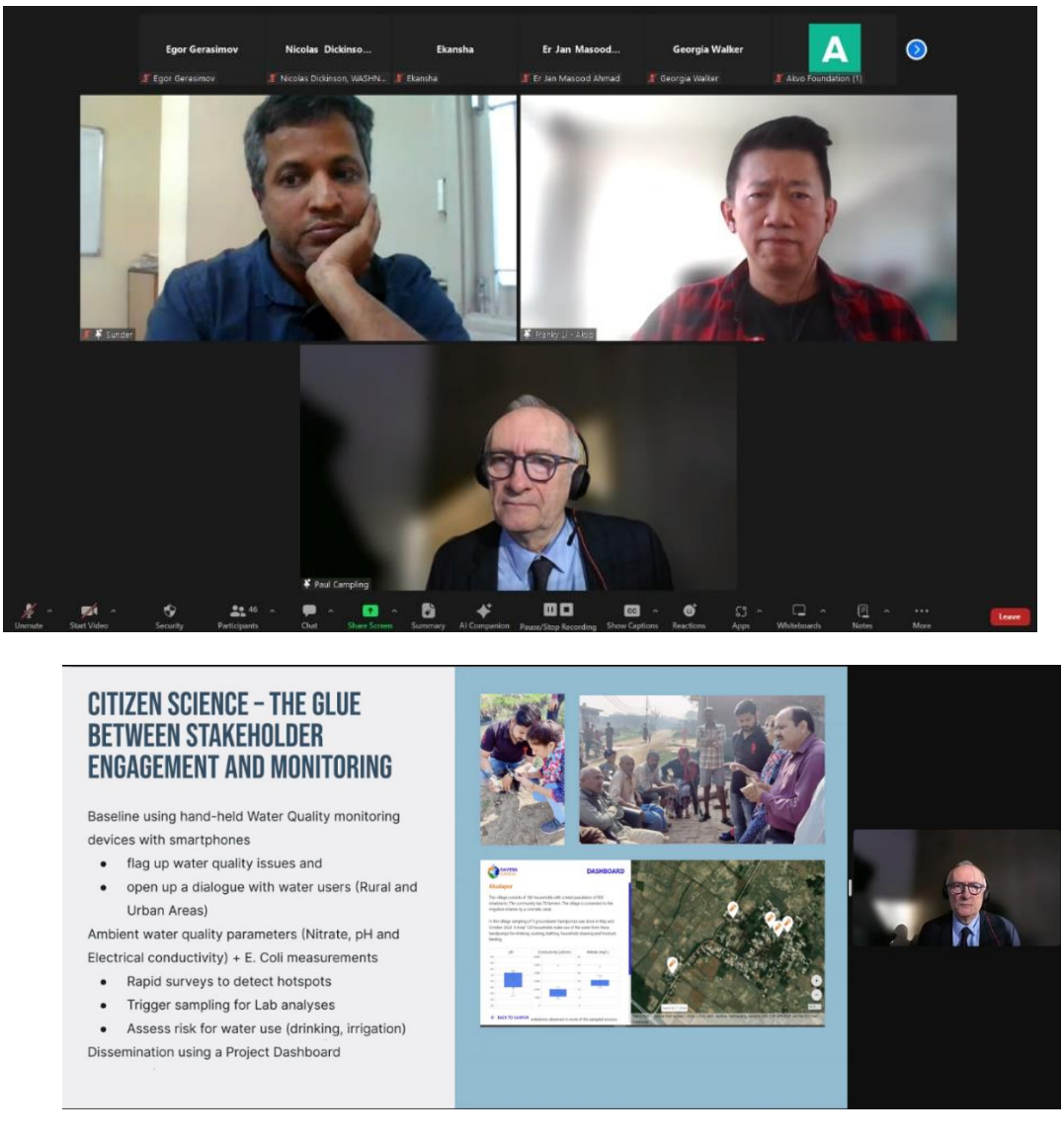



*Figure 3: Photographs of Workshop 3 on Benchmarking Water Quality and Use of Mobile Monitoring Solutions*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

### WORKSHOP 4: MCD MODELS TO SUPPORT REGIONAL WATER MANAGEMENT

The objective of this workshop was to familiarize and train engage stakeholders in the development and application of MCDA framework as a decision aid to address complex problems. Table 5 presents an overview of the key features of the workshop whereas detailed programme of the workshop is included in Appendix A4.

*Table 5: Overview of Workshop on MCD Models*

| Workshop Name | MCD Models to support Regional Water Management |
|---|---|
| Lead Partner + Contact person for workshop | Lisa Scholten (TU Delft) and Tara Saharan (TU Delft) |
| Contributing partners | TERI, IHE, IRAP |
| Key topics covered | • Introduction to problem structuring methods and MCDA process.<br>• Overview of examples related to problem structuring and MCDA.<br>• Applying the framework to a pre-defined decision problem and identifying gaps for improvement in a real-life situation. |
| Mode of Delivery and Duration | Webinar; 2 hours |
| Date and Venue Duration (in days) | 10 April 2022 as a part of IWA Wastewater, Water and Resource Recovery Conference (10-13 April 2022), Poznan (Poland) |
| Number of participants | 19 |
| Website Report | https://pavitra-ganga.eu/en/pavitra-gangas-progress-report-april-2022 |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

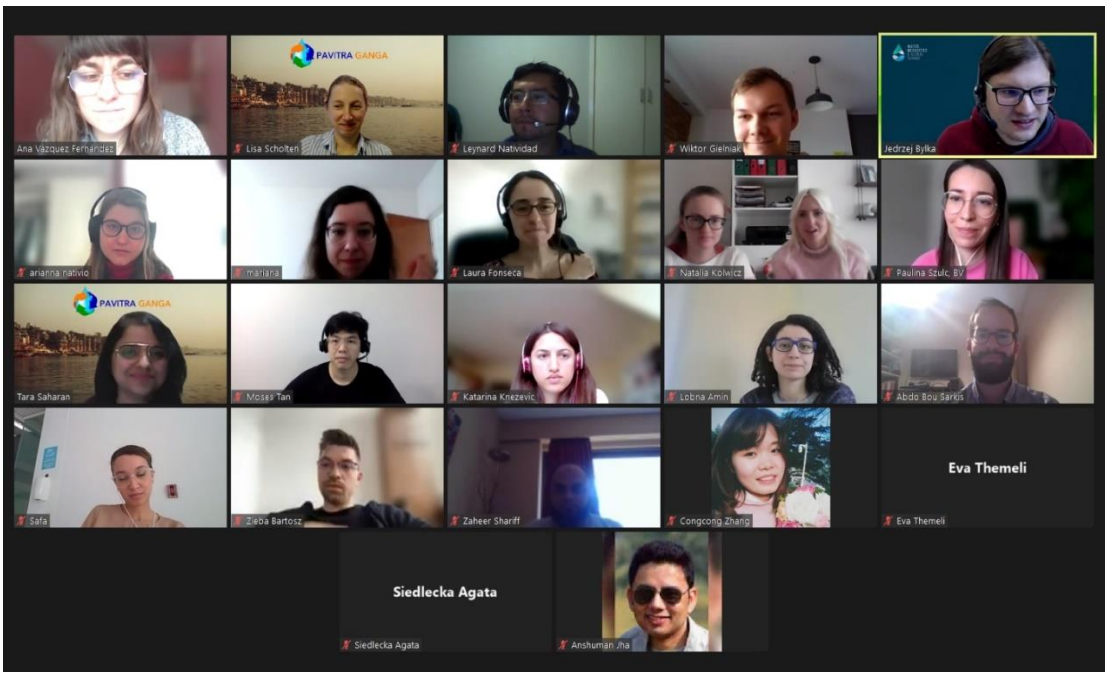



*Figure 4: Screen-shot of webinar Workshop 4 on MCD Models for Regional Water Management*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

## WORKSHOP 5: INNOVATIVE TECHNOLOGIES FOR WASTEWATER TREATMENT AND REUSE/RECOVERY

The main objective of this workshop was (i) to inform the stakeholders on the potential and limitations of eight different innovative wastewater treatment and water reuse/resource recovery technologies researched in PAVITRA GANGA project and (ii) train the participants on analysis and selection of available technologies for integrated wastewater treatment and management. Table 6 presents an overview of the key features of the workshop whereas detailed programme of the workshop is included in Appendix A4.

*Table 6: Overview of Workshop on Innovative Technologies for Wastewater Treatment and Reuse/Recovery*

| Workshop Name | Innovative technologies for wastewater treatment and reuse/recovery |
|---|---|
| Lead Partner + Contact person for workshop | Eldon Rene (IHE Delft) |
| Contributing partners | Zia Shaikh (IIT Delhi) + Purnendu Bose (IIT Kanpur); VITO, HBO, TU Delft; CNR-IRSA |
| Key topics covered | • 5 Keynote lectures on wastewater treatment and reuse<br>• Presentation on 8 innovative technologies developed and piloted in PAVITRA GANGA project<br>• Group exercise on Integrated Wastewater Management and poster presentations;<br>• Field trip to Barapullah Drain Demo site (New Delhi) situation. |
| Mode of Delivery and Duration | Hybrid (Face to face as well as online) ; 2 days |
| Date and Venue Duration (in days) | 27-28 September 2023, IIT Delhi (India) |
| Number of participants | 63 face to face and 50-100 online at different time slots |
| Website Report | https://pavitra-ganga.eu/en/lively-interest-workshop-innovative-wastewater-treatment-technologies |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.


*Figure 5: Photograph of Workshop 5 on Innovative Technologies for Wastewater Treatment and reuse/recovery*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

### WORKSHOP 6: INDIAN WASTEWATER: CHALLENGES AND SOLUTIONS

As this workshop combined all the three main pillars of the project it was conducted as the Final Conference event of the PAVITRA GANGA. The objective of the Workshop/Final Conference was to showcase the project's outcomes, including the water reuse and resource recovery options from wastewater and proposed technological and management options to complement conventional STP (Sewage Treatment Plant) approaches in India. Table 7 presents an overview of the key features of the workshop whereas detailed programme of the workshop is included in Appendix A6.

*Table 7: Overview of Workshop on Indian Wastewater: Challenges and Solutions*

| Workshop Name | Indian wastewater: Challenges and Solutions |
|---|---|
| Lead Partner + Contact person for workshop | Anshuman (TERI) and Paul Campling (VITO) |
| Contributing partners | All Pavitra Ganga partners and invited guests of honour |
| Key topics covered | • Session 1 – Setting the scene for wastewater treatment and reuse<br>• Session 2 – Pavitra Ganga Technology Pitches – outcomes and outlook<br>• Session 3 – Water Governance to address barriers to wastewater treatment and reuse |
| Mode of Delivery and Duration | Hybrid (Face to face as well as online); 1 day |
| Date and Venue Duration (in days) | 24 January 2024, Silver Oak, India Habitat Centre, New Delhi (India) |
| Number of participants | 111 face to face and 50 online |
| Website Report | https://pavitra-ganga.eu/en/pavitra-ganga-concludes-lively-final-conference-new-delhi |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.


*Figure 6: Photograph of Workshop 6 on Indian Wastewater: Challenges and Solutions*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# CHAPTER 3 OVERVIEW OF PAVITRA GANGA OPEN COURSE MATERIAL

## INTRODUCTION

Selected materials presented in six specific workshops were used in developing six different open course materials. It was agreed with the project consortium that no new open online course will be developed but only the workshop materials and other already available training materials will be put together in appropriate format on the project website for open access. Related to each of the workshops the following 6 open course materials have been developed:

1. Water Management Decision Support Systems
2. Safety Planning for Wastewater Reuse
3. Benchmarking Water Quality and Quantity and Use of Mobile Monitoring Solutions
4. MCD Models to Support Regional Water Management
5. Innovative Technologies for Wastewater Treatment and Reuse/Recovery
6. Indian Wastewater: Challenges and Solutions

Figure 7 shows the access page to these open course materials on PAVITRA GANGA website.

(https://pavitra-ganga.eu/en/pavitra-ganga-open-course-network)

## SET-UP OF OPEN COURSE MATERIALS ON PAVITRA GANGA WEBSITE

On the PAVITRA GANGA project website, the course materials are arranged in 4 layers namely (i) Course overview page, (ii) Detailed description of a specific open course material, (iii) Course registration page and (iv) Web page to access the learners schedule and course materials on selected topic.

The first layer is the course overview page (see Figure 7) above where one can see different open course materials available. The interested learner can select one of these courses and then go the second level (next web page) which provides the detailed description of the selected course (see Figure 8, as an example). In addition to the learning objectives and target group, this course description page also provides information the topics covered, suggested learning activities and the estimated duration of the course. If someone is interesting to following the course or downloading the course materials, then the learner need to fill the registration form (see Figure 8) after which the he/she will be directed to the specific page of a particular course from where the learners schedule as well as all learning materials related to that course can be accessed (see Figure 10 and Figure 11).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.


*Figure 7: Pavitra Ganga Open Course Network site showing tabs of six open course material*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

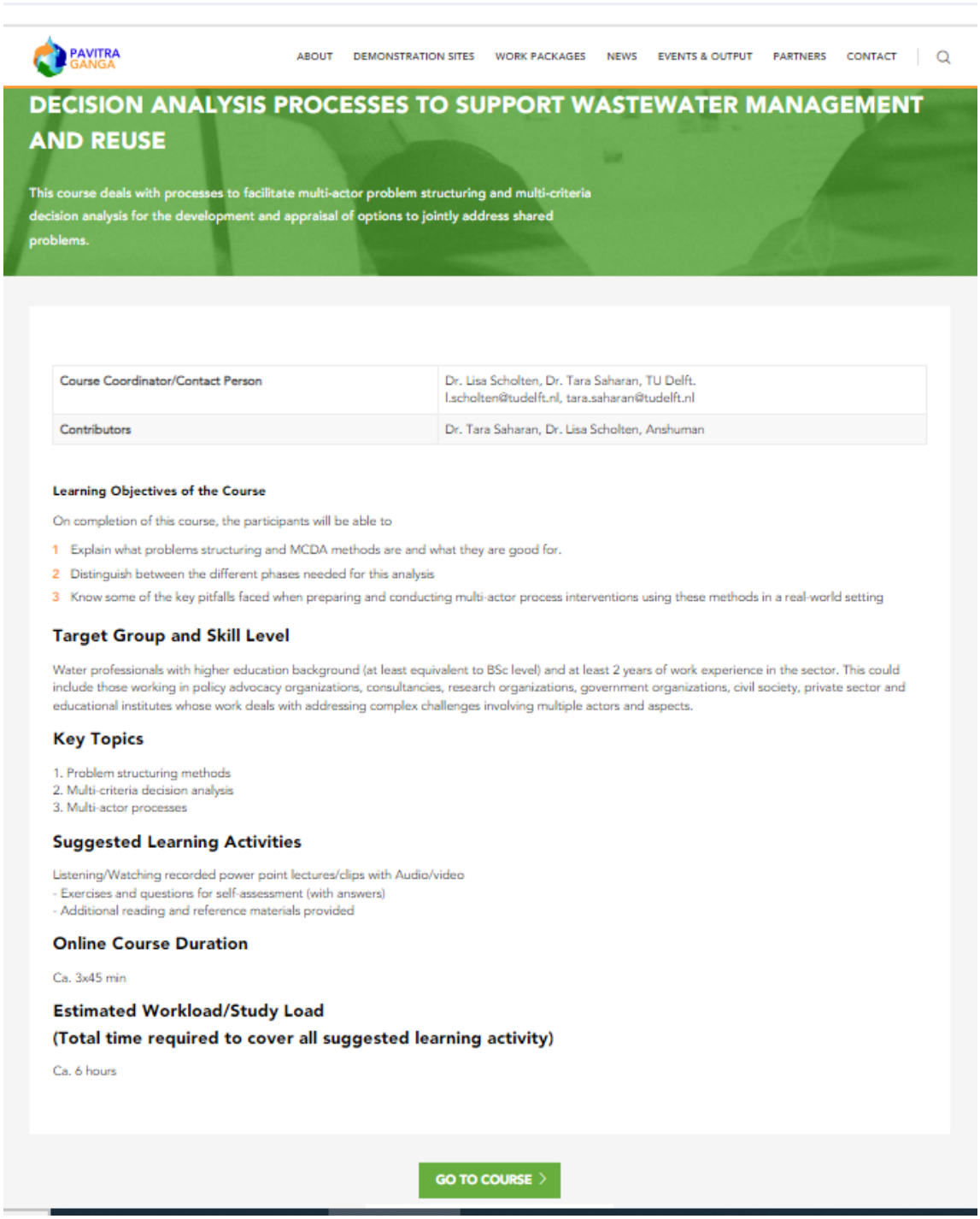



*Figure 8: Pavitra Ganga Open Course Network site showing detailed description of a course (as example)*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

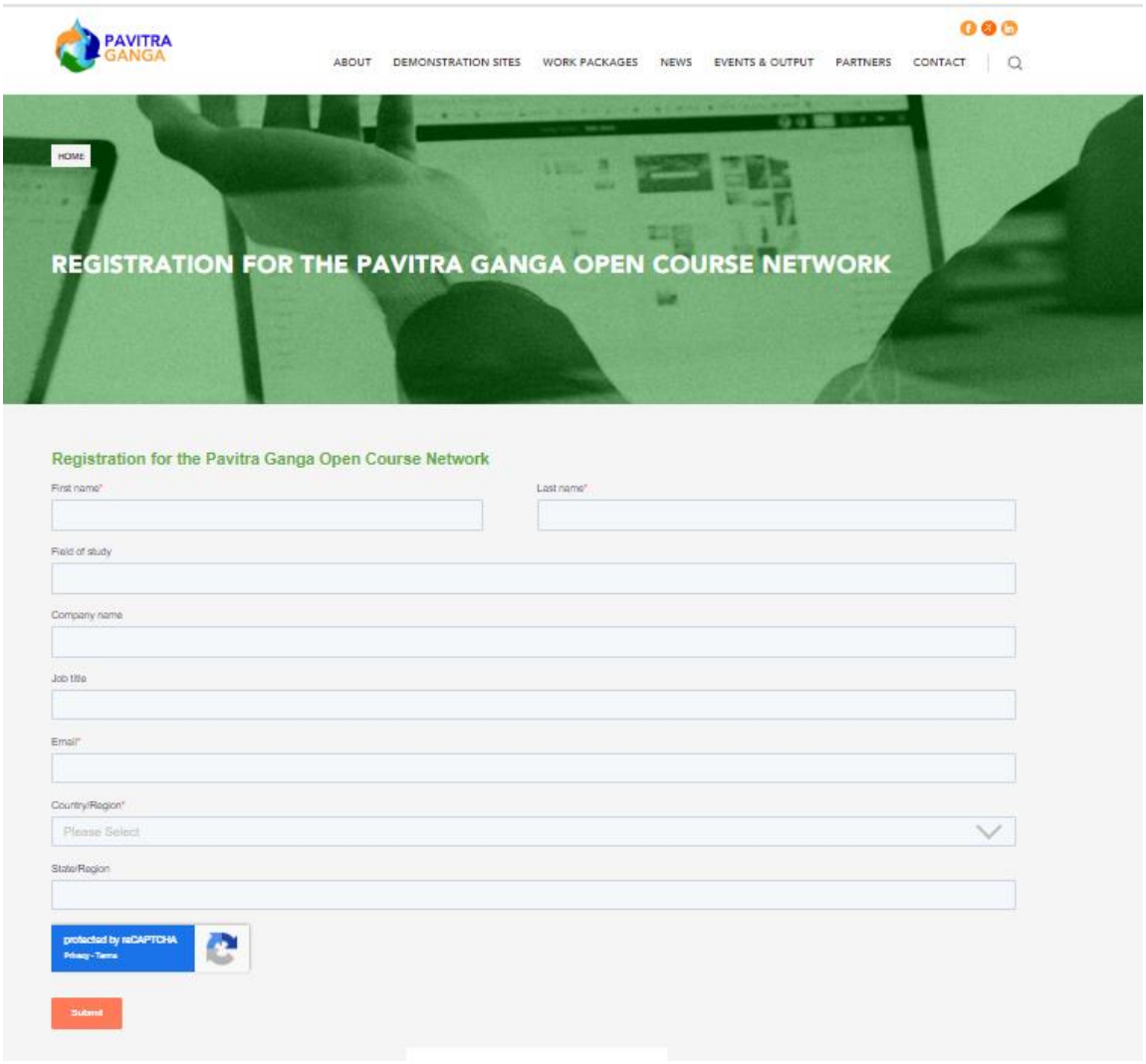



*Figure 9: Pavitra Ganga Open Course Network site showing Registration Page for accessing course material*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

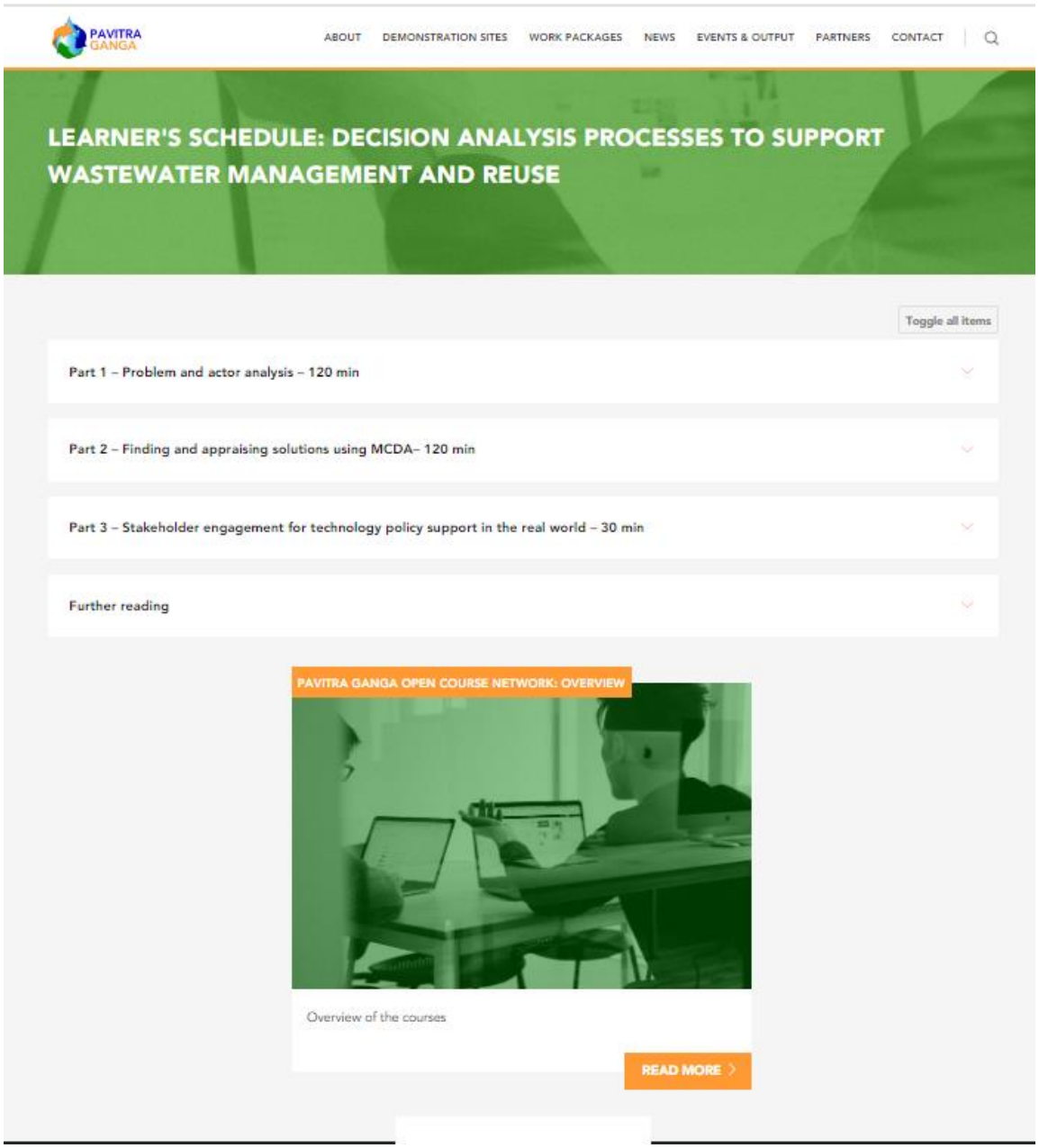



*Figure 10: Pavitra Ganga Open Course Network site showing an example of open course material – Learner's schedule*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

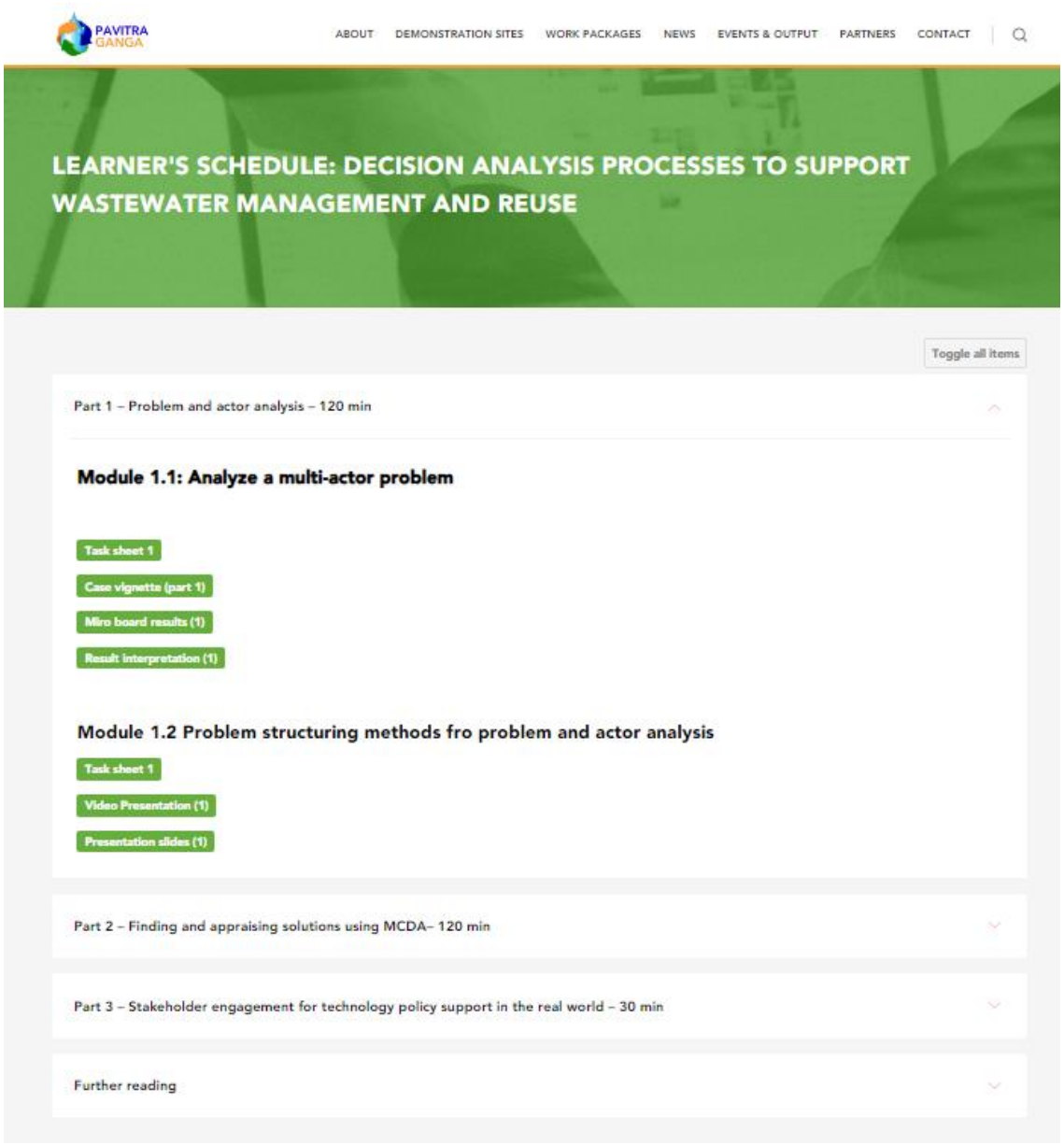



Figure 11: Pavitra Ganga Open Course Network site showing an example of open course material available for a specific workshop

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

## LESSONS LEARNT FROM WORKSHOPS AND OPEN COURSE MATERIALS

The following are the key lessons learnt from the six specific workshops of PAVITRA GANGA project addressing different themes and open course materials developed:

Workshop 1

- Scenario analyses provide rich information on water management options in a changing climate;
- All scenarios indicate that current planned STP infrastructure insufficient to meet likely demand by 2040 and Changing climate exacerbates the situation;
- Sensors provide a means to have continuous monitoring of the environment, but are costly to install and maintain.

Workshop 2

- Technology-based water reuse safety planning is key to occupational safety and health risk/hazard management.

Workshop 3

- Handheld devices with short questionnaire surveys provide rapid appraisal of water resource issues;
- Dashboard on smart phones improves communication & transparency;
- High EC values flag up contamination problems for groundwater resources and can trigger the sampling for laboratory analyses.

Workshop 4

- Proper problem structuring is critical to map priorities and link issues;
- Good decision making is key to better wastewater management;
- MCDA methods are useful to address decision problems that are too complex for common sense.

Workshop 5

- Low energy (or energy producing) secondary treatment can reduce operating costs and GHG emissions;
- Polishing technologies are essential for removing contaminants of emerging concern and deliver "safe" treated wastewater for re-use;
- Efficiency and effectiveness of different innovative technologies piloted during the project for removal of different contaminants is highly influenced by the scale and type of intended water reuse application.

Workshop 6

- Integrated wastewater management is key to sustainable development for which proper wastewater treatment aiming at resource recovery and water reuse is an essential element;
- Policy and guiding frameworks need to establish detailed guidance on wastewater and sewage sludge treatment and reuse technologies (fit-for purpose treatment).
- A robust implementation framework involving the last mile connectivity of solutions will help in better upscaling and optimization.

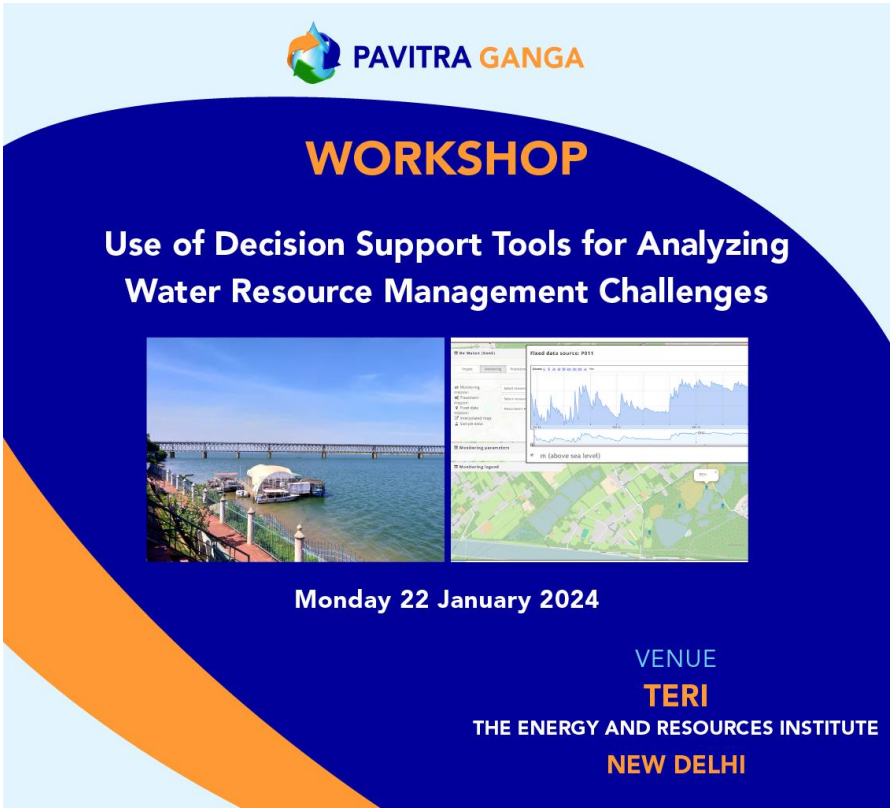
Normally capacity building is not a component of research and innovation projects, but we believe this aspect was an important part of the dissemination process as it gave the opportunity to move beyond the more traditional approaches of dissemination (videos, brochures, websites etc…) and engage properly with water practitioners, stakeholders, academics and students.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# APPENDICES

## A-1. DETAILED SCHEDULE OF WORKSHOP ON WATER MANAGEMENT DECISION SUPPORT SYSTEM




This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

PROGRAMME

| | |
|---|---|
| 9.30 - 9.45 | Welcome, Introduction and Opening Remarks<br>Paul Campling (VITO) and Anshuman (TERI) |
| 9.45 - 10.15 | Introduction to the Water Resource Management Problems and Challenges in Ganga basin<br>M. Dinesh Kumar (IRAP) |
| 10.15 – 10.45 | Description of the Two Pilot Sites and the Water Problems<br>M. Dinesh Kumar (IRAP) and Anshuman (TERI) |
| 10.45 - 11.00 | Tea Break |
| 11.00 - 11.30 | Use of Decision Support Tools in Water Management Planning, and Introduction to WEAP Model<br>M Dinesh Kumar (IRAP) |
| 11.30 - 12.30 | Application of WEAP for the Kanpur Metropolitan Area and the Barapullah Drain<br>M Dinesh Kumar (IRAP) |
| 12.30 -12.50 | Question & Answers and Discussion on Areas of Future Work<br>Moderator Paul Campling (VITO) |
| 12.50-14.00 | Lunch Break |
| 14.00 - 14.45 | Other Applications of the WEAP Model (Mahanadi, Sabarmati River Basin, tank cascades in Sri Lanka), and the modelling outcomes<br>M Dinesh Kumar (IRAP) |
| 14.45-15.00 | Discussion by participants |
| 15.00-15.20 | Challenges in Using Decision Support Tools in Water Management<br>M Dinesh Kumar (IRAP) |
| 15.20 - 16.00 | Use of sensors and dashboarding for water quality management in India and Europe<br>Sofie Van Ermen (VITO) |
| 16.00 - 16.15 | Discussion by participants |
| 16.15 - 16.25 | Closing Remarks<br>Paul Campling (VITO) |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

## A-2. DETAILED SCHEDULE OF WORKSHOP ON WASTEWATER SAFETY PLANNING


**Workshop 4 - Minimizing Occupational Risks in Wastewater Treatment: The Role of Technology-based Wastewater Safety Planning (15 January 2023, 14:00 -17:00hrs)**

Organizers:
Claire Furlong, Tineke Hooijmans (IHE Delft Institute for Water Education, The Netherlands),
Lena Breitenmoser (FHNW University of Applied Sciences and Arts, North-western Switzerland).
Mr Anshuman (TERI The Energy and Resources Institute, India)

**SCHEDULE OF THE WORKSHOP**

Part I: Presentations (all) –35 minutes

Introduction to Pavitra Ganga and the workshop (10 minutes, Tineke and Anshuman)
Wastewater-related health risks (for workers, farmers, communities) (10 Minutes)
Occupational safety and health guidelines (India- Anshuman, 5 Minutes; Europe-Lena, 5 Minutes)
WHO's risk management approach (Lena, 5 Minutes)
Mentimeter start survey: Who are the participants? Do they know about SSP?

Part II: Group exercises (Claire, Lena) –with break: 90 minutes

1. Introduction to group exercise (Claire and Lena, 30 minutes)
   a. Explanations of technologies to assess (Claire, 20 minutes for 4 technologies)
   b. Explanation of health risk assessment matrix (Lena, 10 minutes)

*BREAK -15 minutes*

1. Group exercise I (participants, 30 minutes): technology-based semi-quantitative risk assessment
2. Group exercise II (participants, 15 minutes): re-discussion on technology-based semi-quantitative risk assessment with other groups assessing the same technologies

Part III: Report out/Discussions (all) –55 minutes

1. Report out (participants, 30 minutes): Presentations of the risk assessments of the 4 technologies (5 minutes per technology+ 2 minutes Q&A) (Moderation: Claire and Lena)
2. Award for best assessment (5 minutes) (Moderation: Claire and Lena)
3. Closing session (20 minutes, Moderation: Tineke/ Anshuman?)

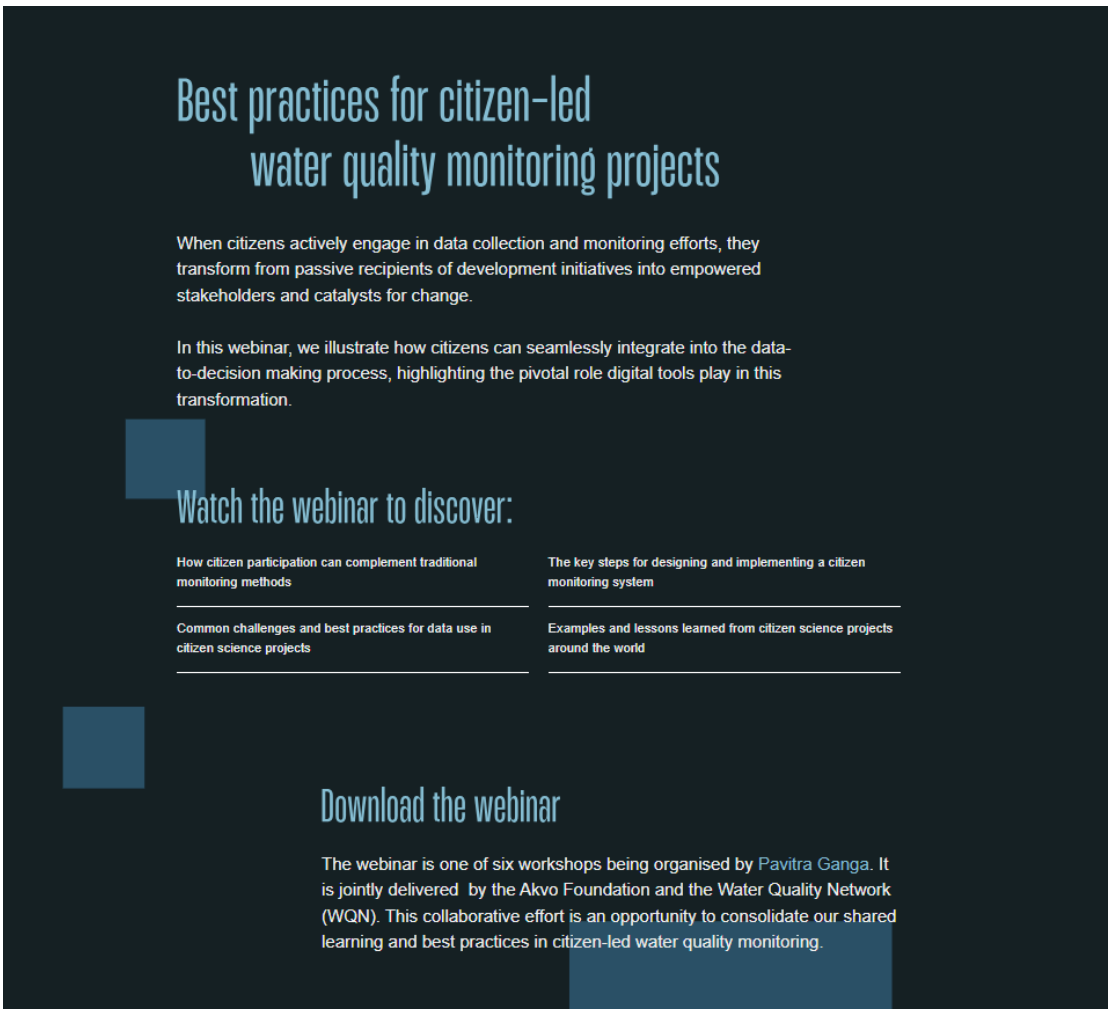
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

a. Discussion: Perceived Potential of WHO risk assessment approach to address occupation safety and health in India? What are the opportunities/challenges perceived with the approach? Can it complement existing Indian guidelines?
b. Mentimeterend survey: What did participants like/dislike about the workshop?
c. Use the platform to 'advertise' Pavitra Ganga online materials on wastewater safety planning/ the presentation on WWSP in Kanpur (Wednesday, 18thJanuary) as well as to the other Pavitra Ganga presentations

## A-3. DETAILED SCHEDULE OF WORKSHOP ON BENCHMARKING WATER QUALITY AND USE OF MOBILE MONITORING SOLUTIONS


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.




Programme


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

## A-4. DETAILED SCHEDULE OF WORKSHOP ON MCD MODELS FOR REGIONAL WATER MANAGEMENT

Wastewater, Water and Resource Recovery Conference 2022

the international water association

**10 – 13 APRIL, 2022 (POZNAN, POLAND)**

**Online Workshop on**
**Decision Analysis Processes to Support Wastewater Management and Reuse**

Presentations and Exercises

- Problem Structuring in Decision Analysis Processes
  (Dr. Tara Saharan, TU Delft, NL)
- Developing and assessing solutions using Multiple Criteria Decision Analysis (MCDA)
  (Dr. Lisa Scholten, TU Delft, NL)
- Stakeholder Engagement for Technological and Policy Support
  (Dr. Anshuman, TERI, IN)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

## A-5. DETAILED SCHEDULE OF WORKSHOP ON INNOVATIVE TECHNOLOGIES FOR WASTEWATER TREATMENT AND REUSE/RECOVERY

| **Title of the workshop:** Innovative technologies for wastewater treatment, reuse and resource recovery<br>**Dates and venue:** September 27-28, IIT Delhi, India | |
|---|---|
| **DAY 1, September 27 \| Wednesday (HYBRID)** | |
| **9:00 h - 10:30 h** | **Inauguration and opening ceremony** |
| 9:00 h - 9:05 h | Welcome and opening note about the workshop - Eldon R. Rene (IHE Delft) |
| 9:05 h - 9:15 h | Welcoming the delegates and participants - Prof. T. R. Sreekrishnan (IIT Delhi) |
| 9:15 h - 9:30 h | The Pavitra Ganga Project: An Overview - Dr. Anshuman (TERI) |
| 9:30 h - 10:00 h | Guest of honour: Dr. D. P. Mathuria [Executive Director (Technical), NMCG, Govt. of India] |
| 10:00 h - 10:30 h | Group photo and coffee break |
| **10:30 h - 12:30 h** | **Workshop session 1**<br>**(Moderators: Eldon R. Rene and Sofie Van Ermen)** |
| 10:30 h - 11:10 h | **Keynote lecture 1:** Ecotechnologies for the removal of heavy metals from wastewater - Prof. Purnendu Bose (IIT Kanpur) |
| 11:10 h - 11:50 h | **Keynote lecture 2:** Current trends in monitoring water and wastewater quality - Prof. Shaikh Ziauddin Ahammad (IIT Delhi) |
| 11:50 h - 12:30 h | **Keynote lecture 3:** A novel approach to achieving compliance: The methodology of CETP Vatva – Mr. Deepak Davda [Executive Director & CEO, GESCSL – Vatva] |
| **12:30 h - 14:00 h** | **Lunch break** |
| **14:00 h - 17:30 h** | **Workshop session 2 (HYBRID)**<br>**(Moderators: Shaikh Z. Ahammad and Saroj Sharma)** |
| 14:00 h - 14:30 h ++ | Technology 1 - Self-forming dynamic - MBR (Alfieri Pollice and Aditya Sharma) |
| 14:30 h - 15:00 h ++ | Technology 2 - Constructed wetland plus (Luca Ofiera and Auchitya Verma) |
| 15:00 h - 15:30 h ++ | Technology 3 - Structured adsorbents (Elena Mihaela Seftel and Henna Shaji) |
| **15:30 h - 15:45 h** | **Coffee break** |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

| | |
|---|---|
| 15:45 h - 16:15 h ++ | Technology 4 - Clean blocks (Antonella Piaggio and Merle de Kreuk) |
| 16:15 h - 16:45 h | Technology 5 - Andicos (Aditya Sharma and Sofie van Ermen) |
| 16:45 h - 17:15 h | Technology 6 - Aerobic MBR (Anil Kumar Dahiya and Hector Garcia) |
| **17:15 h - 17:30 h** | **Feedback and discussions** |

**Note: ++ - The presentation will be made online**

| **DAY 2, September 28 \| Thursday (at IITD only)** | |
|---|---|
| **9:00 h - 12:30 h** | **Field trip** |
| 9:00 h - 12:30 h | Visit to the IITD WWTP and the Pavitra Ganga project demonstration site at Barapullah drain |
| **12:30 h - 14:00 h** | **Lunch break** |
| **14:00 h - 15:30 h** | **Workshop session 3 (Moderators: Eldon R. Rene and Paul Campling)** |
| 14:00 h - 14:25 h | **Keynote lecture 4:** Soil aquifer treatment (SAT): A managed aquifer recharge approach for wastewater treatment and reuse - Dr. Saroj K. Sharma (IHE Delft) |
| 14:25 h - 14:50 h | **Keynote lecture 5:** Recent innovations in the use of membranes to treat and reuse wastewater - Ir. Sofie Van Ermen (VITO) |
| 14:50 h - 15:10 h | Technology 7 - Photo activated sludge - Eldon R. Rene and Ashish K. Lohar |
| 15:10 h - 15:15 h | Technology 8 - AQUATRACK® - Sudhir Chowdhury and Ulla Chowdhury (Presented by Eldon R. Rene) |
| **15:15 h - 15:30 h** | **Coffee break** |
| **15:30 h - 17:45 h** | **Group work activity and closure of the workshop** |
| 15:30 h - 17:30 h | **Group work topic:** Technological and management options to complement conventional STP approaches in India* **poster presentation by the participants* **Group activity facilitators:** Eldon R. Rene, Saroj K. Sharma, Shaikh Ziauddin Ahammad, Sofie Van Ermen and Paul Campling |
| **17:30 h - 17:45 h** | **Closure of the workshop and certificate to the participants** |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

## A-6. Detailed Schedule of Workshop on Indian Wastewater: Challenges and Solutions


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

# Programme

- **09:00 h - 09:40 h ~ Registration and tea**

- **09:45 h - 10:20 ~ Opening ceremony**
  - Welcome and opening note by **Shri Anshuman** (Director, Water Resources Division, TERI)
  - The Pavitra Ganga Project: An overview by **Dr. Paul Campling** (International Business Development Manager, VITO)
  - Welcome Address by **Dr. Vibha Dhawan** (Director General, TERI)
  - Opening Address by **Shri D.K. Tewary** (Scientist 'G' Department of Biotechnology, Ministry of Science and Technology, GoI)
  - Special Address by **Shri D.P. Mathuria** (CE, PDO, Central Water Commission, Ministry of Jal Shakti, GoI)
  - Special Address by **Mr. Pierrick Fillon-Ashida** (First Counsellor - Head of Research & Innovation Section, Delegation of the European Union to India)

- **10:20 h - 11:40 h ~ Session 1 – Setting the scene for wastewater treatment and reuse**
  **Moderator: Prof. Purnendu Bose (IIT Kanpur)**
  - Keynote 1: Water quality issues in India: environmental and social impacts - **Anshuman (TERI)**
  - Keynote 2: Wastewater treatment innovations for water reuse – **Prof. Christian Kazner (HBO)**
  - Keynote 3: New approaches and innovations in smart water management – **Dr Paul Campling (VITO)**
  - Keynote 4: Water resources challenges and solutions in the Ganga Basin – **Dr Dinesh Kumar (IRAP)**
  - Keynote 5: Current trends in analytical techniques for monitoring water and wastewater quality – **Prof. Shaikh Ziauddin Ahammad (IIT Delhi)**
  - Keynote 6: Application of membranes to treat wastewater – cases using IPC membranes – **Dr Ajay Popat (Ion Exchange)**
  - Q & A

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.

- **11:40 h - 12:50 h ~ Session 2A – Pavitra Ganga Technology Pitches – outcomes and outlook**
  **Moderator: Prof. Saroj Sharma (IHE Delft)**
  - Pavitra Ganga approach to wastewater treatment and reuse piloting – **Prof. Christian Kazner (HBO)**
  - Andicos - **Aditya Sharma (IIT Kanpur),** Sofie Van Ermen (VITO), S. Sankararaman (Ion Exchange)
  - Self-forming dynamic Membrane Bioreactor - **Dr. Alfieri Pollice (CNR-IRSA)**
  - Constructed wetland plus - **Luca Ofiera (HBO), Auchitya Verma (IIT Kanpur)**
  - Structured adsorbents - Dr. Bart Michielsen (VITO), **Sofie Van Ermen (VITO),** Dr. Elena Seftel (VITO)
  - Clean blocks - Dr. Antonella Piaggio (TU Delft), Prof. Merle De Kreuk, **Prof. Tineke Hooijmans (IHE Delft)**
  - Q & A
- **12:50 h - 13:50 h ~ Networking Lunch Break**
- **13:50 h -14:00 h Conference Group Photo**
- **14:00 h - 14:30 h ~ Guest of Honour Address**
  - Welcome and Conference Snapshot - **Shri Anshuman** (Director, Water Resources Division, TERI)
  - The Pavitra Ganga Project: An overview - **Dr. Paul Campling** (International Business Development Manager, VITO)
  - Welcome Address - **Dr. Vibha Dhawan** (Director General, TERI)
  - **G Asok Kumar (Director General, National Mission for Clean Ganga, Ministry of Jal Shakti, Government of India)**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051. This project has been co-funded by Department of Biotechnology (DBT), Government of India.

- **14:30 h - 15:35 h ~ Session 2B – Pavitra Ganga Technology Pitches – outcomes and outlook**
  **Moderator: Prof. Saroj Sharma (IHE Delft)**
  - Photo activated sludge - **Dr. Eldon R. Rene (IHE Delft), Dr. Ashish K. Lohar (IIT Delhi/TERI)**
  - AquaTrack and Ozonation - Sudhir and Ulla Chowdhury (Aqua-Q), **Dr. Eldon R. Rene (IHE Delft)**
  - Citizen based water quality surveying - **Isha Parihar (AKVO)**
  - Pavitra Ganga Water Management Dashboard - **Sofie Van Ermen (VITO)**
  - Recommendations and next steps for wastewater treatment and water reuse – **Prof. Christian Kazner (HBO)**
  - Q & A
- **15:35 h - 15:45 h ~ Coffee / Tea Break**
- **15:45 - 16:45 h ~ Session 3 – Water Governance to address barriers to wastewater treatment and reuse**
  **Moderator: Dr. Paul Campling (VITO)**
  - Keynote 7: Stakeholder engagement and lessons learnt to promote wastewater treatment and reuse – **Prof. Tineke Hooijmans (IHE Delft)**
  - Keynote 8: Wastewater safety planning – a call for action – **Dr Claire Furlong (IHE Delft) and Lena Breitenmoser (FHNW)**
  - Keynote 9: Policy recommendations to promote wastewater treatment and reuse in India – **Anshuman (TERI)**
  - Q & A
  - Closing remarks, the way forward and vote of thanks
- **16:45 - 18:00 h ~ Conference Networking with drinks & snacks**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821051.

This project has been co-funded by Department of Biotechnology (DBT), Government of India.