Safe and Sustainable Technologies and Strategies for Integrated Freshwater Resource Management

Report of Scientific Workshop June 2019

May 2020

INDIA-UK
Water Centre
भारत-यूके
जल केन्द्र

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India-UK Water Centre

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Natural Environment Research Council

Ministry of Earth Sciences
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The India-UK Water Centre promotes cooperation and collaboration between the complementary priorities of NERC-MoES water security research.

भारत-ब्रिटेन जल कें द्र एमओईएस-एनईसीआरसी (यूके) जल सुरक्षा अनुसंधान के पूरक प्राथमिकताओ के बीच सहयोग और सहयोग को बढ़ावा देने के लिए करना है

Front cover image: Kerala, India (Unsplash)

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Executive Summary

The Water-Food-Energy Nexus is a dynamic system in which to realise the safe and sustainable development of freshwater resources that is urgently required due to rising global population, rapid urbanization, changing diets and economic growth. Freshwater is one of the most important natural resources and one of the largest in terms of consumption for the production of food and energy, as well as for drinking. When water resources are polluted and unavailable for drinking, energy, agriculture, certain intra-connections of all three may drive the system in a downward spiral towards a worse situation at both local and global levels. The Water-Food-Energy Nexus is connected to socio-economic development in regions where surface water resources plays a key role. Today the focus is on safe and sustainable technologies and strategies for integrated water resource management, including catchment management, pollution remediation, sustainable agriculture, alternative energy systems, ecosystem conservation, safe water supply and sanitation. Solutions have to be affordable, safe and energy efficient.

This report represents an overview of the participation, activities and conclusions at a Scientific Workshop held at JSS Academy of Higher Education and Research (JSSAHER), Mysuru from the 25th to the 28th of June, 2019, convened by the IUKWC and led by Dr. Shivaraju H Puttaiah, JSSAHER, and Dr D L Jenkins, University of Plymouth.

The report is intended for the workshop participants, India-UK Water Centre members and stakeholders.

Figure 1: Delegates of the Scientific Workshop held in June 2019, JSSAHER, Mysuru.

1. Workshop Leads

The Scientific Workshop was convened by the India-UK Water Centre (IUKWC) and led by the Activity Leads:

Dr Shivaraju H. Puttaiah

JSS Academy of Higher Education and Research (JSSAHER)

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The Workshop was held at the JSS Academy of Higher Education and Research (JSSAHER), Mysuru from the 25th to the 28th of June 2019.

2. Aims

The India-UK Water Centre is based around five key cross-sectoral themes and aims to deliver a portfolio of activities across these themes. This Workshop focused on the theme 'Building cross-sectoral collaborations to understand the dynamic interactions across the water-energy-food nexus'.

The workshop aimed to bring together scientists from the UK and India, Industrialists and NGOs to develop sustainable strategies urgently needed in India, which also have global impact, to tackle long term provision of water for drinking and food production.

3. Participants

A competitive call to attend the workshop was published through the IUKWC website in December 2018 for a limited number of delegates based at UK and Indian institutions. Following a short extension of the call to February 2019, an assessment process was undertaken that included members of the IUKWC Secretariat and the leads. All applications were scored against the following criteria and the scores discussed to ensure balance of expertise and organisational representation. The criteria considered included:

- Applicant expertise relevant to the workshop theme;
- Motivation for attending the workshop;
- Expected contribution to the workshop; and
- Potential benefit to the applicant in attending.

A total of 74 applications were received (61 from India and 13 from the UK). Twenty three delegates were selected from India, and ten from the UK. A few other key researchers and stakeholders were also invited from India, whilst there were six delegates who had to cancel. With the inclusion of the IUKWC secretariat and co-ordinators, the total number of delegates in attendance was forty two, representing researchers, practitioners (NGO) and government (Table 1).

	Name	Institution
		UK
1	Mr Matteo Tucci	University of Cambridge, UK
2	Dr Giuliano Punzo	The University of Sheffield, UK
3	Dr Bhopal Pandeya	Imperial College London
4	Dr Alejandro Gallego Schmid	The University of Manchester, UK
5	Dr Diganta Bhusan Das	Loughborough University, UK
6	Dr Devendra Saroj	University of Surrey, UK
7	Dr William Hunter	University of Ulster
8	Prof Awadesh Jha	University of Plymouth (Co-Lead, UK)
9	Dr David F L Jenkins	University of Plymouth (Lead, UK)
10	Prof Harry Dixon	UK Centre for Ecology & Hydrology, Wallingford (IUKWC Coordinator, UK)
11	Ms Emma Bennett	UK Centre for Ecology & Hydrology, Wallingford (IUKWC Secretariat)

INDIA		
12	Dr. Namrata Sengar	University of Kota, India
13	Dr Rohit Goyal	Malaviya National Institute of Technology Jaipur, India
14	Dr. Surajit Chakraborty	Indian Institute of Social Welfare and Business Management, Kolkata, India
15	Dr. Vikram Kumar	Gaya College of Engineering, Gaya - Bihar, India
16	Dr Wazir Alam	Manipur University (A Central University)
17	Mr Ujjwal Kumar	T.M. BHAGALPUR UNIVERSITY, BHAGALPUR, INDIA
18	Prof PP Mujumdar	Indian Institute of Science, Bangalore, India
19	Dr Manoj Kumar Basavarajappa	JSS Academy of Higher Education & Research
20	Dr. Sanjeev Kumar	Central University of Jharkhand, India
21	Dr. Ritu Singh	Central University of Rajasthan, India
22	Dr. Anbazhagi Muthukumar	Central University of Kerala
23	Mr Prashant Basavaraj Bhagawati	Annasaheb Dange College of Engineering and Technology, Ashta, Sangli, Maharashtra
24	Dr. Pallavi N	JSS Academy of Higher Education & Research
25	Dr Dipak Ashok Jadhav	Maharashtra Institute of Technology Aurangabad, India
26	Dr Biplab Biswas	Department of Geography, The University of Burdwan, India
27	Dr Rajeev Pratap Singh	Institute of Environment and Sustainable Development, Banaras Hindu University, Varanasi India
28	Dr Vikram Srinivasa Raghavan	Indian Institute of Science, India
29	Dr Manoj Kumar Tiwari	Indian Institute of Technology Kharagpur, India
30	Mr Dineshkumar Singh	Tata Consultancy Services Ltd. (TCS)
31	Ms Sai Veena	Indian Institute of Technology Bombay, India
32	Dr. M Arivazhaghan	National Institute of Technology Tiruchirappalli
33	Mr. Midhun G Oliparambil	JSS Academy of Higher Education & Research
34	Mr. Anil Kumar Kotermane	JSS Academy of Higher Education & Research
35	Mr. Yashas Sivamurthy Ravindra	JSS Academy of Higher Education & Research
36	Ms. Pallavi Siddappa	JSS Academy of Higher Education & Research
37	Ms. Kumari Sonu Yadav	JSS Academy of Higher Education & Research
38	Dr Bheemappa K	Department of Environmental Science (Need to know more details on this)
39	Mr Sunil K Singh	PETCI
40	Dr. Shivaraju H Puttaiah	JSS Academy of Higher Education & Research (Lead, India)
41	Dr Atul K Sahai	Indian Institute of Tropical Meteorology, Pune (IUKWC Coordinator, India)
42	Ms Priya Joshi	Indian Institute of Tropical Meteorology, Pune (IUKWC Secretariat)

4. Structure

Prior to the official start of this workshop on day 1, the management of JSSAHER held an official opening session, where the Vice Chancellor of the University, Dr. H Basavanagowdappa, gave an address, followed by a keynote speech by Prof Pradeep P Mujumdar of IISc Bangalore on the 'Regional Impacts of Climate Change: Implications for Water Resource Management'. The IUKWC coordinators from India and the UK, both gave an introduction to the IUKWC and there was the lighting of the sacred lamp.

The structure for the remainder of the four-day workshop included eight oral presentation sessions, each with its own theme and sufficient time after each session for discussions. There was one half-day session for posters, where the presenters were given time at the start to describe their work and invite viewers to visit them. There was an entire afternoon on the third day, dedicated to the field visit where delegates were shown around the treatment and water management works of the Jubilee Pharmaceuticals Company just outside Mysuru City. They had time to engage with the managers on site and discuss current methods and future plans. The final day of the workshop was spent developing problem definitions based on the presentations and experience over the first three days, followed by exercises to prioritise the problems that needed more urgent consideration, and developing plans for impactful future, collaborative projects. Due to the multi-disciplinary group present, the solutions were well developed with a catchment level perspective. See Annex A and B for the detailed agenda and list of Posters, respectively.

Overall, there were twenty four talks and twelve posters presented during the workshop. The abstracts for these talks and posters are available to members of the Open Network at IUKWC.org. Open Network members are also able to access the presentations from the workshop here.

Figure 2: Lighting of the sacred lamp (left) and Keynote address by Prof PP Majumdar (right)

Figure 3: Discussions (left) and Poster presentations (right)

Figure 4: Delegates being addressed at offices of the pharmaceutical company

5. Conclusions and Outputs

The workshop ran in the form of a mini-conference for the first two and a half days. This enabled all participants to learn more about the different research interests of the other delegates and to arrive at the key topics of concern. The focus of day 4 was to explore how to take these topics forward, to build new collaborations, and make a difference to quality of life for all.

5.1. Key Topic Areas of Interest Identified

During the presentation session, delegates and session chairs were given the task of identifying key issues/ concerns/ topics or ideas they felt required further examination, and adding these to a board that was provided. This proved to be an excellent route to identifying the key issues, but also the underpinning concerns that form part of the bigger topic. This process produced over a hundred contributions from all delegates and sessions chairs. The leads were tasked with exploring and categorising the suggestions into key topics.

A number of contributions were collected over the two and a half day period, including:

- How to find polluters
- Drinking water – quality and availability; Pharmaceutical and personal care products; Standardisation of water quality monitoring; PFAS in aquatic environments; India needs more wastewater treatment plants; How to make water supply more resilient
- Citizen science for local monitoring
- Education – to develop understanding of the ‘value’ of water
- Social class and access to water
- Mobile apps; Satellite imaging as an ‘eye’ to monitor pollution; LIDAR mapping; Integrating digital data to map impacts; Spatial mapping of pollutants, such as arsenic; Microbial fuel cells for pollution monitoring
- Developing technology for sub-surface water treatment; Nanoparticles for remediation
- Impact analysis on waste to energy recovery; Use of solar energy; Electricity subsidies and water wastage – irrigation
- Energy from waste water
- The impact of climate change

Although a few contributions did not fit in with the overall trend, the consistency of topics and concerns enabled the contributions to be grouped into three themes for group sessions on the final day (Figure 5).

The three key topic areas were:

1. Water quality and monitoring, including sensor technology
2. Water treatment technologies
3. Sustainable water quality management practices

To explore the topic areas, groups and team leaders were selected by the leads to ensure a balance of UK/India and male/female. Five groups were formed, and the group selected their own spokesperson. Each group had to select their rank order for these topics. This process was 'blind', but in fact all groups were able to be assigned their first choice.

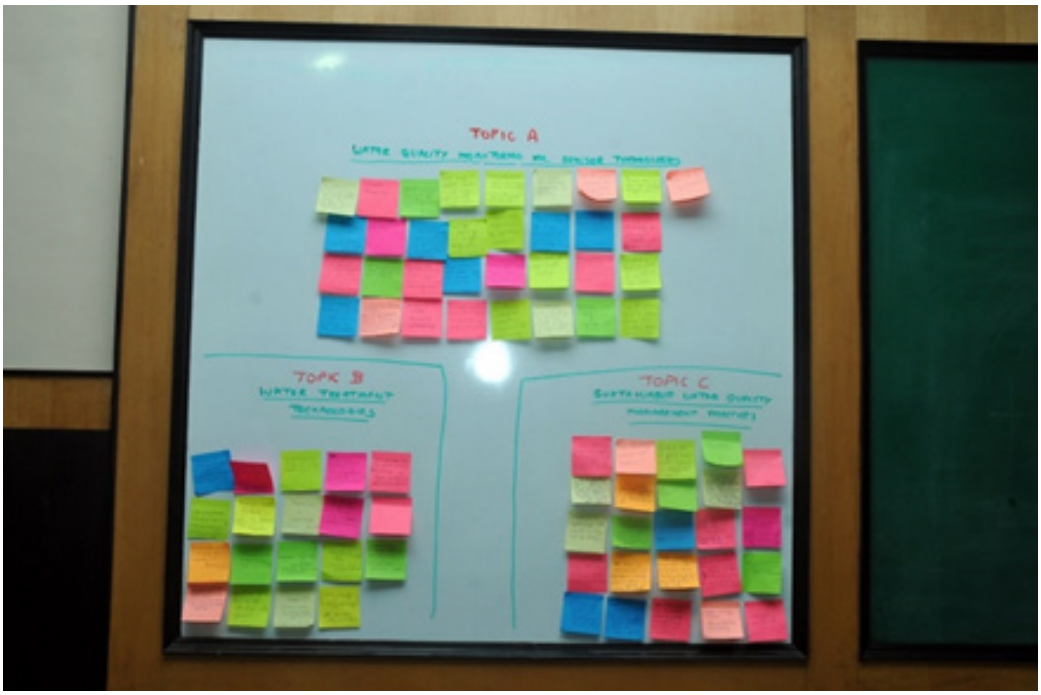

Figure 5: Grouping of key contributions that arose from presentation sessions

The groups were each given a 5-stage process to follow, which included:

a. Developing clear definition/ problem statements (what the problem is, how this problem manifests/occurs/develops, where this problem occurs, who the problem affects)
b. Prioritising to enable selection of the key problems
c. Identifying solutions to the prioritised problems
d. Identifying the impact of the possible solutions and considering which one could be considered for future collaborative projects.
e. Presenting the final results of the group's process

This methodology had been used in a previous workshop held at the University of Warwick (see here), where it worked very well and hence, was replicated in this workshop.

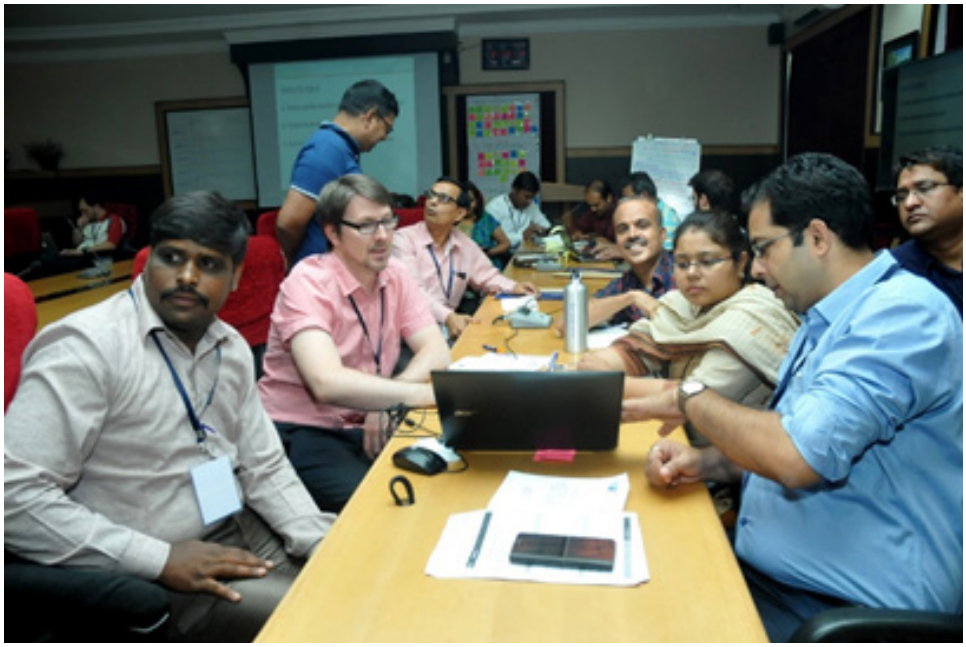

Figure 6: Delegates engaged in group discussions

5.2. Next Steps and Recommendations on Key Topic Areas

The group discussions resulted in a number of potential project ideas under each overarching key topic.

Water Quality and Monitoring, including Sensor Technology

Two project ideas were identified:

- Development and standardization of water quality monitoring systems – A sensor based approach
- M-APP-ING Water with Community Participation – Citizen Science

These projects would work well together, as the first would focus on the development, standardization, and implementation of a sensor-based Water Quality Management System, whereas the second considered the use of citizen science in mapping water quality status using sensors in order to develop policy recommendations.

Water Treatment Technologies

One project came out of the discussions on this key topic and that was: Smart Treatment Technology for Pharmaceutical Compounds released in Mysore.

This project would target the emerging contaminants (AMR compounds, for example) that are a significant problem in the city, in light of a lack of resilient treatment technologies and monitoring systems.

Sustainable Water Quality Management Practices.

The idea proposed was for the development of Participatory Integrated Watershed Management (PIWM) for sustainable water management. This work would target water scarcity and the inadequate strategies used for storing good quality water.

An accompanying Water Brief expanding on the key gaps and way forward on the three key topic areas arising from the workshop can be found at www.iukwc.org.

5.3. Participant Feedback

At the conclusion of the workshop, a feedback form was circulated to participants who were asked to provide comment on:

- The Workshop content;
- The meeting venue and organisation; and
- Networking opportunities;

Participants were also asked to provide an overall score out of 10 for the workshop.

Almost 70% of the delegates provided feedback, giving the workshop an average score of 9.3 out of 10, which is one of the higher scores IUKWC workshops have received. All delegates, except one, made new contacts, with majority choosing future research collaboration and knowledge exchange as potential opportunities from making the new contact.

The overarching request for future events was to have more demonstrations or discussions on new technologies, and having field visits that allowed for a wider view of the issues faced in the area, and projects around these. This latter request had been considered by the leads, but due to unavailability of certain stakeholders, the final plan had to be altered. Majority of the respondents greatly appreciated the group discussions and in particular the final session, as well as the overall organisation of the event.

"Group discussion among the participants leading towards identification of key problems and formulation of solution strategy was the best part which is lacking in several other workshops."

Participant Feedback

6. Annexes

Annex A: Agenda

Day 1 – Tuesday 25th June 2019

Time	Agenda item
9.00 – 10.00	**Registration (Auditorium JSSAHER)**
10:00 – 11:20	**Opening of Workshop (Auditorium JSSAHER)** • **Welcome (5 min)** Dr Shivaraju H Puttaiah (JSSAHER, India) • **Inauguration by lighting of the sacred lamp (5 min)** Chief Guest, IUKWC Coordinators, Workshop Leads • **Introduction to the IUKWC (10 min)** Prof Harry Dixon and Dr Atul Kumar Sahai (IUKWC Coordinators) • **Address by Chief Guest (10 min)** Dr. H Basavanagowdappa, Vice Chancellor (JSSAHER, India) • **Keynote Address (35 min) with questions (10 min)** Prof Pradeep Mujumdar (IISc Bangalore, India): Regional Impacts of Climate Change: Implications for Water Resource Management
11:20 – 11:40	**Tea and Coffee Break**
11:45 – 12:25	**Session 1: Introduction to the Workshop (Boardroom, JSSAHER)** • **Introduction of delegates (15 min)** Prof Harry Dixon (IUKWC Coordinator, UKCEH, UK) • **Workshop purpose, objectives and overview of the 4 days (25 min)** Dr David Jenkins (University of Plymouth, UK)
12.25 – 13.05	**Session 2: Understanding the Inter-Relationship between the Water Food and Energy (WFE) Nexus and Sustainable Development** **Session Chairs:** Prof Pradeep Mujumdar (IISc, Bangalore, India) & Dr David Jenkins (University of Plymouth, UK) **Presentations: 15 min talks + 5 min questions (20 min total per presentation)** • Dr Manoj Tiwari (Indian Institute of Technology Kharagpur, India) - Benchmarking Energy Efficiency of Water Distribution Networks • Dr Namrata Sengar (University of Kota, India) - Interlinkages- Energy and Water Management
13:05 – 14:05	**Lunch**

14:05 – 15:05	**Session 2: Understanding the Inter-Relationship between the Water Food and Energy (WFE) Nexus and Sustainable Development, CONT'D** **Session Chairs:** Prof Awadhesh Jha (University of Plymouth, UK) & Dr David Jenkins (University of Plymouth, UK) **Presentations: 15 min talks + 5 min questions (20 min total per presentation)** • Dr Rajeev Pratap Singh (IESD, BHU Varanasi, India) - Utilization Of Municipal Solid Waste Leachate In Irrigation: Potential Benefits and Threats • Dr Dipak Jadhav (Maharashtra Institute of Technology, India) - Water reuse and electricity generation from human waste in advance bioelectric toilet system during wastewater treatment for effective water management **Facilitated Discussion** (20 min)
15:05 – 16:20	Session 3: Exploring the Inter-Linkage between Integrated Water Resource Management and the WFE Nexus Session Chairs: Prof Awadhesh Jha (University of Plymouth, UK) and Dr Alejandro Gallego Schmid (University of Manchester, UK) Presentations: 15 min talks + 5 min questions (20 min total per presentation) • Dr Vikram Kumar (Gaya College of Engineering, India) - Sustainable watershed development in Himalaya • Ms Sai Veena (Indian Institute of Technology Bombay, India) - Evaluating proposed Godavari to Krishna inter-basin water transfers in Southern India under changing climate and human demands • Dr David Jenkins (University of Plymouth, UK) – Water, Food and Energy Working in Harmony: A Madhya Pradesh Perspective **Facilitated Discussion** (15 min)
16:20 – 16:50	**Tea and Coffee Break**
16:50 – 18:10	**Session 4: Water Quality – Exploring the current Status, Challenges and Innovations** **Session Chairs:** Prof Awadhesh Jha (University of Plymouth, UK) and Dr Manoj Tiwari (Indian Institute of Technology Kharagpur, India) **Presentations: 15 min talks + 5 min questions (20 min total per presentation)** • Dr Biplab Biswas (The University of Burdwan, India) - Spatial Mapping & Spatio-Temporal Variation of Ground Water Arsenic Concentration in Parts of the Western Bhagirathi- Hooghly Sub-System • Dr. Surajit Chakraborty (The Indian Institute of Social Welfare & Business Management, India) - Understanding the control of geology, geomorphology and landuse / landcover on arsenic distribution in groundwater of Bengal Basin using high-resolution RS, GIS and PCA **Facilitated Discussions** (20 min)
18:10 – 18:30	**Wrap-up of Day 1** with key messages; **Plan for Day 2** Dr Shivaraju H Puttaiah and Dr David Jenkins

19:30 – 21:00	**Networking Dinner (On Campus)**

Day 2 – Wednesday 26th June 2019

Time	Agenda item
08:45 – 09.00	**Welcome to Day 2 (Boardroom, JSSAHER)** Dr Shivaraju H Puttaiah and Dr David Jenkins
09:00 - 11:00	**Session 5: Drinking Water Availability and Quality** **Session Chairs:** Dr William Hunter (Ulster University, UK) and Dr Shivaraju H Puttaiah (JSSAHER, India) **Presentations: 15 min talks + 5 min questions (20 min total per presentation)** • Dr Giuliano Punzo (University of Sheffield, UK) - Networks, water systems, urban sustainability and resilience: An integrated approach • Dr Pallavi N (JSSAHER, India) - Water quality parameters of urban and rural lakes in Mysuru district • Mr Dineshkumar Singh (Tata Consultancy Services Ltd., India) - Use of Digital Five Forces to understand, plan and adapt the impact on freshwater due to climate change • Dr Bhopal Pandeya (Imperial College London, UK) - Can citizen science and affordable monitoring technologies address water management challenges at local scale? • Dr Bheemappa K (Bangalore University, India) - Shoreline Conservation Strategies - A profile in the Peri Urban area Fresh water Lakes of Bengaluru **Facilitated Discussion** (20 min)
11:00 – 11.30	**Tea and Coffee Break**
11:30 – 12:50	**Session 6: Wastewater Management and Use** **Session Chairs:** Dr Diganta Das (Loughborough University, UK) and Dr Namrata Sengar (University of Kota, India) **Presentations:** 15 min talks + 5 min questions (20 min total per presentation) • Dr Devendra Saroj (University of Surrey, UK) – Reducing the spread of pollutants from municipal wastewater using a combined system • Dr Alejandro Gallego Schmid (University of Manchester, UK) - Life cycle assessment (LCA) of wastewater treatment in developing countries **Facilitated Discussion** (20 min)
12:50 – 14:00	**Lunch**
14:00 –16:00	**Session 7: Poster Presentations (Boardroom, JSSAHER)** **Session Chairs:** Ms Sai Veena (Indian Institute of Technology Bombay, India) and Mr Matteo Tucci (University of Cambridge, UK) Each poster presenter will have 2 min to give a pitch about their poster, then everyone will be invited to view the posters and discuss with poster presenters (see table below for Poster Presenters and Titles)
16:00 – 16.30	**Tea and Coffee Break**

16:30 – 18:10	**Session 8: Safe and Sustainable Technologies and Strategies for Water-Food- Energy Security (1)** **Session Chairs:** Dr. A.K.Sahai (IITM, India) and Dr Devendra Saroj (University of Surrey, UK) **Presentations: 15 min talks + 5 min questions (20 min total per presentation)** • Prof Awadhesh Jha (University of Plymouth, UK) - Applications of 'biomarkers' in environmental risk assessment: linking human and environmental health • Dr Sanjeev Kumar (Central University of Jharkhand, India) - Remediation of heavy metals and inorganic pollutant through plants species • Dr William Hunter (Ulster University, UK) - Assessing ecological sensitivity to pharmaceutical pollution using the Tea-Bag Index. • Dr Ritu Singh (Central University of Rajasthan, India) - Nanoparticles based remediation of environmental contaminants **Facilitated Discussions** (20 min)
18:10 – 18:30	**Wrap-up of Day 2** with key messages; **Plan for Day 3** Dr Shivaraju H Puttaiah and Prof Awadhesh Jha
19:30 – 21:00	**Networking Dinner : Royal Orchid Metropole, Mysuru**

Day 3 – Thursday 27th June 2019

Time	Agenda item
08:50 – 09:00	**Welcome to Day 3** Dr Shivaraju H Puttaiah and Dr David Jenkins
09:00 – 9:55	**Session 9: Safe and Sustainable Technologies and Strategies for Water-Food- Energy Security** **Session Chairs:** Prof Manoj Kumar Basavarajappa (JSS S&TU, India) and Dr William Hunter (Ulster University, UK) **Presentations: 15 min talks + 5 min questions (20 min total per presentation)** • Dr Anbazhagi Muthukumar (Central University of Kerala, India) - Presence of potentially bioaccumulative and toxic per- and polyfluoroalkyl substances in the aquatic environment • Mr Matteo Tucci (University of Cambridge, UK) - Floating MFC for real- time wastewater monitoring: Field application **Facilitated Discussion** (15 min)

9:55 – 11:10	**Session 10: WFE Nexus technology for sustainable management** **Session Chairs:** Dr David Jenkins (University of Plymouth, UK) & Dr Ritu Singh (Central University of Rajasthan, India) **Presentations: 15 min talks + 5 min questions (20 min total per presentation)** • Mr Sunil Singh (PETCI, India) - Strategy for finding fresh water from rain water: Local technology vs latest technology • Dr Diganta Bhusan Das (Loughborough University, UK) - Sensing for water quality (Time Domain Reflectometry and membrane based sensors) **Facilitated Discussion** (15 min)
11.10 – 11:40	Tea and Coffee Break
11:40 – 12:30	**Briefing on the Field Trip:** Scope and Objectives, Location and other Important Information Dr Shivaraju H Puttaiah and Dr. David Jenkins
12:30 – 13:40	Lunch and Preparation for Field Trip
13:50 – 18:00	**Visit to Industries** Jubilant Pharmaceuticals
19:30 – 21:00	**Networking Dinner (Grand Mercure, Mysuru City)**

Day 4 – Friday 28th June 2019

Time	Agenda item
09:00 – 09:10	Welcome to Day 4 Dr Shivaraju H Puttaiah and Dr David Jenkins
09:10 – 09:30	**Informal collaborations and India-UK funding opportunities** Dr David Jenkins
09:30 – 10:30	**Session 11: Looking Ahead** **Session Facilitators:** Dr David Jenkins & Dr Shivaraju H Puttaiah **Sub-Session 11.1: Problem Definition** **Objective:** Identify the key problems noted in the first 3 days; develop a clear definition/ problem statement (what the problem is, how this problem manifests/occurs/develops, where this problem occurs, who the problem affects) *Group discussion and reporting session*
10:30 – 11:00	Tea
11:00 – 11:30	**Sub-Session 11.2: Prioritisation** **Objective:** Prioritise to enable selection of the key problems *Group work and discussion*
11:30 – 12:30	**Sub-Session 11.3: Solutions** **Objective:** Identify solutions to the prioritised problems *Group work*

12:30 – 13:00	**Sub-Session 11.4: Impacts and Way Forward** **Objective:** Identify the impact of the possible solutions and consider which one could be considered for future collaborative projects, including publishing a paper for example *Group work*
13.00 – 14.00	**Lunch**
14:00 – 14:30	Group work to finalise presentations
14:30 - 15:30	**Final Group Presentations (10 min) per group** *Presentations and discussions*
15:30 – 16:00	**Closing Remarks** Feedback Submitted and Posters Removed

Annex B: Poster Presentations

Name	Organisation Name	Title
Dr Wazir Alam	Manipur University (A Central University), India	A Review on Water Security Status of Few Hilly and Valley Districts of Manipur, India
Mr Prashant Basavaraj Bhagawati	Annasaheb Dange College of Engineering and Technology, India	Electrocoagulation is a potential method for removal of fluoride from drinking water.
Mr Jonathan Bloor (rep by Dr David Jenkins)	University of Plymouth, UK	Capacitive Deionisation of brackish water a competitor for Reverse osmosis
Dr Rohit Goyal	Malaviya National Institute of Technology, India	Action Plans for Rejuvenation of Chambal River.
Mr. Anil Kumar Kotermane	JSSAHER, India	Determination of Gross Alpha Activity and Physico- Chemical Parameters of Borewell Samples of Mysore District, India
Mr. Ujjwal Kumar	T.M. Bhagalpur University, India	Arsenic(III), Chromium(VI) and Dyes contamination in water resources and their sustainable resolution through bioremediation in Gangetic plain of Bihar, India.
Dr Arivazhagan M	National Institute of Technology Tiruchirappalli, India	On the use of Moringa oleifera seeds to treat natural dye effluent
Mr. Midhun G Oliparambil	JSSAHER, India	Treatment of Sewage via Filtration and Mn-TiO2/Fe-Cu- Zno Nano-Composite
Ikram Srinivasa Raghavan	Indian Institute of Science Bangalore, India	Development of Oil Absorbing Polymer Product for Efficient Removal of Oil Spills in Sea Water
Mr. Yashas Shivamurthy Ravindra	JSSAHER, India	Hybrid-photoelectrocatalytic process for treatment of contaminants of emerging concerns in water
Ms. Pallavi Siddappa	JSSAHER, India	A strategy oriented sustainable assessment plan for urban water management
Ms Kumari Sonu	JSSAHER, India	Preparation of floating clay beads for water treatment using natural sunlight as an alternative driving energy

Back cover image: Kerala, India (Unsplash)

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