Project Highlight Report

February 2019

INDIA-UK
Water Centre
भारत-यूके
जल केन्द्र

The India-UK Water Centre (IUKWC) promotes cooperation and collaboration between the complementary priorities of NERC-MoES water security research.

भारत-यूके जल केंद्र एम.ओ.ई.एस - एन.ई.आर.सी (यूके) जल सुरक्षा अनुसंधान की परिपूरक प्राथमिकताओ के बीच सहकार्यता और सहयोग को बढ़ावा देता है ।

CITATION

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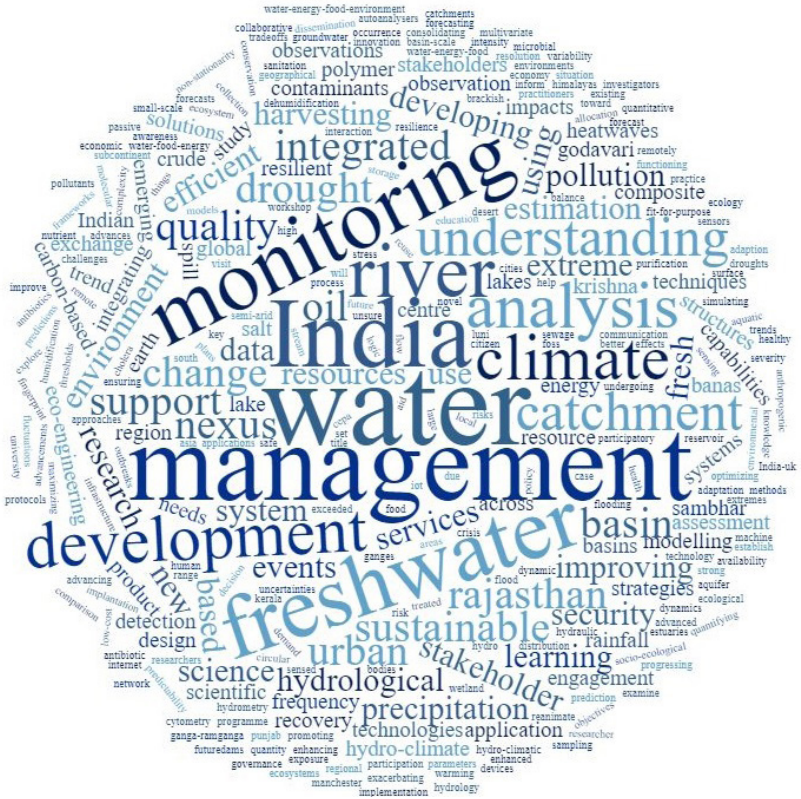
Images by Emma Bennett and Sunita Sarkar



*Created from activity proposals received by IUKWC

Introduction

The India UK Water Centre (IUKWC) was established in 2016 in order to promote cooperation and collaboration between complementary priorities of NERC-MoES water security research. The Centre aims to establish a platform for, and legacy of, long-term partnerships and dialogue between Indian and UK water researchers, water policy-makers and water businesses.

The Centre's scientific scope is defined by five cross-sectoral themes:

- Developing hydro-climate services to support water security;
- Building cross-sectoral collaborations to understand the dynamic interactions across the water-energy-food nexus;
- Using new scientific knowledge to help stakeholders set objectives for freshwater management;
- Improving freshwater monitoring frameworks and data for research and management;
- Transforming science into catchment management solutions.

The Centre's objectives are to support UK-Indian water science through:

- Engaging the community;
- Facilitating partnerships and building capacity;
- Enhancing knowledge exchange;
- Supporting future India-UK collaboration; and
- Developing effective communication platforms.

In order to meet these objectives, the IUKWC's portfolio has included activities such as, Science Workshops, Researcher Exchange schemes, User Engagement Initiatives (UEIs), Pump Priming projects, and Grassroots Field Exposure Sessions (GFES), as well as the establishment of communication platforms, including a fully functional website (www.iukwc.org), an Open Network of India-UK Water Scientists and active social media presence.

This report outlines the activities undertaken by the project since it was established, highlighting its achievements and key messages for the future.

Measures of Success

The aim of this report is to highlight how far the IUKWC has progressed towards meeting its objectives in the past two and a half years. As 'engagement', 'enhancing', 'facilitating' are difficult to directly measure, the IUKWC Management Board developed proxies through which to assess success. These proxies include:

- Level of membership to the Open Network of India-UK Water Scientists, over time (including sub-metrics to identify diversity of scientific interest, location, organisation);
- Reach of online communications (including website hits, social media statistics);
- Levels of engagement with activities over time (including numbers of proposals/applications; and sub-metrics to identify diversity of scientific interest, location, organisation);
- Collaboration proxies such as: recording numbers of new connections made (for example, pre- and post-events), metrics of numbers of collaborative proposals/papers that might be derived from activities, and anecdotal evidence of new Indo-UK networking outside of Centre activities.

Sections of this report outline the status of each of these proxy measures.

Summary of Activities

Since inception, the Centre has convened four Science Workshops (with two currently in planning to take place in May and June 2019); supported thirteen Researcher Exchanges (eight Junior scientists and five Senior scientists); funded three Pump Priming projects (with two proposals under review for commencement in April 2019); organised one UEI (with one in planning to take place at the beginning of March 2019); and run two GFES (with one in planning to take place at the end of February 2019). Table 1 outlines details on the activities that the Centre has convened since its inception.

Table 1: India-UK Water Centre activities undertaken or in planning since inception in 2016, with links to selected outputs

Date and Location	Activity	Title and Leads	Outputs and Outcomes	No of Participants from Each Country
November/ December 2016 IITM, Pune, India	Science Workshop	**Developing Hydro-Climatic Services for Water Security** Dr. A.K. Sahai and Prof. H. Dixon, IUKWC	Activity Report Water Brief 01	14 UK, 46 India
March-August 2017 University of Birmingham	Pump Priming project	**Current Opportunities and Challenges in Developing Hydro-Climatic Services in the Himalayas** Dr. M. Widmann	Water Brief 04 This project led to the Science Workshop in Dehradun	1 UK lead + 1 UK co-author and 6 India co-authors
April-May 2017 Watershed Organisation Trust (WOTR), India	Junior Researcher Exchange	**Consolidating Learning about Stakeholder Engagement from Research and Practice: Toward the Development of Hydro-climatic Services** Dr. M. Daly, University of Leeds, UK (Host Mr. C. Iobo)	Activity Report Water Brief 03	1 UK to India
May 2017 Ashoka Trust for Research in Ecology and the Environment (ATREE), India	Senior Researcher Exchange	**The Use of Passive Sampling Devices to Improve the Monitoring of Anthropogenic Pollutants in River Catchments in India** Prof. G. Fones, University of Portsmouth (Host Dr. P. Jamwal)	*Reports in preparation*	1 UK to India
May 2017 University of Exeter, UK	Junior Researcher Exchange	**Quantifying Resilience of Water Infrastructure to Extreme Precipitation Events in Urban Areas** Ms. C. Rupa, IISc Bangalore, India (Host Prof. G. Fu)	Activity Report	1 India to UK
May-June 2017 Cranfield University, UK	Junior Researcher Exchange	**Ecosystem Services Assessment and its Implementation in UK** Dr. S. Sen, IIT Roorkee, India (Host Dr A. Momblanch)	Activity Report Water Brief 02	1 India to UK

Date and Location	Activity	Title and Leads	Outputs and Outcomes	No of Participants from Each Country
June 2017 Institute of Development Studies, University of Sussex, UK	Senior Researcher Exchange	**Understanding Water–Energy–Food Security Nexus to Design Technology and Policy Approaches for Enhanced Adaptation to Climate Change in India** Dr N.K. Tyagi, International Development Centre Foundation, India (Host Dr L. Mehta)	Activity Report and annexes Water Brief 05	1 India to UK
June, 2017 University of Stirling, UK	Science Workshop	**Enhancing Freshwater Monitoring Through Earth Observation** Dr A. Tyler and Dr M. Dash, IIT Kharagpur, India	Activity Report	21 UK, 16 India
July-October 2017 Anglia Ruskin University	Pump Priming project	**Stakeholder Engagement in Hydro-climatic Services in India** Dr Z. P. Barucha	Water Brief 06	1 UK lead + 2 UK co-authors and 2 India co-authors
July 2017-October 2018 King's College London and University of Delhi	Pump Priming project	**Synergistic Utilisation of EO-Based Soil Moisture Observations: Applications in the UK and India** Dr E. Tebbs and Dr M. Gupta	*Reports in preparation*	1 UK and 1 India co-lead
January, 2018 IUKWC (CEH and IITM), Kochi	UEI	**Improving Freshwater Monitoring Frameworks for Data and Research Management** Dr A.K. Sahai and Prof. H. Dixon, IUKWC, with support from Plymouth Marine Laboratory, UK and Nansen Environmental Research Centre, Kochi	Activity Report	24 Indian stakeholders representing 5 southern states, 8 UK and 8 India scientists
April-May 2018 University of Leicester, UK	Senior Researcher Exchange	**Integrating Remotely Sensed Observations of Surface Water Storage with Climate Forecast for Freshwater Management** Dr V. Mishra, IIT Gandhinagar, India (Host Dr H. Sembhi)	*Reports in preparation*	1 India to UK

Date and Location	Activity	Title and Leads	Outputs and Outcomes	No of Participants from Each Country
May 2018 University of York, UK	Junior Researcher Exchange	**A Small-Scale Monitoring Study for a Range of Pharmaceuticals in the River Foss Catchment and Comparison to Concentrations in the River Nag in India** Ms. A. Singh Kachhawaha, CSIR-NEERI, India (Host Dr. A. Boxall)	*Reports in preparation*	1 India to UK
May 2018 Wildlife Institute of India, Dehradun, India	Science Workshop	**Integrating Precipitation Forecasts and Climate Predictions with Basin-Scale Hydrological Modelling in the Himalayas** Dr S. Tayal and Dr M. Widmann, University of Birmingham, UK	*Reports in preparation*	12 UK, 21 India
July 2018-March 2019 IITM, India	Junior Researcher Exchange	**Are Heatwaves Exacerbating Drought Situation in India? Trends in Occurrence and Intensity of Drought and Heatwaves** Mr. R. Tiwari, University of Leeds, UK (Host Dr S. Joseph);	*RE in final phase*	1 UK to India
September 2018 Lancaster University, UK	Science Workshop	**Advancing Drought Monitoring, Prediction and Management Capabilities** Professor P.M. Atkinson and Dr V. Chakravarthi, University of Hyderabad, India	*Reports in preparation*	17 UK, 19 India

Date and Location	Activity	Title and Leads	Outputs and Outcomes	No of Participants from Each Country
December 2018 Sunderbans, West Bengal, India	GFES	**Managing and Monitoring Agricultural Water Demand** Dr L. Das (Bidhan Chandra Krishi Viswavidyalaya, India) and Mr. D. Joshi (Advanced Centre for Water Resources Development and Management, India)	*Reports in preparation*	8 UK and 9 India; Stakeholders included: 2 grassroots NGOs, about 150 – 200 farmers (men and women); 20 representatives from a District-level governing body; 5 representatives from a District irrigation management body and 3 local academic institutions
December, 2018 Kolkata, West Bengal, India	GFES	**Water Quality – Source Protection; Management of Arsenic and Fluoride in Groundwater Together with the Catchment Scale Management of Industrial Pollution** Dr M. Tiwari (IIT Kharagpur, India) and Dr R. Allan (James Hutton Institute, UK)	*Reports in preparation*	11 UK and 13 India; Stakeholders included: representatives from 4 state government WRM departments; Central Ground Water Board; IMD; 2 NGOs and 30 pisciculture and agriculture representatives; 10 representatives of local Panchayat; representatives from two water intensive industries

Date and Location	Activity	Title and Leads	Outputs and Outcomes	No of Participants from Each Country
February-March 2019 Indian Institute of Science, Bangalore, India	Junior Researcher Exchange	**Development of Carbon-Based Polymer Composite Produce for Efficient Recovery of Crude Oil in Oil Spill Environment** Mr. J. Bloor, Plymouth University, UK (Host Dr S. S. Gorthi)	*RE in preparation*	1 UK to India
February-March 2019 Water Wisdom Foundation and IIT Gandhinagar, India	Junior Researcher Exchange	**Freshwater Resources Analysis from Water Harvesting Structures in the Sambhar Salt Lake region, Rajasthan** Ms. P. Arce Vicente, University of Exeter, UK (Host Dr V. Mishra and Dr D. Sharma)	*RE in preparation*	1 UK to India
February, 2019 Narmada Sagar and Bhopal, India	GFES	**Water Resource Management & Supply in Central India** Dr P. Kumar (IISER, India), Dr S. Sinha (University of Leeds, UK), and Dr A. Gagnon (Liverpool John Moores University, UK)	*Activity in planning*	11 UK and 19 India Stakeholders expected to include: state watershed management body and associated farmers; representatives from pilot horticulture and irrigation management projects; representatives from Narmada Hydroelectric Development Corporation; local academic institutions

Date and Location	Activity	Title and Leads	Outputs and Outcomes	No of Participants from Each Country
February/March, 2019 Bhopal, India	UEI	**Water Resource Management & Supply in Central India** Dr P. Kumar (IISER, India), Dr S. Sinha (University of Leeds, UK), and Dr A. Gagnon (Liverpool John Moores University, UK)	*Activity in planning*	13 India stakeholders, 7 UK and 9 India scientists Stakeholders expected to include: Representatives from 5 state government WRM bodies responsible for water supply for rural, urban, agriculture and industrial areas, and energy ; local academic institutions; 5 local NGOs, amongst others
March-May 2019 University of Manchester, UK	Junior Researcher Exchange	**Establishing a Collaborative Network with Investigators of FutureDams on the Water-Energy-Food-Environment Trade-Offs, Economic Impacts and Water Governance** Ms. A. Pradhan, ATREE, India (Host Dr T. Foster)	*RE in preparation*	1 India to UK
April-May 2019 IIT Kharagpur, India	Senior Researcher Exchange	**System Complexity and Stakeholder Needs - Ensuring River Basin Models for Climate Change are Fit-for-Purpose** Professor I. Holman, Cranfield University, UK (Host Prof. R. Singh)	*RE in preparation*	1 UK to India
May, 2019 University of Warwick, UK	Science Workshop	**Science and innovation for Catchment Management** Mr. A. Parsons (ICE Blue, UK) and Dr K. Gupta, IIT Bombay, India	*Activity in planning*	Delegates selection in progress

Date and Location	Activity	Title and Leads	Outputs and Outcomes	No of Participants from Each Country
May-June 2019 Lancaster University, UK	Senior Researcher Exchange	**A water balance analysis to Support Sustainable River Basin Management in Desert River Luni, India** Dr P. Pani, Jawaharlal Nehru University, India (Host Prof. P.A. Carling)	*RE in preparation*	1 India to UK
June 2019 JSSAHER, Mysuru, India	Science Workshop	**Safe and Sustainable Technologies and Strategies for Integrated Freshwater Resource Management** Dr S. Puttaiah and Dr D. Jenkins, Plymouth University, UK	*Activity in planning*	Open call for delegates in progress

Membership of the Open Network of Water Scientists

The Open Network of India-UK Water Scientists (https://iukwc.org/open-network) is an online, searchable database of individuals and organisations based in the UK or India with research interests in water security; it is free to join. The network provides an information source for researchers and is used by the IUKWC to disseminate communications, circulate calls for new activities and identify participants for commissioned activities.

Membership of the Open Network has consistently risen since the inception of the Centre and membership was at 801 as at the end of 2018 (Figure 1). Membership by country shows that in both the UK and India membership is consistently increasing (Figure 2), with an India to UK ratio of 3:1, as would be expected.

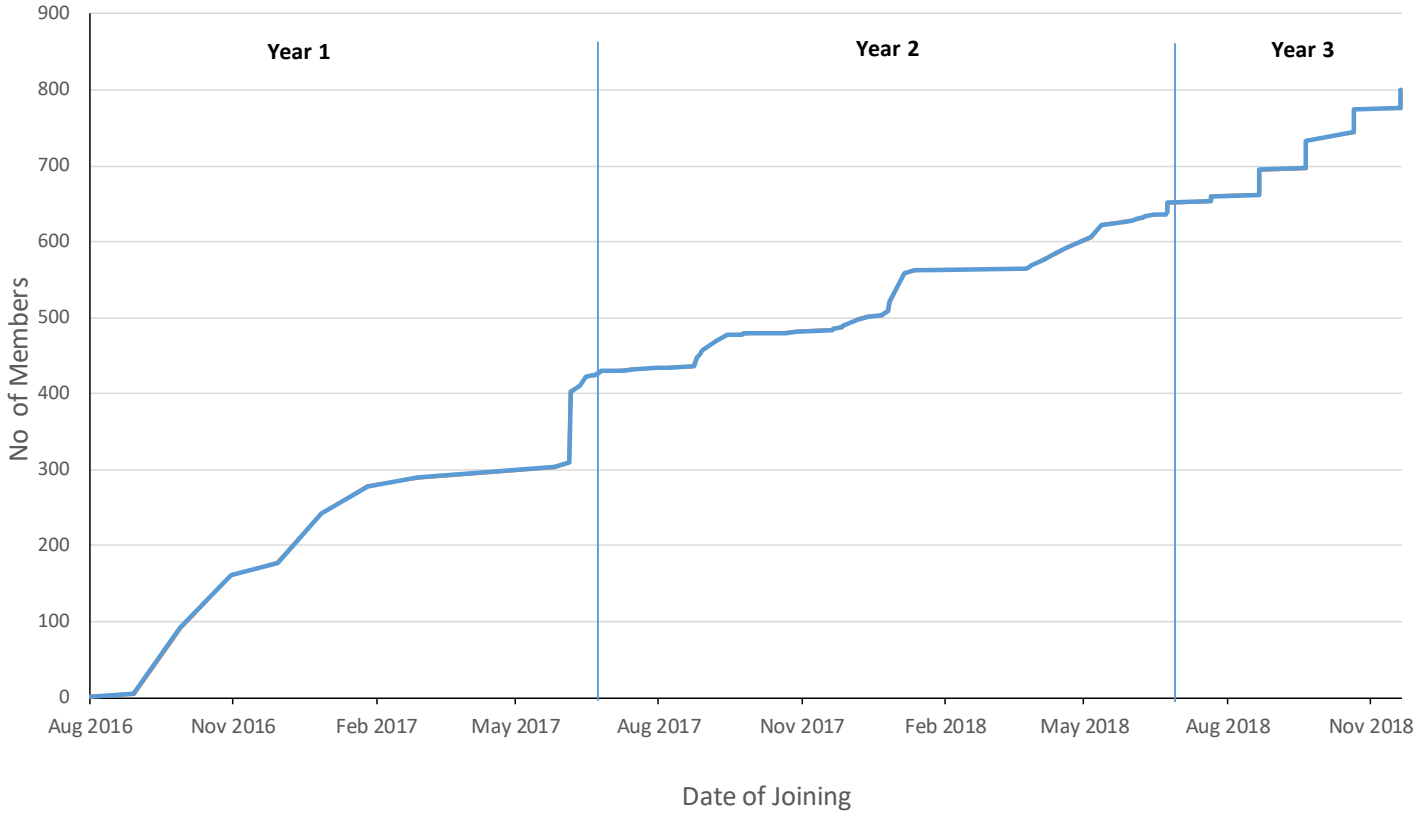


Figure 1: Membership of the Open Network over time

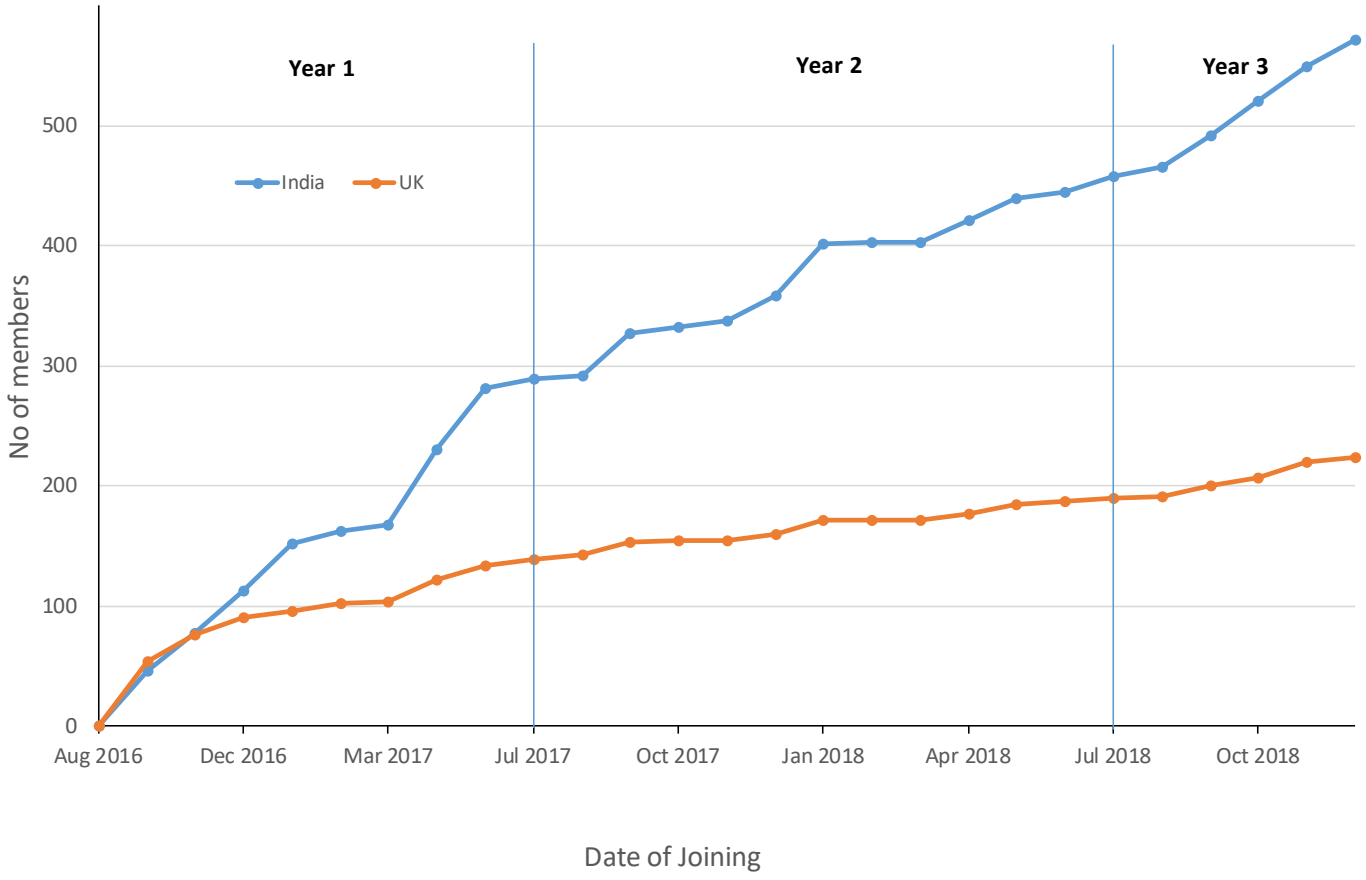


Figure 2 Membership of the Open Network by country

Over the last two and a half years, the number of cities from which our Open Network members join (Figure 3) and the diversity of institutions (Figure 4) that represent our members, continues to grow.

An online survey of the members of the Open Network was conducted, over a period of three weeks in January 2019, to gather information on the benefits they are receiving from the existence of the Open Network, and the Centre and its activities, as well as to determine how well the Centre was performing. Nine percent of the members responded (equivalent to 72 members), which is close to what we expected for an email survey conducted over a short period of time on an online membership platform where a number of the members are passive and interested in the information rather than participating actively in any events or activities. More details of this survey are given in the section below, but here some of the comments from the membership are noted in terms of their perceived benefits from being an Open Network member, in particular around building collaborations, which ranked second after enhanced knowledge about water issues/science in the other country:

'International connections and meeting outcomes.'
Indian researcher, who has participated in an IUKWC activity

'Engaging with the IUKWC provide me an opportunity that hones my skills and knowledge, as well as enable me to build new connections.'
Indian Researcher, who has not yet participated in an IUKWC activity

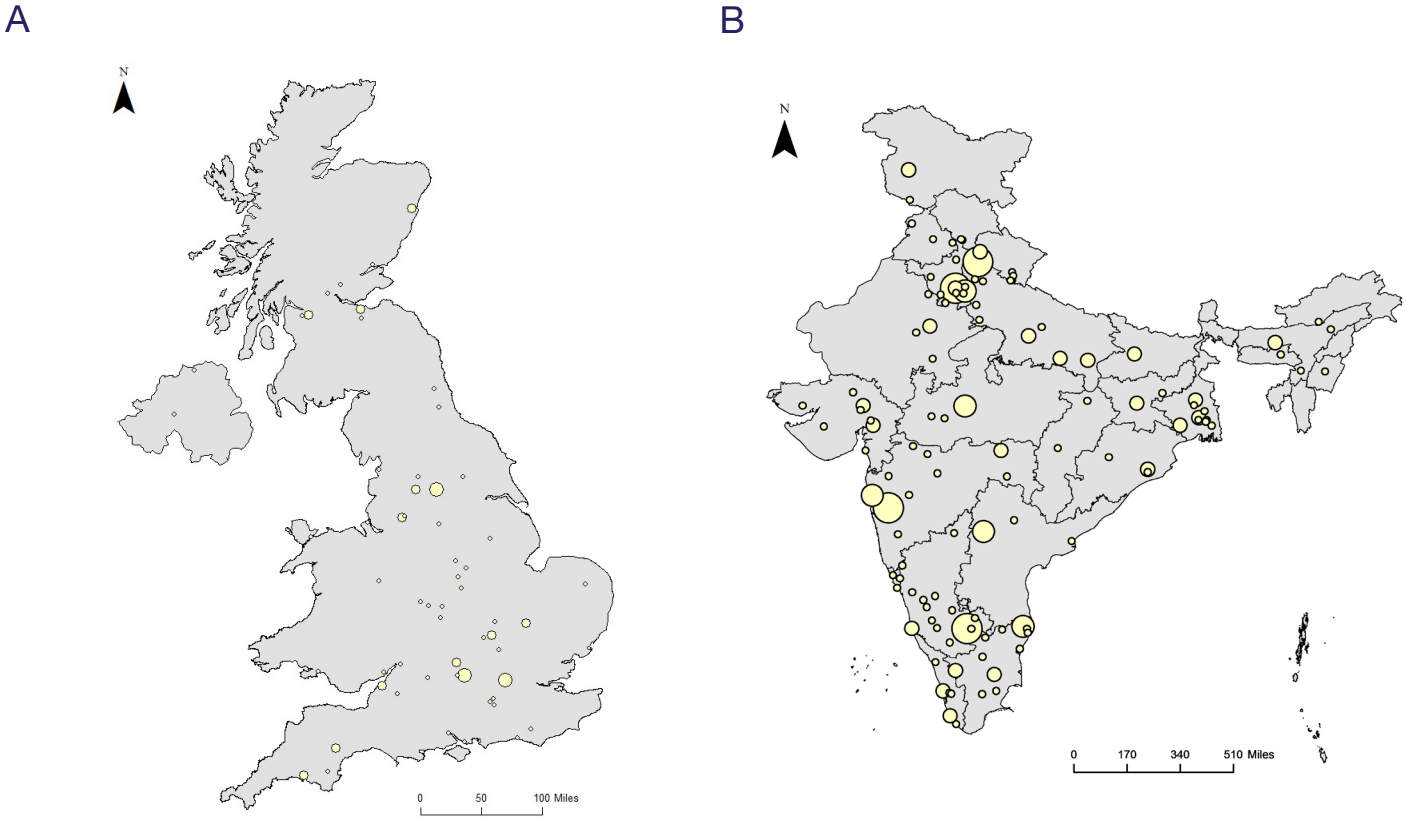


Figure 3: Distribution of Open Network members in the UK (A) and in India (B), where the size of the circle represents the number of members (the smallest representing 1 person and the largest more than 100).

'Networking with scientists from India as well as UK, 'real world' field experience of stakeholder problems, involvement in rethinking sustainable solutions, connections across societal sectors (from village to NGO and up to government and academic), inspiration from all these experience, input to bidding for impactful research, active scientist community engagement'

UK researcher, who has attended an IUKWC event

These comments support the future plans for the Centre, which include a focus on increasing opportunities for researchers to learn from grassroots-level and management-level stakeholders, as well as to take ideas further through Researcher Exchanges and Pump Priming projects. This is in addition to continuing to improve the level of engagement with existing members through an improved website, webinar series, and an e-Newsletter.

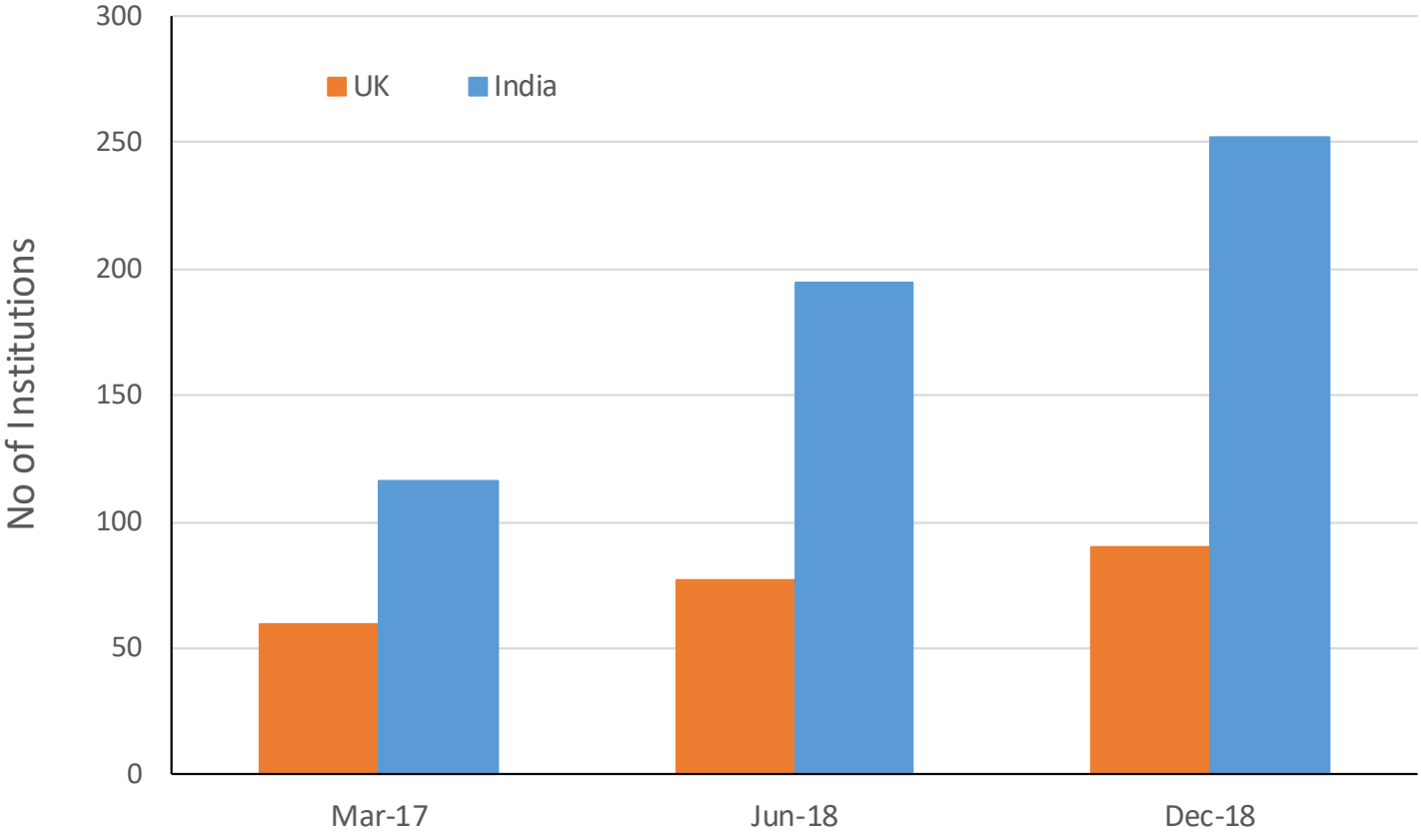


Figure 4: Open Network members by number of institutions from which they join per country over time

Communications Reach

The IUKWC considers a vibrant programme of open on-line, face-to-face and print communication activities to be a key part of engaging the community. The Centre's communication plan, therefore, aims to:

- Raise awareness of the IUKWC among the UK and Indian water research community;
- Engage with, and disseminate information to, this community; and
- Grow the membership of the Open Network.

Since inception, these aims have been fulfilled by the presence of an active website and social media presence, as well as an active email address that is managed jointly by the Secretariat based in both CEH and IITM. Highlights of the progress made with these channels of communication are detailed below.

Website

The number of visits to the IUKWC website, as well as the number of unique users has continued to increase from September 2016, when the website was established, and January 2019 (Figure 5).

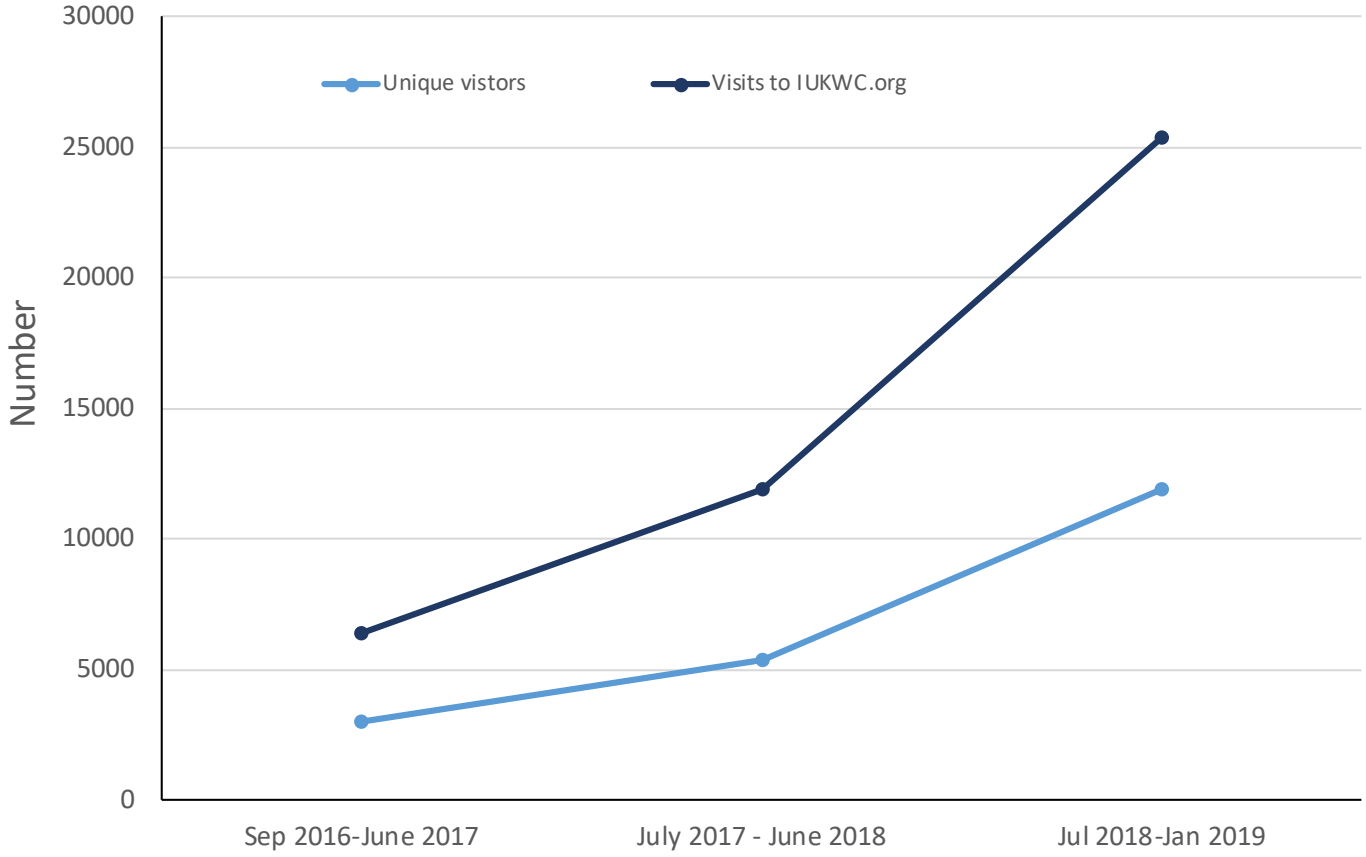


Figure 5: Total number of unique visitors and visits to the www.iukwc.org website for the period September 2016 to January 2019

An assessment of the average number of pages accessed per visit has increased from 4.25 pages to 7.75 pages, which is indicative of the increasing amount of information that is being shared on the website. The bounce rate, or the percentage number of visitors who leave the site without visiting a second page, has also reduced from 34% to 13%. With the plans proposed to improve the website and enhance user-experience over the next three years, we expect these statistics to grow and improve further.

Website Functionality

The functionalities of the IUKWC website enable the Centre to host webinars and surveys, includes a discussion forum, and the searchable Open Network. Some of these functionalities have been used by members, such as the webinar functionality for a Pump Priming project in June, 2017, and the survey functionality for Drs Tebbs and Gupta's Year 2 Pump Priming project in 2018 and the members' survey, introduced above. These functionalities were developed in response to the needs of members and Activity Leads to deliver activities, and will be maintained to serve the membership. It is planned, however, that a webinar series be established if the Centre is funded for an additional period of time.

Website Content

The IUKWC website provides access to publications, events, and news items on current water security issues. Some of this content is open to the public, whereas content such as Briefs, Reports, Workshop presentations, and application forms for activities are only available to Open Network members (so as to encourage new members). The website hosts a Community News section which allows members, to promote news, events, and opportunities from the wider Indian and UK Water Science communities that may be relevant to IUKWC members.

Key pages of the website that are useful for the wider base of water resources stakeholders (for example pages leading to the publications) are now fully translated into Hindi, thus increasing its reach within India and Hindi-speaking stakeholders. The searchable library has also been developed and continues to be populated with Centre publications, documents and event materials.

Social Media

The IUKWC has established Twitter and Facebook accounts, through which all activities and news items are shared with members and the wider community interested in water security and related issues. The metrics for both these accounts show positive growth trends as shown below.

IUKWC's Twitter Presence

The total number of Twitter follows has continued to increase, as has the number of new followers (Figure 6). The total number of followers stood at 416 at the end of December, an increase of 72 new followers from July 2018. The split between genders remains at 69% male to 31% female. There has been a switch of use between the UK and India, with 42% followers from India and 38% from the UK, the almost exact opposite was true six months earlier in June. The remaining followers (20%) are from other countries including the USA, Canada, Ireland and other European and African countries.

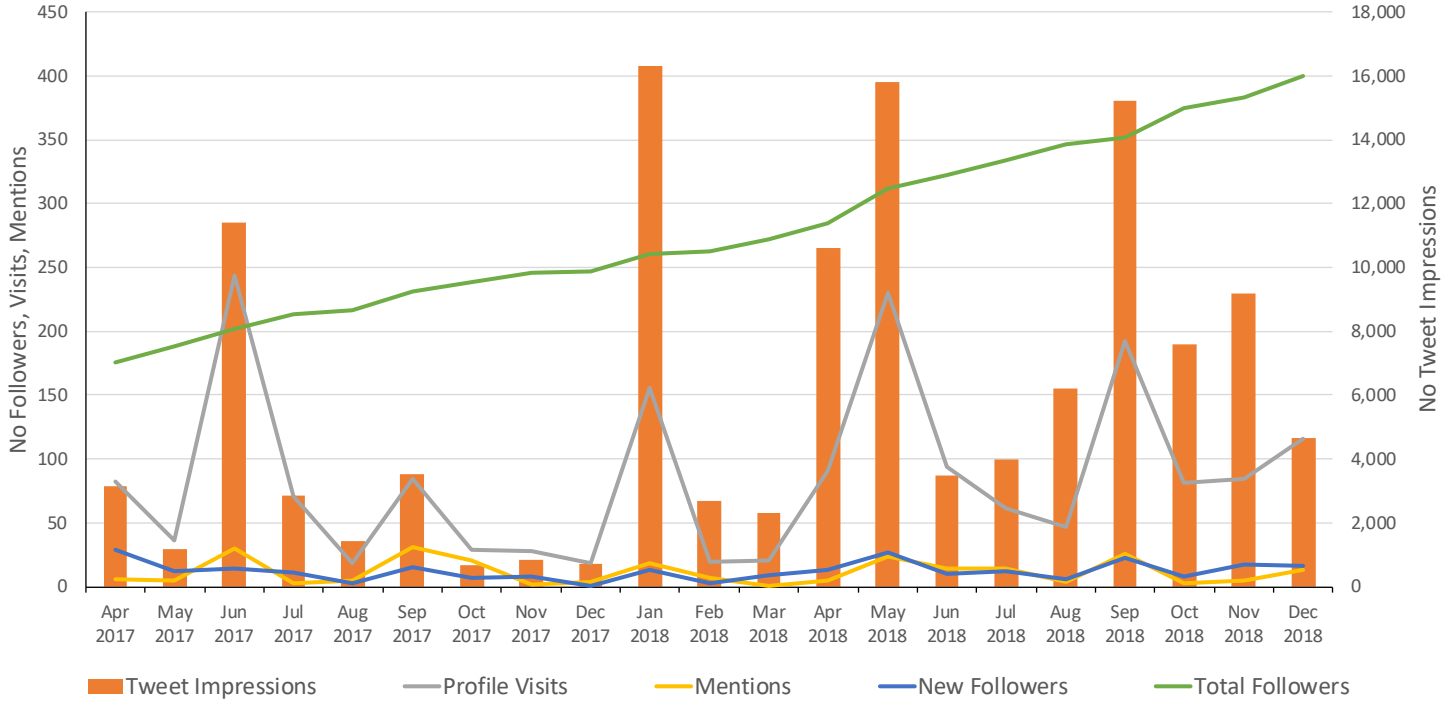


Figure 6: Twitter Analytics for the period April 2017 to December 2018; Tweet impressions: number of times our tweets are seen; Profile visits: number of visits to the @IndiaUKWater Twitter profile; Mentions: Number of times @IndiaUKWater is mention directly within another tweet; New Followers: new followers of the @IndiaUkWater account. NB. The axis on the right indicates the number of tweet impressions.

IUKWC's Facebook Presence

The IUKWC Facebook page (https://www.facebook.com/IUKWC/) contains posts on the latest news in the India–UK water security sector, as well as activity calls, photos, updates and outputs. The number of followers continues to grow since the account was set-up in August 2017 and as of the end of January 2019, the Centre had 179 dedicated followers (Figure 7).

Figure 7: Facebook Analytics for the IUKWC Facebook page, showing the number of followers between August 2017 and January 2019.

Levels of Engagement with Activities

The IUKWC has now convened seven events, with another five in advanced stages of planning, and has supported 16 short-term exchanges and projects. Except for the first Workshop and UEI, which were convened and lead by IUKWC, Leads for all activities have been either selected from an Open Call or by appointment when deemed necessary. Delegates for all events, except for the first UEI, have been selected through Open Calls.

Activity Leads

When open calls have been used for selecting Activity Leads, i.e. for all Researcher Exchanges and all but the first Science Workshop, proposals have come from a large number of applicants with a wide range of scientific interest, within the five cross-sectoral themes of the Centre (Figure 8), and covering a wide range of topics. In ranking these applications, the Management Board has devised a scoring

system from 0 to 6, with any score of 2 and below considered below threshold for consideration. Scores are given against the following criteria:

- Fit to scientific scope of the IUKWC;
- Timeliness of topic (timeliness in scientific terms as well as with respect to balancing portfolio of the IUKWC over the funding period);
- Risk of successful delivery;
- Capability of individuals/organisations to run the activity (experience in running similar activities);
- Relevant expertise of individuals;
- Anticipated added value.

This system of scoring is used each time applications for leads of activities are considered.

Over the period of two and a half years, the total number of applicants to lead Workshops has been 25, with 12 for Workshops in the UK and 13 for Workshops in India. Of this, between 3 and 4 applicants have been below threshold and thus ineligible. Of the remaining applications, 75 - 80% are rejected due to available funding. Similarly, for Researcher Exchanges, for which the Centre has received a total of 39 applications, circa. 60% of the applicants have had to be rejected on the basis of insufficient funding.

A key aspect of the selection process is to ensure sufficient diversity in locations for events and Researcher Exchanges to be held, which the IUKWC Management Board has achieved (Figure 9).

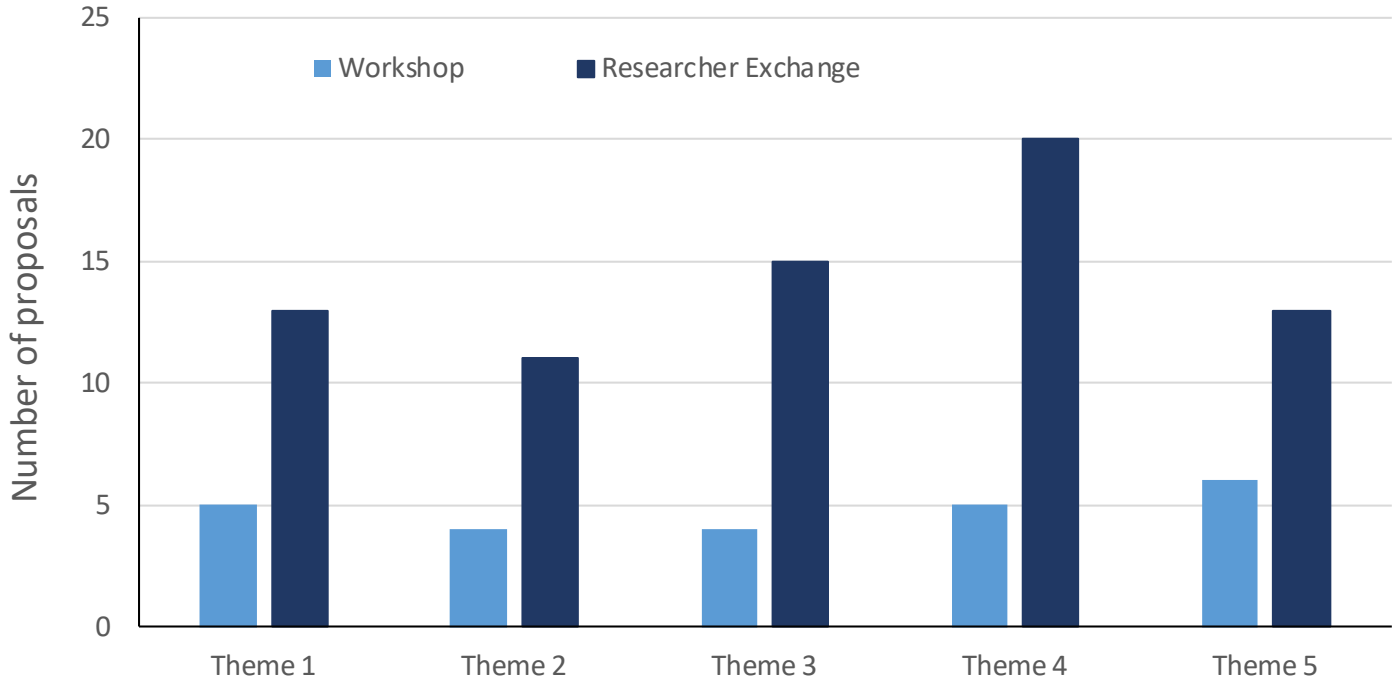


Figure 8: Diversity in scientific scope of applications received to lead workshops and researcher exchanges since inception of the India UK Water Centre; Theme 1 to 5 are 'Developing hydro-climate services to support water security'; 'Building cross-sectoral collaborations to understand the dynamic interactions across the water-energy-food nexus'; ' Using new scientific knowledge to help stakeholders set objectives for freshwater management'; ' Improving freshwater monitoring frameworks and data for research and management'; and ' Transforming science into catchment management solutions'

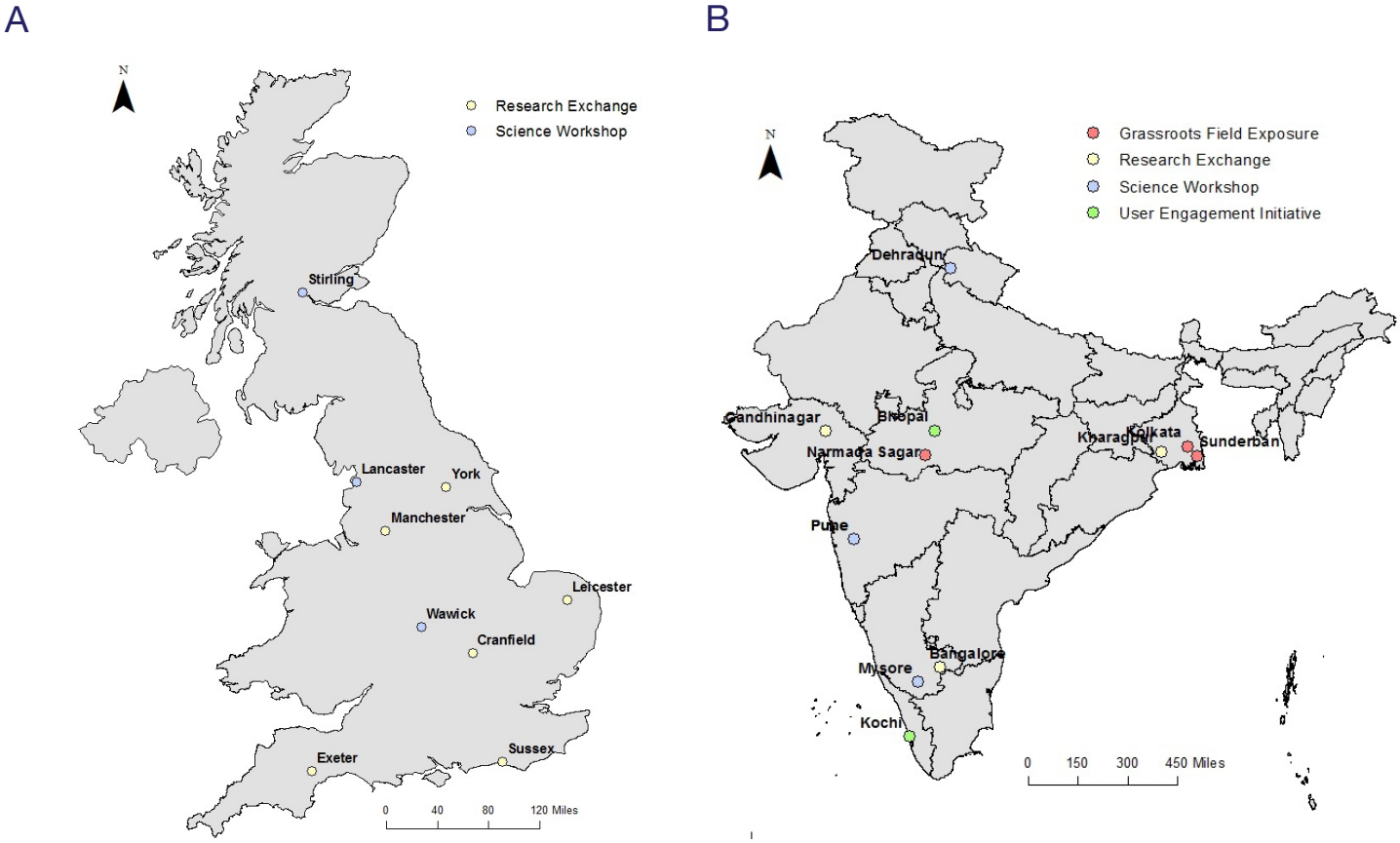


Figure 9: A visual on the distribution of the India UK Water Centre's activities since inception in (A) the UK and (B) India.

Delegates

Open calls have been used to engage members of the Open Network in activities ranging from Science Workshops to the GFES events held in December 2019. The largest number of applications have been received to attend Science Workshops (Table 2), which is expected as most people are familiar with the format and objectives of workshops. However, at least 17% of these applications were below the eligibility threshold when scored, mostly due to insufficient information being provided to make an assessment. Despite this, the rejection rate due to space limitations is on average 13% (Table 2).

Thus far, one UEI event has been held and the delegates were invited to attend. For the second UEI, which is scheduled to take place in March 2019, an open call for delegates resulted in sufficient applications of high quality that none were rejected. However, from the open calls for delegates for the three GFES events, 14% of the applications fell below the threshold and 45% had to be rejected due to over-subscription to the event (Table 2).

The number of applicants for GFES events has grown from the first event to the third event, making them an invaluable addition to the IUKWC programme of work.

Table 2: Applications received for India UK Water Centre activities since inception, separated by country and showing the percentage of applications that fell below threshold and the percent rejected.

Activity	No. Applicants			No. Spaces for Delegates	Rejected	Below Threshold
	Total	UK	India	Total	%	%
Science Workshops (6 no.)	354	90	264	240	13	17
UEI (1 no.)	23	7	16	25	0	0
GFES (3 No.)	76	19	56	36	45	14

Outputs and Outcomes from Activities

The Centre's activities have resulted in a number of outputs and outcomes, including a wide array of IUKWC Water Briefs and Activity Reports, evidence of networks being formed between researchers and between researchers and stakeholders, as well as the development of collaborative proposals and papers.

IUKWC Publications

In the past two and a half years, the Centre has published six Water Briefs (Table 3) with a further nine in preparation. In addition, the Centre has published six Activity Reports, with nine more in preparation.

Feedback from the membership survey (mentioned above) supports the usefulness of these publications in, for example, learning more about the type of science being conducted in both countries and learning about the new research areas in the field of water conservation.

Table 3: Water Briefs Published by IUKWC

Water Brief No.	Title	Authors and Date of publication
01	Developing Hydro-climatic Services for Water Security: Opportunities for Collaboration Between UK and Indian Hydrologists, Climatologists and Stakeholders	IUKWC, April 2017
02	Integration of Ecosystem Services into Catchment Management: Monitoring and Modelling to Provide Solutions	S. Sen, A. Momblanch; March, 2018
03	Towards the Co-production of Hydro-climatic Services: Learning from Research and Practice	M. Daly, C. Lobo, and M. D'Souza; June 2018
04	Developing Hydro-Climatic Services in the Indian Himalayas: Opportunities and Challenges	M. Widmann; April 2018
05	Understanding Water–Energy–Food Security Nexus to Design Technology and Policy Approaches for Enhanced Adaptation to Climate Change in India	N.K. Tyagi and L. Mehta; August 2018
06	Stakeholder Engagement in Hydro-climatic Services in India	Z. Barucha, M. Sosa, A. Bhave, R. Chattopadhyay, M. Green, and J. Krishnaswamy; October 2018

Inter-linking of IUKWC Activities

A number of activities convened or supported by the IUKWC have been interlinked to provide the basis for subsequent activities. The first Science Workshop held in Pune, led to the first two Pump-priming proposals being commissioned, one of which (Water Brief 04) subsequently being chosen through an Open Call for the third Science Workshop held in Dehradun. The second Science Workshop in Stirling led to

the topic for the first UEI, where the IUKWC secured representation from five different states in southern India and from diverse Indian Water Resource Management departments. At least two Junior Researcher Exchanges have arisen directly from new connections made at IUKWC Science Workshops, whilst more recently, two Pump Priming proposals have been submitted for review following the recent GFES events held in December 2019.

Indo-UK Collaborations and Furthering Water Research

Outcomes have not been restricted to follow-up IUKWC activities. There is evidence for further collaborations having developed out of activities. For instance, the Stirling Workshop led to the development and submission of a joint Indo-UK proposal to the GCRF Interdisciplinary Research Hubs call. Following attendance to the Dehradun Workshop, a researcher from Cranfield University established collaboration with the Wildlife Institute of India for potential joint work on freshwater ecosystem services modelling. An Indian delegate also developed a collaboration with a UK researcher that may lead to a new Indo-UK research proposal, through attendance at one of the UK Workshops.

Results from the membership survey conducted in January 2019 revealed that from the respondents who have attended events, three have submitted a new Indo-UK research proposal, eight are developing a new Indo-UK proposal, six have publications other than the IUKWC Activity Reports and Water Briefs, and two respondents said that they have developed new datasets out of their IUKWC activities.

Feedback from the Open Network Membership and Stakeholders

Feedback collected from all our activities thus far, have ranked the events on average 8.7 out of 10. Most heartening is the fact that the most important outcome of all the activities has been the development of new contacts with possibilities for future collaborations (see Progress Report Year 1 and Year 2), one of the main outcomes the Centre was set-up to deliver.

"It was probably the best content/structure of a networking meeting that I have been on. Scientists from both sides exchanged views/experience and was not exclusive meeting of two different nations - it was very mixed"

(IUKWC Workshop 1 Participant)

Furthermore, feedback from the stakeholders who attended the UEI and GFES events give a different but equally important view of the value of these particular events. In reference to the UEI, the stakeholders highlighted that they rarely get opportunities where they can interact with their counterparts from neighbouring states to discuss common issues, as well as with scientists, who can validate the feasibility of their technological needs. During the GFES events in West Bengal, the stakeholders who were visited, which included farmers, women's groups and block-level water managers, all responded that they greatly appreciated the opportunity to share their concerns and challenges first-hand with the scientists who may have solutions for them.

In order to obtain further evidence of how the membership is benefiting or not from the existence of the Centre, and its activities, the membership survey was conducted during three weeks in the month of January 2019. The summary report of the survey will be prepared and published on the website in the near future.

The respondents fell into three categories:

1. Not applied for activities yet – 11 members (18%)
2. Applied but not participated in activities yet – 25 members (35%)
3. Applied and have participated in activities – 34 members (47%)

For the respondents in all three categories the most important perceived benefit from their membership to the Open Network is the opportunity to gain or enhance knowledge on water issues and science in both countries, as well as developing links with scientists from both countries and stakeholders within India.

Reassuringly, they ranked the quality of IUKWC communications, support to members, and events 4/5 and indicated an intention to increase their engagement with the IUKWC over the coming years.

Respondents were also asked to provide comment on how the IUKWC can improve and the following were the most commonly recurring themes:

- Increase the inclusivity of the participation – i.e. young scientists, representatives from NGOs, CSOs and grassroots organisations, policy makers, water sector businesses; Increase

interdisciplinary workshops;

- More training-focused activities;
- Provide funding opportunities and provide some form of follow-up support to ensure collaborations/joint-proposals come to fruition.

A sampling of key benefits that some of the respondents has directly received from being associated with the IUKWC:

'Yet I haven't attended any event, but I learned that it is helpful in interactions with researchers from India and UK both. Also I get insight of the work which are going on in both the countries.'

'I am getting information of IUKWC regularly regarding all activities of IUKWC. I am also gaining new ideas and knowledge of present trends of water resource related research.'

'My visit has insured broader understanding on application of space technology in water resources monitoring. In particular use of Sentinel satellite data for water monitoring caught attention. Now, I am writing a proposal on performance of Sentinel and Indian satellite data for water resources applications.'

Summary and Conclusion

Overall, the growing membership to the Open Network and social media accounts, the diversity of our membership, as well as the results of our members' survey and the list of outcomes from the activities that IUKWC has convened and supported, clearly show that the Centre has made a mark on a section of the water security sector and has the potential and support to continue making this impact.

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