

# SAWA (South Asian Water) Fellowship 2012 - 2016

## Final Technical Report

Sucharita Sen  
&  
Monica Priya

**SaciWATERS**

SOUTH ASIA CONSORTIUM FOR INTER-DISCIPLINARY  
WATER RESEARCH STUDIES





# SAWA (South Asian Water) Fellowship

IDRC Project Number: 107240-001

Sucharita Sen, Monica Priya



**Supported by**



August, 2018

## Members and Organisations involved in the Project

- **Executive Director**, South Asia Consortium for Interdisciplinary Water Resources Studies, Hyderabad, India (Project In-charge)
- **Ms. Monica Priya**, Research Associate, South Asia Consortium for Interdisciplinary Water Resources Studies, Hyderabad, India (Project Coordinator)
- **Prof B.V. Mudgal**, Professor, Centre for Water Resources, Anna University, Chennai, India (Program Coordinator)
- **Mr. Robert Dongol**, Assistant Professor, Nepal Engineering College, Kathmandu, Nepal (Program Coordinator)
- **Dr. Shahjahan Mondal**, Professor, Institute of Water and Flood Management, BUET, Dhaka, Bangladesh (Program Coordinator)
- **Dr. Dhammika Dayawansa**, Associate Professor, Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka (Program Coordinator)

## Acknowledgement

We would like to acknowledge the funding support from IDRC for this project. We would also like to thank and appreciate the coordinators of the partner institutions for their constant support through the project. Lastly, we would also like to acknowledge the assistance provided by our colleagues Manoj Jatav, Sahithi Parepally and Vishaka Gulati in data analysis and editing of the report.

## Citation

SaciWATERs (South Asia Consortium for Interdisciplinary Water Resources Studies) 2018. South Asian Water Fellowship - Final Technical Report. Report number 5/2018. SaciWATERs, Hyderabad.

Copyright© **SaciWATERs**, Hyderabad, India. Sections of this material may be reproduced for personal and not-for-profit use without the express written permission of but with acknowledgment to SaciWATERs. To reproduce material contained herein for profit or commercial use requires express written permission. To obtain permission, contact [info@saciwaters.org](mailto:info@saciwaters.org)

## Designed by

**Raju Kakkerla**

## Address of Research Institution


B - 87, 3rd Avenue, Sainikpuri,  
Secunderabad - 500 094, Telangana, India  
Tele Fax: +91 40 27116721, 27117728  
Email : [info@saciwaters.org](mailto:info@saciwaters.org)

## **List of Contents**

Executive Summary	1
Structure of the Report	7
<b>1. Project Background and Description</b>	<b>8</b>
<b>2. Project Implementation</b>	<b>10</b>
<b>3. Methodology</b>	<b>13</b>
<hr/>	
3.1 Objective 1	13
• The method of selection of potential awardees	13
• Nature of courses in the academic curriculum	14
• Regional training on 'Interdisciplinary Research Concepts and Methods'	14
• Fieldwork-based research	15
3.2 Objective 2	15
• Common research themes	15
• Research approach	15
• Monitoring	16
• Review workshop	16
3.3 Objective 3	16
• Knowledge sharing via regional workshop	16
• Knowledge sharing via conferences	16
• Knowledge sharing via research publications	16
3.4 Objective 4	17
3.5 Objective 5	17
<b>4. Progress towards Milestones</b>	<b>18</b>
<hr/>	
4.1 Objective 1	18
• Fellowships awarded and the status of degree completion	18
• Course curriculum	19
• Regional training workshops	19
4.2 Objective 2	24
• Theses with focus on climate change and gender	24

4.3 Objective 3	26
• Knowledge sharing via research publications and conferences	26
4.4 Objective 4	27
4.5 Objective 5	27
<b>5. Synthesis of Research Results and Development Outcomes</b>	<b>28</b>
<hr/>	
5.1 Objective 1	28
• Course curriculum	28
• Regional training workshop	29
• Performance in academics	31
5.2 Objective 2	31
• Synthesis of results	31
5.3 Objective 3	51
• Developing new linkages and collaborations	51
• Collaboration in research activities	52
• Membership with national/international networks	53
5.4 Objective 4	53
• Competencies	53
• Employability status	54
5.5 Objective 5	55
5.6 Involvement in Research Uptake Action	57
5.7 Overarching Benefits of the SAWA Fellowship	58
<b>6. Challenges and Lessons Learnt</b>	<b>60</b>
<hr/>	
6.1 Major Challenges	60
6.2 Lessons Learnt	60
Annexes	61

# Executive Summary



This is the final technical report of the project titled 'South Asian Water Fellowship' funded by IDRC. The report presents the achievements, outputs, outcomes, impact, key challenges, and lessons learnt from the project. The project was funded for four years (2012-2016) with the main objective of generating a critical mass of water professionals trained to tackle water issues using multi-disciplinary approaches sensitive to women, the poor, the environment, and sustainability in South Asia, through awarding of fellowships.

The project awarded a total of 60 fellowships across four universities, i.e., Institute of Water and Flood Management, BUET in Bangladesh; Centre for Water Resources, Anna University in India; Nepal Engineering College in Nepal and Postgraduate Institute of Agriculture, and University of Peradeniya in Sri Lanka. The project was coordinated by SaciWATERs from Hyderabad, India.

The specific objectives of the project were:

1. To create a new generation of 60 “interdisciplinary water professionals” in South Asia, trained to deal with issues of climate change, water and food insecurity, and adaption by awarding IDRC SAWA Fellowships;
2. To generate action-oriented research theses via M.Sc. and M.Phil. degrees in IWRM in four institutions in South Asia, which will both closely study the impact of climate change, adaptation, food insecurity, and resilience and also help tackle these issues through a gender and equity perspective;
3. To exchange knowledge and share ideas at the South Asia level, using a South-to-South Learning framework for meetings and exchanges of IDRC-SAWA fellowship awardees;
4. To create a group of water professionals trained to address water and climate issues scientifically and through an interdisciplinary lens, beyond nation-state boundaries; and
5. To support free access to the e-journal South Asian Water Studies, and encourage young water professionals to publish peer-reviewed journal articles.

The key outcomes expected at the end of the project included:

1. Largely demonstrable efficacy of the holistic, integrated water resources management approach, with respect to the impact of climate change and urbanisation on water resources, through student research theses.
2. Uniquely trained interdisciplinary water professionals who can translate interdisciplinary learning into action-oriented, problem-solving approaches through stakeholder meetings and collaborating/networking with multiple water agencies for maximum impact.

3. Long-term impact of an integrated approach is expected to continue the in future of water sector jobs through the SAWA fellows' professional engagements.
4. Building capacity of specifically women water professionals, using an integrated and interdisciplinary approach, and strengthening the ability to link technical, social, and economic issues relating to water and consequently redeeming the gender balance in women's education and jobs in the water sector.
5. Improving academic and professional exchanges among SAWA fellows from different countries, as well as between them and water experts from South Asia through trainings and international conferences.
6. Networking between partner institutions.
7. Research theses and knowledge dissemination through international conferences, policy briefs, books, websites, media reports, SAWAS e-journal, and long-term interaction between SAWA Fellows and the water sector.

The key indicators used to evaluate the project are:

1. Selection of eligible students with motivation to work in interdisciplinary areas.
2. Criteria to evaluate the thesis on the basis of mainstreaming climate change, incorporating an interdisciplinary lens, bringing in a gender focus, and effective application of interdisciplinary research methods.
3. Academic performance of SAWA fellows in IWRM courses.
4. Timeliness for submission of the thesis.
5. Contribution to larger body of research through publications.
6. Expanding existing networks and creation of new networks.
7. Fellows' perception about the efficacy of the program based on the following criteria:
  - a. Qualitative and quantitative data analysis
  - b. Data collection methods, tools, and techniques
  - c. Publication in the field of water and climate change with gender as the cross-cutting theme
  - d. Interdisciplinary approach in research
  - e. Oral communication and presentation skills
  - f. Networking and collaboration
  - g. Adequacy of the financial support

The project has been successful in heading towards achieving its first objective of creation of 60 interdisciplinary water professionals, by supporting the qualification of 37 SAWA fellows, with the remaining students expected to graduate by the end of 2017. The program was structured in a way



that each batch of SAWA students focused on three broad themes to conduct their research; Climate Change and Food Security (2013-2015 batch); Climate Change and Water Security (2014-2016 batch); and Climate Change and Livelihood Adaptation (2015-2017 batch). Hence, by the way of its structure and implementation, the project generated action-oriented theses focusing on the impacts of climate change, adaptation, food insecurity, and resilience with gender as the cross-cutting theme in a few of them.

Synthesis of research results under three broad themes that were researched by the SAWA fellows was undertaken. Research findings on "Climate Change and Food Security" indicated that climate variability poses a major challenge to agricultural productivity and livelihood vulnerability. Research demonstrated that food security is linked strongly to flood and drought situations. Research also indicated that in addition to climate variability, food insecurity is also related to socioeconomic factors, such as land use and availability of financial capital to farmers for crop production. The impact of climate variability was found to be high on small and marginal farmers as compared to large farmers. It was further identified that although certain policies and programs are attempting to address the issues of climate change, they are not sufficient. Coordination between relevant institutions is required to address the issues effectively and efficiently.

Under the theme "Climate Change and Water Security", studies were carried out focusing on evaluating the impact of climatic parameters, local institutions, and policy implementation such as tank renovation on water security, addressing the water security in agriculture and ecosystems under changing climatic, environmental, and social conditions; and the effect of urbanization and water quality on water security. The studies indicated that though climatic parameters like rainfall influence water security of a region, social and cultural norms prevailing in a village strongly impact it as well. It was also found that tank rehabilitation and functional Water User Associations (WUAs) in a large way have a positive impact on ensuring water security. Hence, in addition climate variability factors such as poor water management practices also lead to water (in)security. An interesting finding of the study is that urbanization is found to have both positive and negative impacts on water security. On one hand, while heavy extraction of water, water transfers, and change in land use are causing water (in)security; urban local bodies along with the community are taking measures to conserve the water bodies, in the case of Nepal, on the other hand.

The third theme on which research is being carried out is "Climate Change and Livelihood Adaptation". Since the research is still underway, the report only gives a glimpse of the issues and thematic areas undertaken by the fellows. Largely, the research is focusing on understanding peoples' perception of climate change, the effect of climate change on the livelihoods, and various adaptation strategies to climate change. Studies are also being carried out on understanding the role of water resources in livelihood diversification and its impact on displacement and migration. Certain studies are specifically focusing on studying the social and livelihood impacts of dam construction and the role of governance structures and institutional arrangements in strengthening resilience to shocks and stresses to livelihoods.

To sum up, the thematic areas in the three batches of the SAWA fellows were consistent with the three research issues aimed for in the proposal for the SAWA fellowship programme. The research done by the young scholars of the four institutions in South Asia has undoubtedly brought forth a better understanding about climate change and water related issues in the region. Some areas of strengths of the fellowship programme can clearly be identified after reviewing the vast body of

research produced by the SAWA fellows. They have been listed below:

- a. *Developing a systemic understanding of water and other natural resources:* Much of the work conducted by the SAWA fellows have enabled them, and potentially the readers of their work, to bring together a systemic understanding of water, land, and vegetation. The theme selected for the first batch, i.e., climate variability and food security, actually required such an approach, but this systemic approach has been adopted in other batches too. This body of work collectively point towards the importance of firstly, analyzing water in conjunction with other natural resources, and secondly, having a systemic understanding of natural resources within a framework of a geo-hydrological unit (as adopted by CWR and PGIA for all batches).
- b. *Highlighting the need for interdisciplinary research:* To a very large extent, the young scientists, who mostly come from a pure science disciplinary background, have managed to incorporate the training they received on the societal aspects of water resources into their research. This did not only include their use of interdisciplinary research methods, but highlighting through their research that a purely scientific view of water resource management, though useful, is likely to be incomplete. A few examples where interdisciplinary elements were handled with great competence were in terms of understanding the guiding forces behind crop diversification, identifying how the larger scientific phenomenon of climate change can be understood by members of community differentially, and the way institutions can function for implementation or non-implementation of efficient scientific solutions.
- c. *Learning across batches of SAWA fellows:* Though the thematic thrust of different batches were different, there was overall cross-learning across the different batches of SAWA fellows. There were results, as in case of the achievements of WUAs that conformed to the results that were established in earlier batches in different context; this enabled triangulation of results, throwing up larger and more robust findings. There was a great deal of complementarity among the knowledge generated when the scholars over batches studied the same river basin or irrigation systems.
- d. *Learning across countries:* The larger aim of this programme has been to develop a common framework for understanding water resource management in South Asia as a whole. Though the water endowment and issues embedded in them are different in different countries, some of the findings of the research conducted in different countries both complemented and supplemented each other. There were studies conducted in, say, Bangladesh and India that highlighted the limited participation of women in local institutions that manage water, and the conditions that promote such participation. A study conducted in India for example, identifies male-selective out-migration from the village as a condition that promotes the same. The study from Bangladesh goes on to highlight the positive outcomes associated when women's participation is high. A study from Sri Lanka, though not focusing on gender, which concludes that institutions work better when the marginalized participate, complements the findings of the research carried out in Bangladesh. A related result from Nepal demonstrates how differently men and women view wastewater irrigation, with the latter have a stronger sense for sustainable health outcomes.
- e. *Policy relevance:* Much of the work carried out by the SAWA fellows has strong policy relevance, both directly and indirectly. Some of the findings established through such studies moves away from the commonly established understanding about water resources. For example, a study

carried out in Sri Lanka, highlighting that water distribution in the tail reaches of the canal system rather than the head reaches, throws new insights into how an irrigation system may work in humid regions. A study conducted in India bringing into focus how non-system tanks actually are more efficient than cascade tanks, has great relevance for tank rejuvenation programmes being carried out in a big way in the other parts of the country.

There was however, some scope for improvement in the research that was conducted by the SAWA fellows:

1. Though gender was handled in a few of the studies, it could have meaningfully been a cross-cutting theme in many of the studies where it was not touched.
2. Climate change was handled by very few studies, though there were a large number of studies that looked at climate vulnerability. This is understandable, given the fellows was encouraged to base their work on fieldwork, and had no opportunity to compare the same with an earlier benchmark.
3. Though a number of social science research methods were used in many of the studies, the application of the same can be sharpened in the future.

In order to support the students' research, the program provided training in research concepts and methodologies, regular monitoring of the research progress by experts from SaciWATERS, and review of the final research work by experts from South Asia. The networks established during meetings and exchange of the SAWA awardees aided in sharing of ideas and exchange of knowledge with fellow students and experts at the South Asia level.

The project was successful both in building the capacity of students especially women and in using an integrated and interdisciplinary approach, by strengthening students' ability to link technical, social, and economic issues relating to water. The following story of a fellowship awardee illustrates how the research capacity built during the program has helped in bringing about a change in the implementation of a watershed program:

*I am currently working as an Associate Project Engineer with National Agro Foundation, a Non-Governmental Organisation (NGO) that works on watershed development programs. The organisation initially had taken up works at the local level, and now they have expanded their works to other parts of India. This was made possible because of the way the program has been implemented in an integrated way, with inputs given by me from the knowledge and training acquired by me from the SAWA fellowship.*

- Ellakiya Priya. A

A further illustration that the SAWA fellowship program has given opportunities to work with international organisations and hence, providing global exposure is a testimony from a Master's grantee from PGIA:

*“Water sector has always been my area of interest and the fellowship has provided me with the financial support and opportunity to explore beyond technical aspects to conduct interdisciplinary research. It has provided me with an opportunity to intern at SaciWATERS. As an outcome of my fellowship, I was able to publish all the chapters of my thesis as paper publications in national and*

*international conferences and journals. These publications and receiving a fellowship together with the international experience gained through the internship at SaciWATERs paved my way to win a full scholarship (International Macquarie Research Excellence Scholarship/iMQRES) to pursue my PhD in Environmental Science (Department of Environmental Science / Faculty of Science and Engineering) at Macquarie University, NSW Australia”.*

- Ms. Chathurika Perera

Apart from building the capacity of the awardees the program had an impact on the coordinators as well, which is illustrated by the following narrative:

*“I have an academic background in civil engineering. I used to teach technical subjects in the academic program at IWFM. Through the SAWA Fellowship Program, I became familiar with the concept of interdisciplinarity in water resources development and management. The regional trainings that were held under the program helped me to gain that knowledge. My teaching and thinking approach has now changed from a pure technical to interdisciplinary perspective. I now teach subjects like water rights and equity, people's participation in water management, water governance, conflict management, etc., which I could not even think of before. I now realize the value of integration in water resources management”.*

- Prof. Shahjahan Mondal, IWFM, BUET

The project has generated outputs in the form of academic publications and presentations at conferences by students at both national and international platforms. The absorption of students in government organisations, research, NGOs, and academics will contribute to continuity and sustainability of the developed capacity and also to a long-term impact if an integrated approach is adopted in the water sector.

Some of the key lessons learnt from the project are: (1) the financial assistance provided by the program has benefited women researchers in pursuing higher studies and conducting research; (2) the project through workshops has facilitated in opening new avenues for South Asia collaboration; (3) there is a need for involvement of experts from social sciences to ensure a greater degree of interdisciplinary element in the students' research; (4) there is a need for creating a resource base consolidating the research work of the three batches to ensure that the knowledge generated will not be underutilized.

# Structure of the Report



The report consists of six sections. The first section provides a brief description of the project and the second section describes the way the project has been implemented. Section three describes the methodology adopted to achieve the objectives, four describes the progress made, i.e., what has been achieved and what has not been achieved; and five gives a detailed description of the synthesis of research results for each project objective.

Sections three, four, and five give the details with respect to each project objective as mentioned in the grant agreement. Section six lists the challenges encountered during the project period and the lessons learnt.

# Project Background and Description

1

South Asia's agricultural economies remain vulnerable due to extreme environmental events. Better management of water and other natural resources is fundamental to the development of the region. Climate variability and change, food and water insecurity, population growth, and urbanisation have intensified environmental disasters in the recent past. Poor land and water resource allocation as well as over-utilisation and pollution have robbed the poor, particularly women, of livelihood and dignity. Such broad, yet closely linked issues can be effectively tackled through an integrated approach to water resources management, when addressing current and future water challenges in South Asia.

While integrated water resource management is widely accepted, it was rarely implemented. This was partly because there are huge gaps in the South Asian knowledge and research base on water, as well as in the human resource base in Integrated Water Resource Management (IWRM). Also, the paradigm in water resources education programmes focused majorly on engineering and hydrology with less attention being paid to address challenges of poverty reduction, livelihood insecurity, gender, and water. Thus building the capacity of students to fill these gaps - both with a body of research work as well as that of trained researchers and faculty in addressing key issues of climate change, gender, and equity in water resource management - was found to be critical.

The specific objectives of the project were:

1. To create a new generation of 60 “interdisciplinary water professionals” in South Asia, trained to deal with issues of climate change, water and food insecurity, and adaptation by awarding IDRC SAWA Fellowships;
2. To generate action-oriented research theses via M.Sc. and M.Phil. degrees in IWRM in four institutions in South Asia, which will both closely study the impact of climate change, adaptation, food insecurity, and resilience and also help tackle these issues through a gender and equity perspective;
3. To exchange knowledge and share ideas at the South Asia level, using a South-to-South Learning framework for meetings and exchanges of IDRC-SAWA fellowship awardees;
4. To create a group of water professionals trained to address water and climate issues scientifically and through an interdisciplinary lens, beyond nation-state boundaries; and
5. To support free access to the e-journal South Asian Water Studies, and encourage young water professionals to publish peer-reviewed journal articles.

The project “**South Asian Water (SAWA) Fellowship**” funded by IDRC therefore sought to generate a

critical mass of water professionals trained to tackle water issues using multidisciplinary approaches sensitive to women, the poor, the environment, and sustainability in South Asia, through the awarding of fellowships. The project aimed to create a paradigm shift in understanding the interlinkages among the issues of agriculture, water and food security, and adaptation to climate change by enabling an integrated and gender-sensitive water resource management through a regional, collaborative, and partnership-based capacity building programme for water professionals.

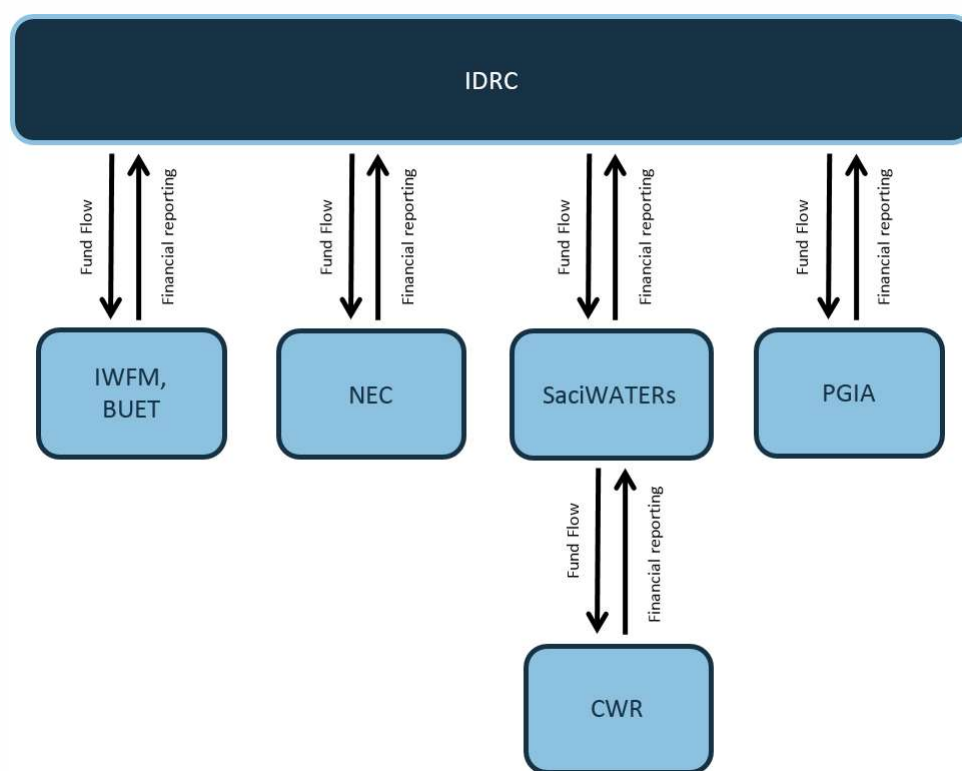
The project awarded fellowships to Master's and M.Phil. Students enrolled in Integrated Water Resources Management courses in four universities of four South Asian countries - Bangladesh, India, Nepal, and Sri Lanka. A total of 60 fellowships were awarded, 80% of which were given to women (see Annexure 1 for details of the awardees). The 60 fellowships awarded were of two years duration each, in three batches over a four-year cycle starting from 2012. The project started in December 2012 and ended in December 2016.

# Project Implementation

# 2

The “SAWA Fellowship” project funded by International Development Research Centre (IDRC) started in December 2012, with SaciWATERS as the coordinating body and four institutions, namely, Centre for Water Resources (CWR), Anna University; Institute of Water and Flood Management (IWFM), Bangladesh University of Engineering and Technology (BUET); Nepal Engineering College (NEC); and Postgraduate Institute of Agriculture (PGIA), as partners of the project.

The following chart depicts the fund flow to the different institutions.

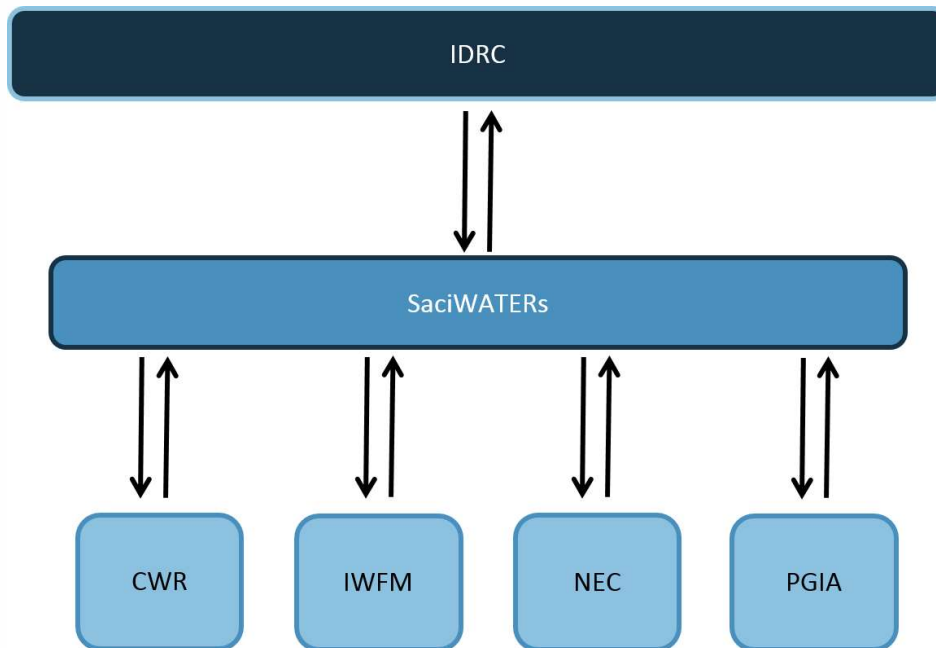


**Figure 1: Fund Flow and Financial Reporting**

For the transfer of funds, SaciWATERS and three of the Partner Institutions (PIs) have signed a Memorandum of Understanding (MoU) with IDRC. The funds for CWR were transferred through SaciWATERS. On a half-yearly basis, each of the partners submitted a financial report to IDRC indicating the details of expenses in the reporting period and the forecast of expenditures for the next period.

SaciWATERS was the nodal agency in the implementation of the project and also functioned as the coordinating body with IDRC and the four PIs. The following chart gives a figurative representation of





**Figure 2: Project Implementation and Management**

the project implementation and management.

SaciWATERS was the central organisation in planning of project-related activities such as regional workshops in consultation with the PIs and IDRC. The coordinator at the PIs, on a half-yearly basis, shared the progress of students' research and various activities undertaken at the university level. The project coordinator at SaciWATERS was responsible for collating and sending the interim technical reports to IDRC under the supervision of the project in-charge. In addition, the granting of fellowships and monitoring of the fellows was conducted on a yearly basis at the partner universities with a representative from SaciWATERS on board. In order to ensure efficacy in the implementation of the project, the following key indicators were developed:

1. Selection of eligible students with motivation to work in interdisciplinary areas.
2. Criteria to evaluate the thesis on the basis of mainstreaming climate change, incorporating an interdisciplinary lens, bringing in a gender focus, and effective application of interdisciplinary research methods.
3. Academic performance of SAWA fellows in IWRM courses.
4. Timeliness for submission of the thesis.
5. Contribution to larger body of research through publications.
6. Expanding existing networks and creation of new networks.
7. Fellows' perception about the efficacy of the program based on the following criteria:
  - a. Qualitative and quantitative data analysis
  - b. Data collection methods, tools, and techniques

- c. Publication in the field of water and climate change with gender as the cross-cutting theme
- d. Interdisciplinary approach in research
- e. Oral communication and presentation skills
- f. Networking and collaboration
- g. Adequacy of the financial support

# Project Methodology

# 3

This section details out the methodology adopted to achieve the project-specific objectives.

## 3.1 Objective 1

The methodology employed to achieve the objective are given in detail below.

### The method for selection of potential awardees:

The criteria for selecting the fellowship candidates varied at the four universities, but it was ensured that students showing a strong motivation towards research and interest to work further in the relevant field were given priority. The project sought to redeem a gender balance in water-related research, jobs, and policy in the South Asian region, hence 80% of the total fellowships were awarded to women. Table 1 gives the shortlisting and selection criteria of each institution.

**Table 1: Method of selection of the awardees**

	Entrance Examination (EE)	Statement of Purpose	Shortlisting	Selection Criteria			
				Performance in Basic Degree	Work Experience	Marks in EE	Interview
BUET	✓	✗	✓ (Based on EE)	50%			50%
CWR	✗	✓	✗	50%	10%	✗	40%
NEC	✓	✗	✗	✗	✓	75%	25%
PGIA	✗	✗	✗	10%	20%	✗	70%

All the candidates registered into the IWRM course were allowed to apply for the fellowship, except in BUET where students were shortlisted based on marks secured in the entrance examination. The weightage assigned to the other criteria are mentioned in . Through the interview, candidates' communication skills, leadership qualities, interest to work in the relevant field, commitment and motivation, and socio-economic need base were assessed. The selection committee at all the PIs consisted of the university faculty and a representative from SaciWATERS. The score given by each panelist was totaled and 5 students securing the top most marks were selected to be awarded the fellowship.

Since the methodology for selecting the awardees varied at each university, there could have been a

possibility that students having a greater interest in IWRM and showing commitment to work in the relevant field might have lost out on the opportunity to secure the fellowship, due to a lower grade obtained during the Bachelor's degree compared to their peers or just due to poor performance in the entrance examination. Hence, one of the lessons learnt is the need for common selection criteria for all the participating institutions, which SaciWATERS and its PIs intend to develop in the next phase of the fellowship program.

### Nature of courses in the academic curriculum

The courses offered at the four universities were such that they laid a strong foundation on the concepts of IWRM, gender, climate change, and field research methodology; all of which have been the thrust areas of the SAWA fellowship as well. Some of the courses offered are listed below:

**Table 2: Courses offered at the Partner Institutions**

INSTITUTION	COURSES OFFERED
BUET	<ul style="list-style-type: none"> <li>• Water, Gender and Society</li> <li>• Socio-economic analysis</li> <li>• Interdisciplinary field research methodology in water management</li> <li>• Integrated water resources management</li> </ul>
CWR	<ul style="list-style-type: none"> <li>• Integrated water resources management</li> <li>• Gender and water</li> <li>• Participatory field research methodology</li> <li>• Legal aspects of water resources</li> <li>• Climate change and water resources</li> <li>• Environmental Impact Assessment for water resources</li> <li>• Integrated river basin management</li> <li>• Watershed conservation and management</li> </ul>
NEC	<ul style="list-style-type: none"> <li>• Society and water</li> <li>• Gender, Water and Social Inclusion</li> <li>• Legal and policy Dimensions of Water Management</li> <li>• Conflicts in water management</li> <li>• Integrated water resources management</li> <li>• Field Research methodology</li> <li>• Climate change, livelihood and adaptation</li> </ul>
PGIA	<ul style="list-style-type: none"> <li>• Gender in IWRM</li> <li>• Water and Society</li> <li>• River basin planning and management</li> <li>• Interdisciplinary field research methodology</li> </ul>

### Regional training on “Interdisciplinary Research Concepts and Methods”

The regional training workshops held every year focused on interdisciplinary research concepts and methods. The two main objectives of these workshops were to acquaint fellows with the relevant concepts of social science, and to build the capacity of the SAWA fellows towards methods to be used in interdisciplinary research. Accordingly, these workshops, much of them in an interactive mode,

included lectures on IWRM in South Asia, gender and water, and sessions on qualitative and quantitative research methods.

These workshops were held at the end of the first semester to ensure that the students attending them already have a basic knowledge on IWRM and research methods. The workshops focused on an advanced level of training to complement their regular course structure in the respective PIs. Classroom learning during the trainings was followed by fieldwork to train the students in applying the research methods learnt during the regional workshop.

### **Fieldwork-based research**

The research carried out by all the SAWA fellows had a component of field research attached to it. This ensured that the students applied the research methods learnt during 18 months of course work and the regional training. It also ensured that the research findings were not just restricted to analysis based on secondary data, but that a mixed methods approach using both quantitative and qualitative methods was adopted; thus making the research interdisciplinary in nature.

## **3.2 Objective 2**

The methodology employed to achieve the objective are given in detail below.

### **Common research themes**

The research theme for the project was water, food security, and adaptation issues in the context of climate change and variability and its impact on women and marginalized sections of the rural societies. Under this broad theme, three sub-themes were given for each batch, and the fellows were asked to focus on that specific theme for their thesis in order to develop a shared understanding of these issues from the four countries. The three sub-themes were “Climate Change and Food Security” for the first batch (2013-2015), “Water Security” for the second (2014-2016), and “Livelihood Adaptation” for the third (2015-2017).

### **Research approach**

The student's thesis was to focus on the issues of climate change and variability and its impact on women and marginalized sections of the rural societies, taking sub-river basins as the unit of research. In Bangladesh, IWFM took up the southwest coastal delta, consisting of the southwest and south-central regions of Bangladesh, for conducting students' research; this region has the highest incidence of poverty in the country and is most vulnerable to climate change. In India, the students of CWR were working on the impact of climate variability on a range of issues, including gender and food security in the Vellar river basin in Tamil Nadu in South India. In Nepal, Nepal Engineering College focused its research on livelihood security in the context of changing water use and climate variability in the Bagmati river basin, with emphasis on urban areas along with the rural. In Sri Lanka, PGIA was working on the Mahaweli river basin, the main river in Sri Lanka. With rapid urbanisation and expanding agricultural activities, the upper Mahaweli catchment area is under severe threat of degradation. Students' research in the Mahaweli river basin has focused on climate variability, water flow, food security, and gender issues.

## Monitoring

Monitoring of the SAWA fellows at each PI was done by the project in-charge and/or the project coordinator from SaciWATERs. These visits were used to monitor the research progress and academic performance of the fellows. The students were required to make a presentation on their thesis/project indicating their objectives and methods to be used for the study. Based on these presentations, comments or suggestions were given to tailor their work as per the mandate of the SAWA fellowship programme and to improve upon their methodologies adopted for the study. During these visits, one-on-one discussions between the project coordinator and the awardees were conducted wherein the students shared challenges they faced in conducting their research.

## Review workshop

Review workshops are held for each batch of SAWA fellows at the end of the two years. The purpose of these workshops is to give students feedback on and suggestions for the research work done so as to help in developing their research findings into publishable material. Since the focus of the fellowship is to bring in an interdisciplinary lens into the research on climate change and water, the workshop, apart from providing feedback, also intended for self-evaluation through students' abstracts in terms of asking, "how far have we reached in terms of interdisciplinarity?" These workshops although not budgeted in the grant agreement were planned and organized for the first and the second batch of SAWA fellows with funding from IDRC and co-funding from CapNet and International Waters.

## 3.3 Objective 3

The methodology employed to achieve the objective are given in detail below.

### Knowledge sharing via regional workshop

The sessions of the regional workshop were designed to ensure that students from all four universities were teamed to share their experiences from their respective countries and learn from each other. This included the field practicum wherein groups were divided in a manner that each group had representation from every institution. The assignments given to them required participation of all students. One such assignment was preparing a research proposal based on knowledge gained from previous sessions and the local knowledge and experiences that they carry from their country. Also, the discussions held at the end of each session aided in the exchange of knowledge and ideas.

### Knowledge sharing via conferences

Students participated in a number of national and international conferences and presented their research work in the form of conference presentations/proceedings and poster presentations. These conferences were seen as platforms to disseminate their research results and share their ideas with a wider audience and to actively interact with researchers outside their institution. Details of the number of proceedings published and conferences attended are provided in Section 4.3.

### Knowledge sharing via research publications

The grantees in the project have generated research outputs in the form of academic publications in

peer-reviewed journals, newsletters, and symposium proceedings. Through these, the grantees have been able to reach an increasingly diverse audience. Grantees have co-authored a number of academic publications and conference proceedings with their supervisors and fellow students, thus aiding in sharing and exchange of ideas within the institution. A full listing of the publications is provided in Annexure 1.

### **3.4 Objective 4**

One of the methods adopted to achieve the objective were the courses offered in the institutions during 18 months of their classroom learning. Through these courses, students were trained in the concepts of IWRM, gender, climate change, and field research methodology. Some of the courses offered are mentioned in . In addition to this, the regional workshops provided an exposure to the climate issues at the South Asia level through various sessions focused on experiences in IWRM from Bangladesh, India, Nepal, and Sri Lanka. Field practicum during these workshops provided field insights of issues prevalent in the country. The grantees were provided with an opportunity to interact with the community, and stakeholders to have a cross-country field experience.

### **3.5 Objective 5**

South Asian Water Studies (SAWAS) journal is an interdisciplinary journal that aims at providing space for alternative and critical thinking. The journal is an independent forum for discussion about water-related issues that affect South Asia, including: issues in particular countries and regions within South Asia, issues at the level of South Asia as a region, and issues related to the global context in which South Asian water issues are situated.

The methodology adopted to achieve the objective is given below:

The journal was financially supported by IDRC. The SAWAS e-journal supports free access and the published volumes are available at <http://www.sawasjournal.org>. The call for papers for each issue was widely circulated between the SaciWATERs network and beyond the network through some of the partners. A minimum duration of 90 days is given to submit the paper post the circulation of the call. Notification of acceptance is given within 30 days of the submission of the paper. The revised paper is to be submitted within 30 days after the notification of acceptance is received. All the issues published broadly followed this timeline. Themes for the journal were kept open-ended in order to encourage contributions from a wider group of academicians, development practitioners, activists, and researchers working on related issues in South Asia, while priority was given to contributions from young water professionals. Further details about the journal are given in Section 5.5.

# Progress towards Milestones

# 4

The specific objectives of the project are taken as milestones and this section describes to what extent has the project achieved the milestones, what has not been achieved and why.

## 4.1 Objective 1

### Fellowships awarded and the status of degree completion

- A total of 60 fellowships have been awarded to students enrolled in Masters and M.Phil. programs in four universities of Bangladesh, India, Nepal, and Sri Lanka. The following is a timeline chart (Table 3) indicating the fellowships being awarded and the status of completion of the degree.

**Table 3: Timeline of awarding the Fellowship**

INSTITUTIONS	2013				2014				2015			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
CWR, Anna University			■				■				■	
IWFM, BUET	■	■	■	■	■	■	■	■	■	■	■	■
NEC	■				■					■		
PGIA, University of Peradeniya	■	■	■	■	■	■	■	■	■	■	■	■

■	2013-2015 Batch	■	2014-2016 Batch	■	2015-2017 Batch
---	-----------------	---	-----------------	---	-----------------

**Table 4: Timeline indicating the status of completion of degrees**

INSTITUTIONS	2015				2016				2017				2018			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
CWR, Anna University			■				■				■					
IWFM, BUET	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
NEC		■							■	■						
PGIA, University of Peradeniya	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

37 SAWA fellows have graduated as on August 2017. The expected completion period of the remaining students has been given in the table above



One awardee from the 3rd batch at BUET has discontinued her studies. Since the awardee discontinued her studies after the completion of one year, the fellowship could not be passed on to another student. Srishti Pradhan from the 1st batch at NEC has also discontinued her studies due to illness. Hence, a total of 58 SAWA fellows will be graduating by the end of 2017.

There has been unforeseen delay in conducting field research at NEC due to the earthquake in Nepal in 2015. Hence, the 2nd batch students are expected to submit their thesis by August 2017 along with the 3rd batch.

As per the university rules at PGIA, students are allowed to submit their thesis within five years from the completion of their course work. Although the project coordinator has worked proactively and encouraged students to submit the thesis on time, it has been observed that a few fellows of the first two batches had taken an additional time of 9 to 12 months for submitting their final thesis. First and second batch students of CWR have submitted their thesis on completion of 24 months.

### Course curriculum

Most of the SAWA fellows are trained in the field of natural sciences during their Bachelor's degree and have very little or no exposure to social science, similar to other students enrolled into the Master's program. Hence, to ensure interdisciplinarity through the course work, SAWA fellows have a compulsory focus on social sciences in the institution through courses mentioned in Section 3.1.

Although the four technical institutions have initiated and introduced social science courses, these have been developed in an independent fashion across the four universities. Therefore there is a lack of common understanding of the subjects that are central to the SAWA program. Hence, there is a need for developing a common course curriculum. It has therefore been proposed that the courses on Gender and Water, Water and Society, IWRM, and Integrated Field Research Methodology (IFRM) taught in the universities will be revised in the next phase of the project to ensure coherence across all the institutions. This would also lead to a common understanding of these topics across all the PIs.

These courses are taught by faculty of the PIs who, in spite of having training in these courses, have a science-based background in most cases. One of the lessons learnt has been that there is a need for involvement of experts from social sciences in order to provide hand-holding support and to ensure a greater degree of interdisciplinary element in the students' research.

### Regional training workshops

The regional training workshops have been successful in acquainting students to interdisciplinary research methods and also helped them gain a clearer understanding of integrating gender in interdisciplinary research which is evident through the feedback given by students as mentioned in Section 5.1. Some of the sessions of the workshops are mentioned below:

- o Overview of Water Resources Management in Bangladesh, India, Nepal, and Sri Lanka
- o Understanding Gender - Theoretical and Conceptual Frameworks
- o Doing Gender - Methodological Guidelines
- o Research Paradigms and Design

- o Foundations of Research and Designing Research
- o Qualitative Research: Methods and Tools
- o Qualitative and Quantitative Data Analysis
- o Questionnaire Development and Administration

The workshops included experts from diverse fields. There were resource persons who were trained in different fields of natural sciences such as hydrogeology, environmental engineering, and water resources engineering, but have learnt to appreciate interdisciplinary approaches for research over the years. Also there were gender experts and experts in qualitative and quantitative methods, mostly from social sciences backgrounds.

Three regional workshops were held for the three batches, the details of which are mentioned below.

Regional South Asia Water (SAWA) Fellows Training on Integrated Water Resources Management:

The workshop for the first batch of SAWA fellows was held in Kathmandu, Nepal from 3 to 8 October 2013. The workshop laid emphasis on understanding the impact of climate change on water and food security; gender, rights, and equity; and on research tools and methods. In addition to classroom learning, the workshop had a field exercise. One of the field visits was to Matatirtha village where, participants learned about the community managed water distribution system and the water transfers occurring at the Matatirtha Village Development Council on the outskirts of Kathmandu. At the location they were able to see how the local community harnessed and distributed water from mountain springs. They interacted with members of the water user associations in the village and obtained information about pricing, distribution structure, structure, and functioning of user associations and also how water was shared with the neighboring villages. In addition, they gained information about the system of supplying water to urban areas of Kathmandu through water tankers.

A full day field exercise was held at Naubise Phant irrigation system, which is at a distance of 45 kilometers east of Kathmandu. Here the irrigation department of Nepal had constructed the irrigation system by diverting water from a river with the first siphoned irrigation scheme in Nepal. Participants were split into five groups with different research questions to be answered. The students then engaged with the local community, the water user association, and other key



*Picture 1: Regional Training Workshop in Nepal*

informants. Following are the different themes undertaken by the groups for study:

- o Gender roles in the study area and their relation to water accessibility
  - o Examining the water distribution inefficiency in the Naubise Phant irrigation system
  - o To study the impact of Naubise Phant irrigation system on agricultural productivity
  - o To examine the impact of the irrigation system on livelihoods of the beneficiaries
- Picture :  
Regional Training Workshop in Nepal

A detailed report of the workshop is presented in Annexure 2.

Regional Training for South Asia Water Studies (SAWA) fellows on Interdisciplinary Research Methods:

The workshop was held in Dhaka, Bangladesh from 18-22 December 2014. The training program targeted 20 recipients of the SAWA Fellowship. The focus of the workshop was similar to that of the first regional workshop. Participants visited Narayanganj-Narshingdi irrigation project in the peri-



**Picture 2: Regional Training Workshop in Dhaka**

urban area of Dhaka to conduct the fieldwork. This Irrigation Project was a flood control, drainage, and irrigation project (FCDI). It has Phase-I (Area-A) & II (Area B) with gross area of 29,000 ha and 16,000 ha respectively. The purpose of the project was to protect homesteads and infrastructures from the monsoon floods of the Meghna and Lakhya rivers, promote high value and diversified agriculture, and to increase production of HYV monsoon rice. Participants were split into four groups

with different research questions mentioned below:

- o Equity in Agricultural Benefit Sharing in the Area of N-N Irrigation Project
- o Assessment of Industrial Impact on Agricultural and Fisheries Livelihood in the N-N Irrigation Project
- o Farmers' Participation In N-N Irrigation Project
- o Identifying the Role of Human Interventions Affecting the Condition of Embankment Picture : Regional Training Workshop in Dhaka



**Picture 3: Regional Training Workshop in Sri Lanka**

A detailed report of the workshop is presented in Annexure 3 below.

### Regional Training for South Asia Water Studies (SAWA) Fellows on Interdisciplinary Research Methods:

The training program for the 3rd batch of students was held in Kandy, Sri Lanka from 28 November - 3 December 2015. The third workshop was different from the first two in how it focused on understanding and doing gender, and on research paradigms. As a part of the training, the students visited a farmer organisation. Galkiriyagama is a major irrigation system managed by the Mahaweli Authority of Sri Lanka. The water allocation to the farmers in this system is based on the bulk water allocation concept in which farmers together with the officials decide how much water they require based on the crops to be grown. To facilitate the process, participation of the farmers is made through farmer organisations. The field visit was to Damulla farmers' organisation, where the students worked on the following topics:

- o Assessment of the Performance of Farmer Organization in the Area
- o Water Management Issues at Distributary Canal Level
- o Cultivation Practices Adopted Under Water-Stressed Conditions and Their Effectiveness

o Drinking Water, Health Issues and Women in the Area

A detailed report of the workshop is presented in Annexure 4.

These training programs intended to provide training at an advanced level, hence were held at the end of the first semester to ensure that the students attending it already have a basic knowledge on IWRM and gender and research methods. Due to the huge time gap in recruiting students at the four universities, students were not on a common platform in terms of conceptual knowledge at the time of training. As mentioned above, there is a lack of common understanding across the PIs, which posed as a challenge in designing the content of the sessions.



**Picture 4: Review Workshop for 2013-2015 Batch**



**Picture 5: Reviewers and Coordinators at the Second Review Workshop**

## 4.2 Objective 2

### Theses with focus on climate change and gender

- Out of the 37 theses that have been submitted and approved, 20 theses focused on climate change. Out of the 22 theses that are yet to be submitted, ten focus on climate change. The remaining theses have made an attempt to study the impacts of climate variability, but it has not been the focal point of their research. The list of thesis topics is presented in Annexure 5.
- Two theses out of 37 and three out of 22 theses have mainstreamed gender in the research while a few others have adopted a gendered lens but with a limited understanding. Overall there is a lack of a gender lens in students' research, in spite of the training and focus on gender in the program. Training on gender related aspects and application of these concepts has been limited to the course and are taught by faculty of the PIs who, in spite of having training in these courses, have a science-based background in most cases.
- 56 theses out of 58 have focused on the common sub-themes decided for each batch.



**Picture 6: Experts Invited for the Review Workshop**

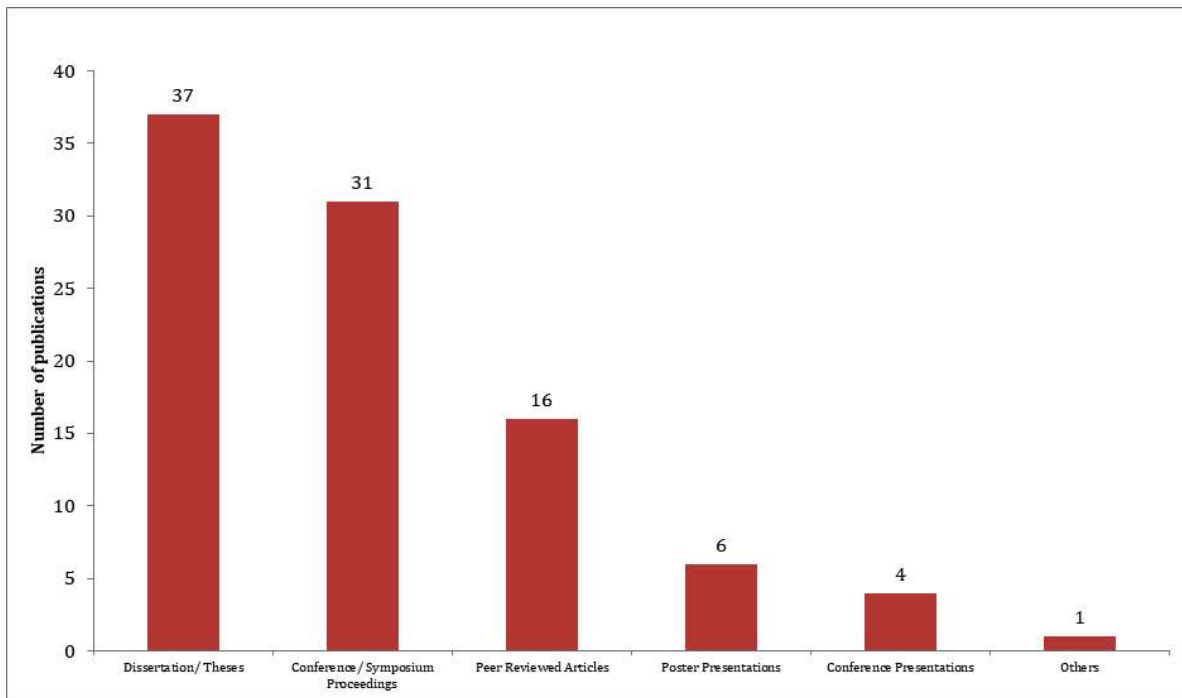
**Picture 1:** Dr. S. Janakarajan, Economist, Professor at the Madras Institute of Development Studies MIDS

**Picture 2:** Dr. Mahanta. C, Professor, Department of Civil Engineering, Indian Institute of Technology, Guwahati

**Picture 3:** Dr. Vishal Narain, Associate Professor, Public Policy and Governance, Management Development Institute

**Picture 4:** Dr. Priyanie Amerasinghe, Senior Researcher, International Water Management Institute

**Picture 5:** Dr. N.C. Narayanan, Professor, Indian Institute of Technology, Bombay



**Figure 3: Summary of research publications**

#### Research approach

- All 58 theses have used the research approach as mentioned in the “synthesized research note”, i.e., sub-river basin as the unit of research for India, Nepal, Sri Lanka, and the southwest coastal delta for Bangladesh.

#### Review workshops

- Two review workshops were organized for the 1st and 2nd batches. The first workshop was held on 29 May 2015 in Hyderabad. It was centered on “Climate Change and Food Security”. The second workshop was held on 23 May 2016 in Hyderabad that focused on the theme “Water Security”. A detailed report of these workshops is presented in Annexure 6 and Annexure 7.
- During the first workshop, students made presentations of their work and the reviewers were assigned a few papers based on their area of expertise. Since this was a one-day meeting, there was limited time available with the experts to share their comments. Learning from this, the extended abstracts were sent well in advance to the reviewers for the second review workshop and they reflected on each of their abstracts individually and in a detailed manner. In addition to the review sessions, there was a session on proposal writing in the second review meeting to acquaint the students with the science and art of proposal writing before they engage with research/academic/government organisations for work.
- Some of the experts who were invited to review the work were themselves engineers by profession who eventually have learned to appreciate and apply interdisciplinary approach to water issues. The others included economists and environmentalists with lengthy academic and research experience; they hold expertise in development studies, climate change and adaptation, water management, public policy processes, urban and peri-urban ecosystems and ecosystem services, and qualitative research.

### 4.3 Objective 3

#### Knowledge sharing via research publications and conferences

- The grantees have generated research outputs in the form of academic publications and participated in various national and international conferences. The figure below gives a summary of the research publications.

A few students have published in international journals such as the International Journal of Innovative Research in Science, Engineering and Technology, International Journal of Humanities and Social Science, and International Journal of Social and Economic Research. A large number of them have participated in international conferences and symposia such as the International Conference of Water and Flood Management, International Conference on Sustainable Development, International Conference of Academic World, World Water Day, Young Women Scientist Conference, and International Research Symposium on Engineering Advancements. They presented on various topics like local adaptation practices to cyclones, impact of climate change on agro-ecosystems, development of livelihood security index, and assessment of agricultural water security, to name a few. A full listing of the publications is provided in Annexure 1.

- Grantees have co-authored 44 academic publications and conference proceedings with their supervisors and 9 with their fellow students, thus aiding in sharing and exchange of knowledge and ideas within the institution.
- Very few students have been able to publish in international refereed journals while for most of them this was restricted to the university/national journals. The reasons are huge costs and high levels of quality control attached to publication in the international journals.

Through this medium, knowledge exchange and sharing has taken place within the country but there has been a lacuna at the South Asia level. Despite some of the challenges in publishing in refereed journals, the awardees have been able to share their research findings on an international platform and communicate with a wider audience through presentations in international conferences. One such conference has been “Peri-Urban Water Conflicts: Perspectives and Issue of Water justice in South Asia” organized by SasiWATERS along with the Review Workshop for the 2nd batch SAWA Fellows. This conference allowed for interaction with professionals/researchers/ academicians from South Asia coming from NGOs, academic institutions, universities, think tanks, and regional research and implementation agencies.

#### Knowledge sharing via regional training and review workshop

- Sessions on Situation Problem Query Response (SPQR)/research proposal, Participatory Rural Appraisal (PRA) tools, and understanding and doing gender were held via participatory and facilitated group discussions wherein the participants interacted with each other sharing their ideas and experiences.
- Majorly, group presentations and field practicum during the workshop aided in sharing of knowledge among the participants from the four South Asian countries.
- Every workshop had a panel on “Overview of IWRM” with four coordinators from the PIs as the panel members. During these sessions, experiences from each country were shared that gave



the participants an overview of the water resources management in the four countries.

- The presentations made by students during the review workshop were seen as a useful tool for sharing of learnings from each other's work.

#### 4.4 Objective 4

- The SAWA fellows were trained in interdisciplinary and climate change concepts through various subjects that have been offered in the universities - interdisciplinary field research methodology; climate change, adaptation, and livelihoods; and climate change and water resources, for example. Although they have received training, the application of these concepts is limited to the course.
- A limited number of theses have shown a truly interdisciplinary focus, which has also been pointed out by reviewers during the review workshops. Also, it was observed that there was very little theoretical grounding to help them think in an interdisciplinary way, while there was sufficient literature review done on the technical aspects.
- Engaging the scholars in an interdisciplinary framework has been thus more challenging than originally thought. The next phase proposes to incorporate greater involvement of gender experts in teaching the courses and more in-depth field survey methods.

#### 4.5 Objective 5

- The published volumes of the SAWA journal are available at <http://www.sawasjournal.org>.
- 15 articles/commentaries/book reviews have been contributed by young water professionals. A list of these publications is given in Annexure 8.
- There are only a few contributions made by SAWA Fellows in the journal. Therefore, in order to encourage young water professionals, especially the SAWA Fellows, to publish in the journal, a special issue has been planned for 2018, exclusively for students. Though the theme has not been decided, it will target young professionals enrolled in Masters and Doctoral programs to make contributions.
- In order to maintain the quality and standard of the journal, a number of special issues were published. A list of these is given below:
  - o Water Justice, Gender and Disability. Volume 5 Issue 4. Guest Editor: Dr. Floriane Clement, Ms. Sylvie Cordier, Dr. Alan Nicol.
  - o Urbanization and periurbanization: Challenges for water governance in South Asia. Volume 5, Issue 3. Guest Editor: Dr. Vishal Narain
  - o Special issue on 'Ramaswamy R. Iyer'. Volume 5, Issue 2.

# Synthesis of Research Results and Development Outcomes

This section provides a synthesized reflection of the outcomes for each objective.

Synthesis for objectives 1, 3, and 4 has been done on the basis of a questionnaire developed using the criteria mentioned in Table 5. This was administered as an online form to the grantees and a collation of the responses has been used for synthesizing the results.

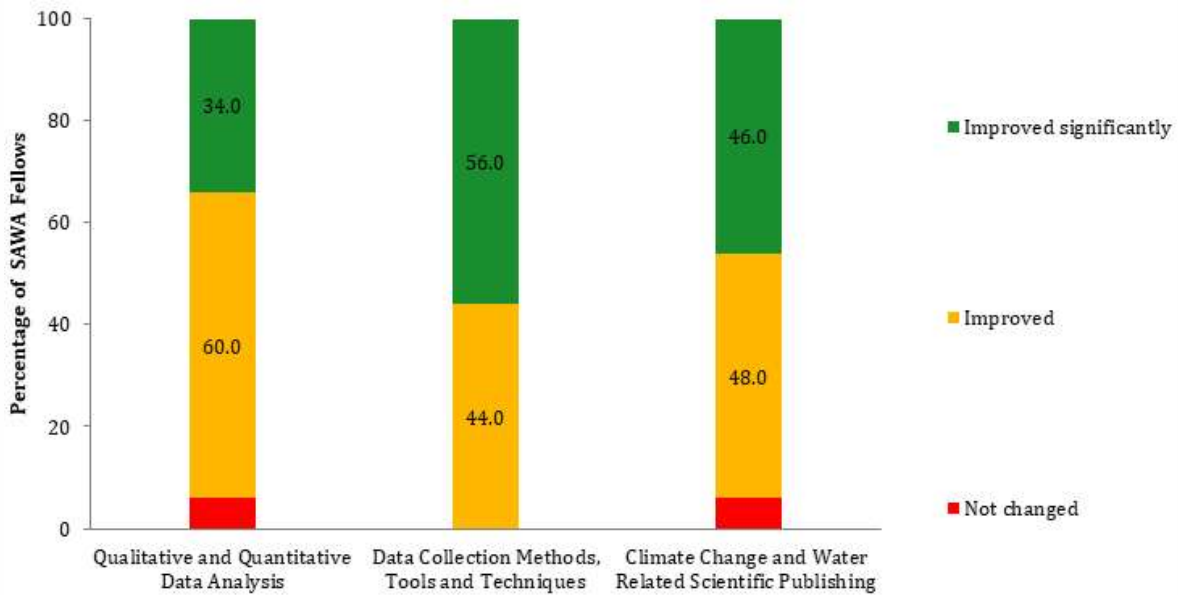
**Table 5: Criteria used for questionnaire**

Criteria		Indicators
Capacity Building	Regional Training Workshop	<ul style="list-style-type: none"> <li>Aid in designing and conducting research</li> </ul>
	Course Curriculum	<ul style="list-style-type: none"> <li>Competencies in qualitative and quantitative data analysis</li> <li>Competencies in data collection methods, tools, and techniques</li> <li>Competency in scientific publishing</li> <li>Competency in adopting an interdisciplinary approach</li> <li>Competency in oral communication and presentation</li> </ul>
Networking and Collaboration		<ul style="list-style-type: none"> <li>Establishing of new linkages and collaboration</li> <li>Collaboration in activities on proposal writing, research dissemination activities, undertaking research projects, community outreach activities</li> </ul>
Employment		<ul style="list-style-type: none"> <li>Expectations of employment opportunity from the course and Fellowship</li> <li>Aspiration on completion of the degree</li> </ul>

## 5.1 Objective 1

### Course curriculum

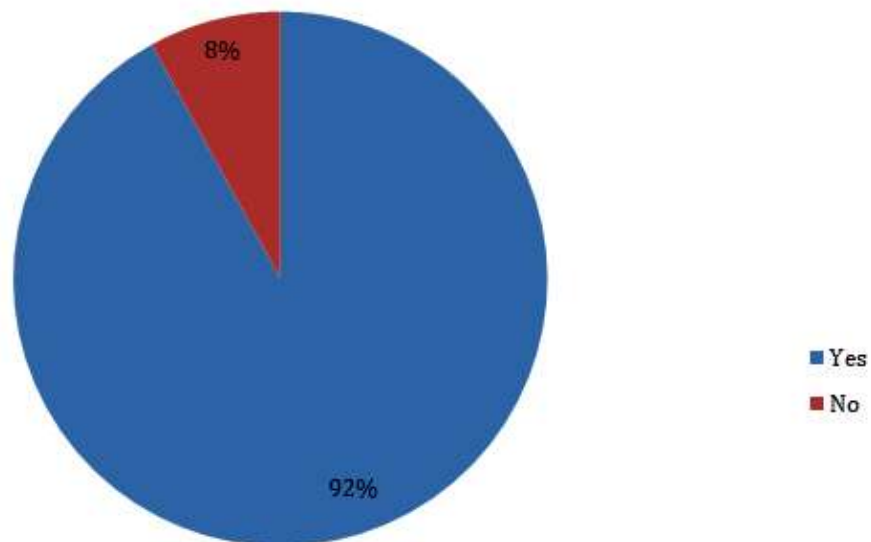
The courses offered at the universities as well as the training workshops aimed to build the capacities of students in enhancing the conceptual understanding of IWRM from an interdisciplinary perspective, developing research methods skills, and building up their analytical skills. The Fellows were asked to assess their own competencies in research skills before and after joining the course, and the chart below shows their responses.



**Figure 4: Competencies in research skills before and after joining the IWRM program**

### Regional training workshop

The training workshops have been useful in acquainting the students to different concepts and methods to be used in interdisciplinary research and have contributed towards the development of the grantee's knowledge. 92% of the SAWA Fellows have said that the training workshop has met their expectations.



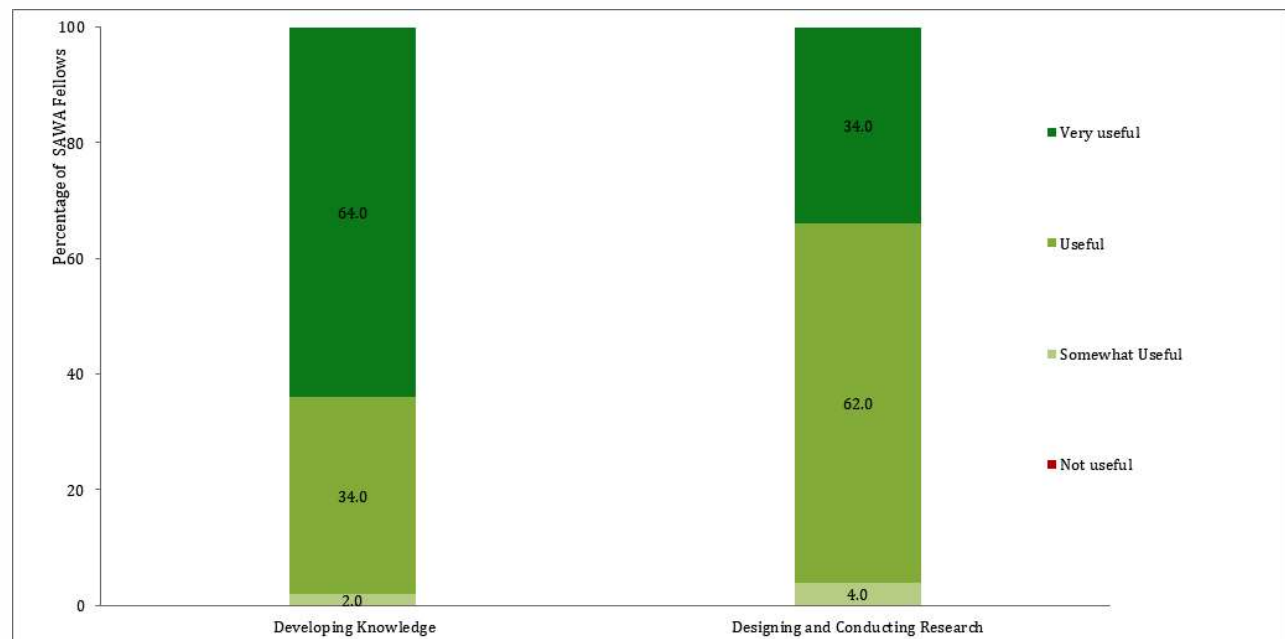
**Figure 5: Meeting Grantee's expectations/objctives**

The experiences shared by two of the SAWA fellows about the workshop further illustrates on how the training has broadened their understanding of interdisciplinarity:

*"I have always been fond of travelling and the exposure it accompanies with fun. This time, trip to Sri Lanka was much more than fun, in terms of knowledge building and networking. Training on research methodology had been such a wonderful opportunity for me to widen the knowledge regarding*

various interdisciplinary research approaches where, my understanding was guided by stereotypical methodologies. Thanks to SAWA for all these opportunities!!!”

- Neha Basnet, NEC



**Figure 6: Usefulness of Regional Training Workshop**

“In the regional training of South Asian Water (SAWA) Fellows on “Interdisciplinary Research Concepts & Methodologies” held in Kandy, Sri Lanka we had seven days of intensive yet a very amusing training period. Coming from an Engineering background myself, it was my first sweeping exposure to interdisciplinary concepts - an introduction to how interdisciplinary paradigm is defined, how it shapes the solution of the problems addressing issues as diverse as socio-economic, technological, gender and development, and integrating all of them within the broader spectrum of the modern days' sustainable development. The distinguished resource persons were perhaps the premier from their respective fields of knowledge and it was a life-changing experience to be trained by them. The field visit to Mahaweli irrigation system in Dambulla was an eye opener for us as it was an ideal system of irrigation project, the model of which could be replicated in our country as well. Last but not the least, the multicultural knowledge and friendship sharing was the most amazing involvement we have had from the training.”

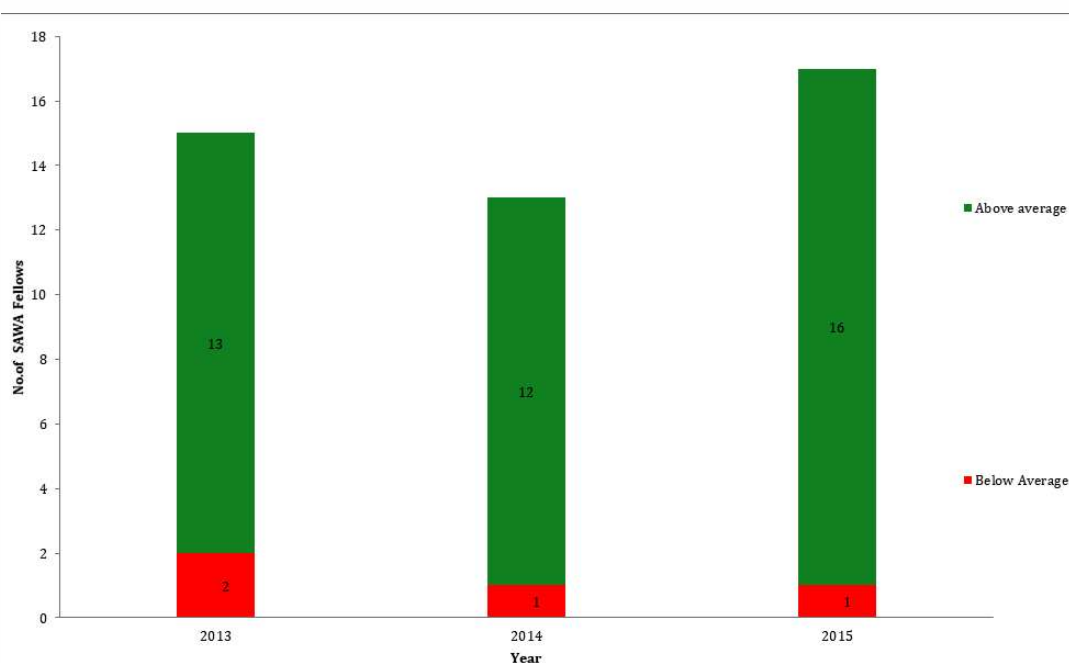
- Md Sadiul Alam Chyon, BUET

The students were also asked to give suggestions, if any, to improve the content and design of the workshop. Following is a summary of their suggestions:

- Extending the duration of fieldwork
- More of “hands-on” training
- More interaction time during the workshops
- Inclusion of practical problem solving exercises related to research methodology

## Performance in academics

The following chart shows the number of SAWA students in each batch who have secured marks above or below the average marks of the entire class of M.Sc. IWRM.



**Figure 7: Academic performance of SAWA fellows**

*Note: This analysis has not been done for SAWA fellows in PGIA as M.Phil. in PGIA does not have any non-SAWA fellows because only those who receive fellowship enroll into M.Phil. and the remaining students take up M.Sc. in IWRM.*

The chart shows that a majority of the SAWA Fellows are performing well in academics and have secured marks above the class average, hence are performing better than the non-SAWA students. Also, the fellows are much ahead of their peers in the research work.

## 5.2 Objective 2

### Synthesis of results

#### Synthesis for Batch 1

The purpose of the SAWA programme between 2012 and 2016 was to encourage interdisciplinary research among a group of research scholars who are from hydrology and related areas. This is done through training them in interdisciplinary methods as well offering them a wide range of courses on social science and water, with particular focus on gender and climate change, over and above the scientific training in water that they receive in their respective institutes.

Accordingly, the SAWA Fellows have worked on three themes for their IWRM Masters in the three years, designed to suit the purpose mentioned above:

1. Food Security and Climate Variability
2. Climate and Water Security

### 3. Climate Change and Livelihood Adaptation

The approaches taken up by different PIs were different. CWR, PGIA, and NEC chose specific study areas like river basins on which all the students worked on different issues to develop an integrated understanding on the area. BUET worked on diverse regions on diverse issues.

The batch-wise details of the four PIs are given below:

#### Batch 1

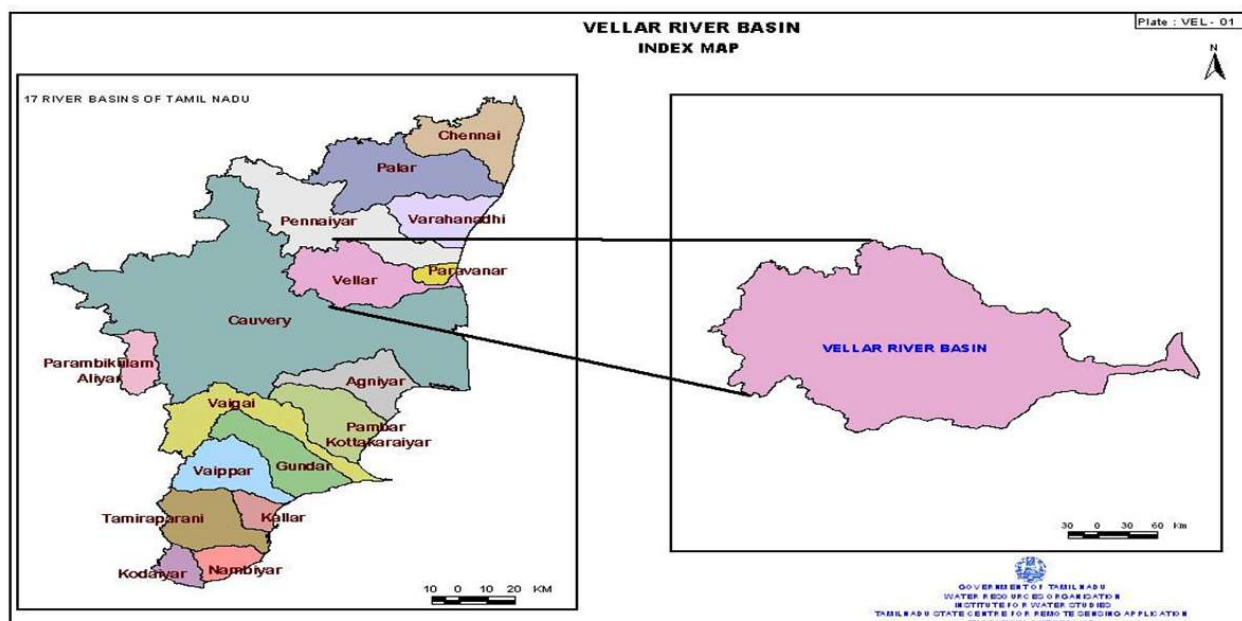
**Theme:** Food Security and Climate Variability

- Centre for Water Resources (CWR), Anna University

The selected study area was Vellar basin which is located in the northern part of Tamil Nadu in India, between latitude 11°13' N to 12°00' N and longitude 78°13' E to 79°47' E. The total length of the Vellar river is about 150 km. The total area of the basin is 7520.87 sq km. This basin is surrounded by Pennaiyar, Paravananar and Cauvery river basins. The tributaries of Vellar are Anaimaduvu, Swethanadhi, Kallar, Chinnar, and Manimukthanadhi. Vellar is a river which originates in the Shevaroy hills and runs through five districts of Tamil Nadu such as Villupuram, Salem, Namakkal, Perambalur and Cuddalore. The Vellar river flows in the valley between two raised mountains: the Kalrayan hills in the north and the Kollimalai-Pachchamalai hills in the south. Vellar basin covers the districts of Dharmapuri, Salem, Namakkal, Thiruchirapalli, Perambalur, Ariyalur, Villupuram, and Cuddalore. The river drains into the Bay of Bengal near Parangipettai (Portnova). The following figure gives the location map of the study basin.

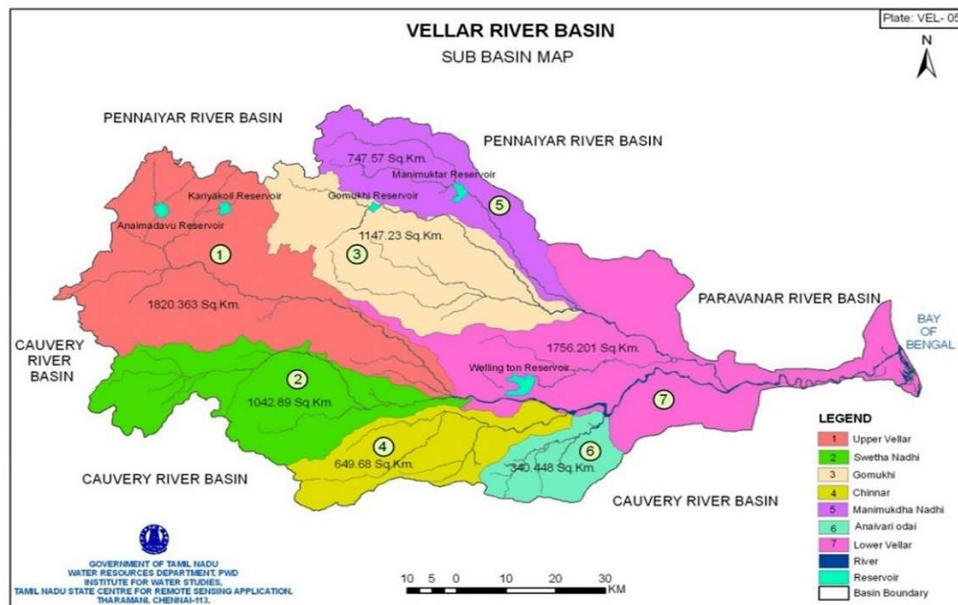
There are seven sub-basins in Vellar namely: Upper Vellar, Swethanadhi, Gomukhinadhi, Manimukthanadhi, Chinnar, Anaivariodai, and Lower Vellar.

Gomukhi sub-basin was chosen for the identification of changes witnessed due to climate variability and land-use dynamics. Agro-ecological zoning (AEZ) was taken as the guideline for carrying out the



**Figure 8: Location Map of the Study Basin in India**

Source: Multi-Disciplinary Project Unit, Public Works Department, Tamil Nadu



**Figure 9: Sub-basin map of Vellar River Basin**

Source : Multi--Disciplinary Project Unit, Public Works Department, Tamil Nadu

chosen objectives. Cropping pattern and crop diversification due to climate variability impacts were found in the Vashistanadhi sub-basin. Additionally, agricultural productivity in Lower Vellar, Anaivariodai, and Chinnar sub-basins were studied.

The research of the first batch of SAWA Fellows focused on identifying and evaluating the various dimensions of food security. Special emphasis was given to analyze food security in accordance with agro-ecosystems, by comparing irrigated and dry systems and assessing the changes in land-use dynamics. The research studies had a spatial and temporal framework and was done through interdisciplinary approaches. The specific studies were conducted on the following topics:

- Impact of climate variability on agricultural productivity in Lower Vellar, Anaivari Odai, and Chinnar sub-basins
- Impact of climate variability on agro-ecosystems and its vulnerability to livelihood
- Impact of climate variability on cropping pattern and crop diversification in Manimukthanadhi sub-basin
- Land cover dynamics and its impact on vulnerability of agro-ecosystems and food security
- Impact of IAMWARM on food security in Vellar basin

The larger research also aimed at understanding the farmers' perception on climate variability and its impact on agricultural productivity, net revenue per hectare, and yield per hectare. The studies examined the changes in the agro-ecosystem through a livelihood vulnerability index. Evaluating the efficacy of the institutions in creating an enabling environment for the food security aspect of the study area was considered important. Some of the research was aimed towards understanding the functioning of both the Water Users' Associations (WUAs) on the one hand, and the government departments, on the other, at the village level. WUAs have been formed in the state through the Irrigated Agriculture Modernisation and Water-Bodies Restoration and Management (IAMWARM)

programme during 2008, and the larger canvas of the research conducted under the SAWA Fellowship was aimed at observing the effectiveness of functioning of the WUAs. An attempt was made to understand the community-government interaction by looking at the intervention made by various line departments at the village level.

SPQR analysis was used to identify the research questions. The primary data collection was done using the PRA tools. Secondary data like precipitation, temperature, and yield per hectare were collected from the respective departments. Remote sensing imageries and Geographic Information Systems (GIS) analysis were used to obtain the agro-ecological zoning map of the Vellar basin by overlaying different thematic layers. ERDAS software was utilized to generate the land-use maps.

The findings show that women are often as aware as men of climate variability and its impact on productivity. It has been found that marginal and small farmers have incurred heavier losses due to impact of climate variability on agricultural productivity than large farmers. A Livelihood Vulnerability Index was calculated for the villages that are affected by climate variability and this aided in understanding the spatial pattern of vulnerability of the villages, which was significantly related to climatic variability. Food security status at the household level was categorized as food secure, mildly food insecure, moderately food insecure, and extremely food insecure. Based on these findings it can be concluded that the climate variability has negative impacts on agricultural productivity in the study area.

Occurrence of flood and drought in the sub-basin has been used to analyze the impact of climatic variability on food security in the study. The impact analysis was carried out in the village Koogaiyur (drought-hit) and Kachiarapalayam (flood-affected). Livelihood vulnerability and hence food security was found to be linked strongly to flood and drought situations. The studies broadly converge in arriving to the conclusion that though farmers are by and large aware about climatic variability and their impact on production, a more holistic sensitization of larger environmental concerns along with integrated crop management techniques would be of use to improve their coping capabilities in the face of extreme climatic events. As per the feedback of the farmers, a proper institutional framework providing subsidies to the farmers without caste-based discretion is likely to improve adaptation to climatic variability.

Climate variability poses major challenges to agricultural productivity. Variability in climate could cause both positive and negative impacts on agricultural productivity as agriculture is dependent on climate variables. Paddy is the major crop of Lower Vellar, Anaivari Odai, and Chinnar. The specific objectives were to firstly, understand the farmers' perception of climate variability and its impacts; secondly, to assess the impact of climate variability on net revenue per hectare using Ricardian model; and finally, to relate the impact of climate variability on yield per hectare using Just-Pope protection function.

It was found that the villages chosen by the IAMWARM programme had progressed well in terms of economic growth. The villagers get assistance through programmes like animal husbandry programme and trainings on the technical adoption such as System of Rice Intensification, drip irrigation, and sprinkler irrigation systems. They were also trained to handle farm machineries. It was recommended by one of the studies that the functioning of WUAs could be more effective if the coordination among the members improved and leadership skills could be imparted.



- [Post Graduate Institute of Agriculture \(PGIA\), University of Peradeniya](#)

The five students of the first group of SAWA Fellows attempted to address the food security issues selecting two study sites; Hakwatuna Oya major irrigation system and Bayawa minor irrigation system located in Deduru Oya river basin in the North Western province of Sri Lanka. The division between major and minor irrigation systems is based on the size of the command area - if it is less than 80 ha, then the system is considered as a minor irrigation system - and the two systems are operated by different government departments. Both irrigation systems were dominated with paddy cultivation. Since rice is the staple food in Sri Lanka, success of the paddy cultivation highly contributes to food security of the society. The overall objective of the research programme of the first batch of SAWA Fellows was to address the food security issue with respect to climate change/ variability which may impact water security of the irrigation systems, and also to address the ecosystem degradation and social issues on sustainability of the watershed areas of the irrigation reservoir. These issues were addressed under five research topics, namely:

- Impact of climate variability on water availability and paddy productivity in the Hakwatuna Oya irrigation scheme in Sri Lanka,
- Assessment of water management on sustainability of paddy cultivation under variable rainfall in Bayawa, Kurunegala, Sri Lanka,
- Impact of rainfall variability on soil organic matter and nitrogen in lowland paddy field: A case study in Bayawa minor irrigation system,
- Impact of climate change and policy environment on rural smallholder farmers in Hakwatuna Oya scheme in Sri Lanka, and
- Impacts of land use/land cover changes on ecosystem and food security in Hakwatuna Oya watershed in Deduru Oya basin.

Research methodologies included field surveys, field and laboratory experiments, analysis of secondary data, using statistical techniques etc.

According to the results, there were no significant trends in annual rainfall during 1991 to 2010 in Hakwatuna Oya area compared to the base period of 1961-1990 considered in the study. The decrease in mean yala (minor cultivation season) rainfall during post-1990 period compared to the base period may justify the farmers' perception of increased drought. Expansion of agricultural land in the watershed of Hakwatuna Oya reservoir has improved food security and income levels while bringing negative impacts on groundwater resources and ecosystems.

With respect to Bayawa minor irrigation system, the tank catchment is sufficient to produce stable water yields and its storage is sufficient to provide irrigation water to the command area. However, yield failures have occurred due to rainfall during harvesting season, inadequate decisions, poor implementation strategy, and poor coordination and attitudes of the farmers. The study identified that the rainfall variability has an influence on biomass accumulation, decomposition, and nitrogen transformation in the paddy fields; which can contribute to the yield. It was further identified that certain elements of various policies and programs in Sri Lanka have provided directions to deal with climate change issues. But these interventions are not strong enough to reduce farmers' vulnerability to climate change or variability. Coordination between relevant institutions is required to address the issues effectively and efficiently.



Picture 1: A water gauge installed in the Bayawa tank by SAWA Fellow Sumudu to monitor the water level in the tank

Picture 2: Interview with a farmer

Picture 3: Collecting information on pump discharge

### Institute of Water and Flood Management (IWFM), BUET

There were five Fellows from the first batch at IWFM, BUET. All the Fellows have completed their theses. They worked in the south-west coastal area of Bangladesh, specifically in Dacope sub-district of Khulna district. Cyclone, storm surge, water logging, erosion, and salinity are among the major water-related hazards in the area. The inundation caused by the cyclone “Aila” in 2009 increased soil and water salinity, and resulted in immediate and prolonged livelihood and food security impacts. The five Fellows worked broadly on food security issues of different livelihood groups in the area.

The specific research topics were as follows:

- Prospect of rabi crops in south-west coastal area under climate change scenarios
- Storm surge propagation and crop damage assessment in a coastal polder of Bangladesh
- Assessment of biophysical factors for storm surge hazard and their implications for food security
- Crop decision-making model and impacts of crop selection on the livelihood of farmers in coastal area

- Changes on land use and soil properties and their impact on rice yield in Dacope Upazila, Khulna

All the Fellows followed a participatory approach in their research design and execution. They frequently used a number of participatory tools including focus group discussions (FGDs), semi structured interviews (SSIs), key informants' interviews (KIIs), timeline analysis, participatory GIS, and social and resource mapping. The Fellows made a number of field visits to the study area for gathering of field data. For bio-physical assessment, they made use of simulation models, such as Delft3D and AquaCrop, and image processing software such as ERDAS Imagine. Overall, the approach followed by each Fellow was both socio-technical and interdisciplinary.



*Picture 1: Focus Group Discussion with rice farmers*

*Picture 2: Social mapping in a market with local people*

*Picture 3: Measurement of storm surge height during cyclone Aila marked in a tree*

*Picture 4: Measurement of embankment height in cyclone affected areas*

*Picture 5: Interview with rice farmers in the field*

*Picture 6: Water salinity measurement in rice field*

The findings point towards the fact that the coastal people are in general food insecure. The insecurity is due to frequent natural disasters, such as cyclonic storm surge, and long-term chronic stress, such as soil salinity. Storm surge has both immediate and prolonged impacts. Repeated tidal inundation through storm surge led polder breaches over a period of three to four years to delay livelihood restoration and puts local people under food insecurity. Excessive soil salinity and lack of fresh water for irrigation discourage farmers to grow subsistence food crops and sometimes any crop at all, which in turn results in acute food insecurity. Food insecurity is also related to socio-economic factors, such as land use and availability of financial capital of farmers for crop production. Though shrimp cultivation has a high profit margin, the distributional aspects of the benefits work as a deterrent to food security. In addition, there are adverse environmental impacts of shrimp cultivation.

Among the different livelihood groups, the wage laborers and the people living in Sundarbans are the most vulnerable to food insecurity in terms of its different dimensions (availability, access, stability,

and utilization). The perception of local people about challenges of shrimp aquaculture has changed and they are switching back to crop agriculture. However, one of the studies, through crop model simulation, highlights the opportunities of climate change, namely a good prospect of rabi crops under future climate. Various institutional supports are needed for the farmers to facilitate crop cultivation and attain food security.

- [Nepal Engineering College \(NEC\)](#)

The first batch students focused their research in the Kathmandu Valley (Bhaktapur and Lalitpur) and one study was carried out in Lower Bagmati basin, where the students assessed the impacts of urbanisation-led land-use and climate change on food security of the valley. In particular, the impacts of flooding on paddy production was assessed. The study conducted in Bhaktapur was based on a case study approach, while the rest of the studies used tools like ArcGIS, a computer model called HecRAS, along with various participatory tools such as focus group discussions, key informants' interviews, field observation, and questionnaire surveys.

Two of the studies that had direct bearing on food security were carried out in Madhyapur Thimi municipality and in Kodku Khola watershed. The decadal land use maps of Madhyapur Thimi showed that the agricultural lands are being rapidly converted into urban landscapes, but upon field verification it was observed that the extent of agricultural land is even less than that analyzed through GIS because of major land pooling activities going on in the municipality. This has hampered the local food production of the area, which was one of the food baskets of the valley. The agricultural land is left fallow due to various reasons such as selling of lands to immigrants who neither cultivate on their own nor allow others to cultivate, fragmentation of lands, lands surrounded by buildings inappropriate for agriculture, water logging problems, and occupational shift of the farmers. However, the food security of the area is still intact, as people earn a greater share of income from non-farm activities which allows them to purchase food.

In the study of Kodku Khola watershed, the decadal land cover map analysis showed that the forest and agriculture cover has decreased substantially and were converted into settlements resulting in negative consequences on food production. During the study period, it was clearly found out that the food deficiency period has increased from less than three months to almost nearly seven months over a 35 year period. The reasons are similar to that of the above case.

The research findings with respect to farm households' vulnerability to climate change was carried out in Dadhikot Village Development Council (VDC) of Bhaktapur district; the study concluded that social characteristics of farmers play a crucial role in climate change adaptation action and adaptive capacity, and thereby create differential social vulnerability among farmers to climate variability along with the bio-physical factors of climate change. Social vulnerability to climatic variability is not made up by any single characteristic of individuals or households but is a combination of diverse factors that determine adaptive capacities.

The poor farmers who have comparatively smaller land holding size or the ones that are landless and those solely dependent on agriculture were found more vulnerable compared to the rich farmers having a larger irrigated landholding and diversity of income sources. Those belonging to a higher level of socio-economic status tend to be less vulnerable compared to those at a lower level. Those vulnerable to climatic variability mostly comprised socio-economically disadvantaged farmers, women, and the households belonging to lower caste groups.



Picture 1: Papaya currently grown in Dadhikot VDC while earlier the climate of the valley was unsuitable for its growth

Picture 2: Dried-up agricultural field of Kodku Khola watershed

Picture 3: Farmland under water due to flash floods as a result of urbanisation

The research conducted on inundation impact on paddy yield was carried out in the middle Bagmati river basin where frequent flood takes place. The study estimated that floods of varying magnitude with various return periods in the study area inundate thousands of hectares of agriculture lands. The inundation remains for less than a day to more than seven days. Since the area under study was agriculture based, the study assessed the impacts of inundation on paddy yield. The paddy yield loss is high and increases with the inundation resulted by floods of various return periods. Loss of paddy yield by the inundation is about 25% for each return period.

## Batch 2

**Theme:** Climate Change and Water Security

- [Centre for Water Resources \(CWR\), Anna University](#)

The study area for CWR remained the same as the first year, the Vellar basin. In the second year, the water security of the Upper Vellar sub-basin was studied. The role of the rehabilitated tanks in improving water security in the Gomukhi sub-basin of Vellar basin was analysed. Anaivari Odai sub-basin was chosen for the study on water security and vulnerability since it is the driest sub-basin of the Vellar basin. Studying the water footprint of agriculture and domestic sectors and its impact on water security of Veppanthatai block of the Vellar basin was also attempted.

The role of Water Users' Associations in the rehabilitated tank catchment for improving water security to promote economic and ecological water saving mechanisms increasing farm income were studied. The other objectives included assessing the water footprint of agriculture and domestic sectors' impact on water security, examining rainfall variability under changing climate and

its impact on drinking water security, and to understand the impact of crop diversification on water use and water security at the village level.

The methodology of some of the studies incorporates technical, financial, and livelihood related indicators. Reviews of the policy framework and legislations at the national and the state levels with respect to the WUAs were carried out. The studies incorporated the entire gamut of actors, from local and informal ones to more formalized and registered organizations and associations at the regional level. Using different parameters, indicators, and tools (Likert's scale), a comparative analysis was carried out between the associations. Selected engineering, agricultural, and financial indicators for the head, middle, and tail reaches of the tanks were assessed through questionnaire surveys conducted among the stakeholders.

The tank performance was simulated in terms of water balance for the past 15 years (2000-2015) to evaluate the impact of tank rehabilitation. It was found that the agricultural production and net income of the farmers had increased after the implementation of the tank rehabilitation programme. The impact of tank rehabilitation on water security has been studied for selected tanks. Frequency analysis, trend analysis, and analysis through statistical parameters were used to determine and ensure the prevalence of rainfall variability at the block level. Climate data from 2005 to 2014 was collected from the Institute for Water Studies and used to estimate the evapotranspiration. Crop and yield data from 2005 to 2014 was collected from Thiyagaidurugam Agriculture Department and was further used to estimate the crop water requirement and water productivity.

The body of research conducted by the 2nd batch of SAWA Fellows analyses the water footprint of different sectors (agricultural, domestic, and ecological) at the block level and the consequent water security of these sectors. The components of water footprint assessment also includes within its scope virtual water flows, which in turn incorporates the virtual water exports and imports. The purpose of this body of research was to evaluate the impact of climatic parameters, local institutions, and policy implementation like tank renovation on water security at different scales. The research topics of this batch are as follows:

- Rainfall variability under changing climate: An impact study of drinking water security at village level
- Impact of crop diversification on water use and water security at village level
- Role of Water Users' Associations in improving water security: A case study of Upper Vellar sub-basin
- A study of agriculture and domestic water footprint and its impact on water security of Veppanthatai block of Vellar basin
- Role of rehabilitated tanks in improving water security in Gomuhi sub-basin of Vellar basin

As an outcome of the study, the change in water conveyance efficiency in agriculture as a result of tank renovation was established. It was found that agricultural water security improved significantly due to rehabilitation of tanks due to increased water-availability days and their groundwater recharge capability. The study also found that performance of the non-system tank was better than the system tank because of good rehabilitation work as well as agricultural productivity. This is a particularly significant finding from the perspective of providing policy directions to the recent tank

rejuvenation programmes in other states in India. Though climatic parameters like rainfall influence water security of a region, it was notably observed that social and cultural norms prevailing in a village impact, to a large extent.

The impact of WUAs, like one of the studies in the previous batch (though in different context), was found to be positive in managing the water security of the village in general. However, this is with some caveats; the performances of WUAs having large farmers from upper castes performed worse than those with representations of the marginalized groups, while the canal-based associations performed better than the tank-based ones, probably due to its scale effect. Women participated in those associations where incidence of male selective out-migration was high in the village.



*Picture 1: Sluice and water spread area of non-system tank*

*Picture 2: Typical well under system command area*

The research also established a relationship between crop diversification and water security in the sense that often high-value crop combinations are also ones that save on water. The water footprint and water security parameters were used to recommend appropriate measures for enhancing water resource use. A water security plan was designed for effective watershed improvement in a small village, which can potentially be replicated for similar agro-ecological systems.

- [Post Graduate Institute of Agriculture \(PGIA\), University of Peradeniya](#)

The five students of the 2nd batch of SAWA Fellows attempted to address the water security issues selecting two study sites located in Deduru Oya river basin in the North Western Province of Sri Lanka; Hakwatuna Oya major irrigation system in the watershed area of Hakwatuna Oya and Bayawa minor irrigation system in the riparian ecosystem located downstream of Deduru Oya reservoir. The overall objective of the research programme of the 2nd batch of SAWA Fellows is to address water security in agriculture and ecosystems under changing climatic, environmental, and social conditions. These issues were addressed under five research topics, namely:

- Identification and assessment of technical and socioeconomic aspects in cultivating Other Field Crops (OFC) in Bayawa minor irrigation system,
- Alternative water regimes cum enhanced ecosystem as an adaptation to climate variability in

paddy cultivation,

- Effect of climate variability on water availability, allocation, productivity, and conflicts in Hakwatuna Oya watershed in the Deduru Oya basin;
- Small-scale water interventions for improving livelihoods of rural smallholder farmers in a selected minor tank cascade system in the Deduru Oya basin; and
- Environmental flow assessment of the Deduru Oya reservoir in the Deduru Oya basin to enhance the sustainability of the downstream ecosystems.

The research methodologies included questionnaire surveys, use of PRA tools to collect required data, and secondary data analysis.

The results revealed that the farmers in the study areas suffer due to inadequacy of water, which is due either to climatic variability or poor water management practices. In Bayawa irrigation system, introduction of Other Field Crops (crops which consume less water compared to paddy) is not easy mostly due to field limitations, moisture availability, and socioeconomic factors. In addition, crop diversification is highly dependent on socioeconomic variables such as education, gender, social capital, field location etc. In the same irrigation system, a water management index was developed to assess the water regime of the field using physical factors and social capacity of the farmers. According to the index, water regime varies in the head, middle, and tail end of the command area. The tail end of the command area has more reliability for water than the head and middle sections. These water level fluctuations have led to high biodiversity in the paddy fields, which is beneficial to the ecosystem sustainability.

It was identified that conflicts exist among the water users and uses in Hakwatuna Oya watershed and the command area due to scarcity of water. These conflicts are high during water short Yala cultivation season. Non-cooperative attitude among farmers, weak land and water rights, non-



Picture 1: Collection of water sample in the field using dipping method

Picture 2, 3 & 4: Fauna in the paddy field



implementation of law, encroachments, and inadequate institutional arrangements were the reasons behind these conflicts. The ecosystems downstream of the Deduru Oya reservoir do not suffer much due to reservoir construction since there is adequate flow release to compensate the environmental flow requirement. The social water requirement, which is a component of the environmental flow, is significant in this segment of Deduru Oya.

- [Institute of Water and Flood Management \(IWFM\), BUET](#)

There are three<sup>1</sup> fellows from the second batch at IWFM, BUET. All the fellows are continuing their work in the southwest coastal area of Bangladesh, specifically in Tala sub-district of Satkhira district. Soil and water salinity, water logging, and fresh water scarcity are among the major water security issues in the area. With these, there is an issue of shrimp aquaculture - gender and equity are major concerns of this practice. Three fellows are working on three issues of water security - agricultural water security, economic valuation of the ecosystem service created through enhanced water security, and gender-water security interrelation. The fellows are using PRA tools, such as FGDs and Key Informant Interviews (KIIs), along with a formal questionnaire survey for gathering field data and information. They are also using economic valuation tools, multi-criteria decision analysis tools, and the Harvard Analytical Framework, depending on the thesis topics. They have made three field visits to the study area and interacted with local stakeholders.

Agricultural water security consists of water availability, access, water use, and capacity and disaster management. The security index was found to be high for agro-ecosystems in which tidal river management is practiced. However, the indices were found to be very low in water logged and saline agro-ecosystems. Suitable strategies to improve water security in these two areas are suggested.

Gender performance was found to be better in Jalalpur union due to better distribution of resources among different spheres of society, better conditions to pursue other agricultural activities, and better earning opportunities of women. A better earning opportunity ultimately led to women



**Picture 1: Students conducting FGD**

---

<sup>1</sup> Two students from the 2nd batch dropped out from college. The two fellowships were carried forward and a total of seven fellowships have been awarded to the 3rd batch.

empowerment in the area. Gender awareness, gender performance, social safety, and health facilities were in good condition in Jalalpur union for primarily adopting mixed culture. In contrast, fresh water availability is a major concern for agriculture-related livelihood in Kumira union. Brackish water shrimp culture is the dominant livelihood practice in the area. Though the economic return was high compared to paddy cultivation, the return was not distributed evenly in the society. In addition, shrimp culture posed a threat to other occupations and environment. The shrimp culture practice should be subjected to some regulations, and NGO and government sectors should come together to ensure better livelihood opportunities in an equitable manner.

Tidal river management provides various ecosystem services. These include agricultural and fisheries benefits, reduced rate of dredging, improved tidal flow, reduced drainage congestion, land raising, and increased soil fertility. Proper valuation of these services can show its value over structural measures, which is very important for decision-making regarding natural resources. This study is currently evaluating such services in a selected area, called Pakhimara Beel.

- [Nepal Engineering College \(NEC\)](#)

The thematic issue for the second batch was water security. Out of five SAWA Fellows, only one has completed the research so far. The tools used for inquiries included FGDs, KIIs, household questionnaire survey, water quality analysis, and tools such as GIS and various models.

The individual topics for this batch are as follows:

- Effect of Urbanization and Urban Water Extraction on Water Security of Jhaukhel
- An Assessment of Water Security Situation in Terms of Water Quality in Upper Bagmati Basin, Nepal in Present and Future Climatic Conditions
- Water Resources Conservation and Management Practices in Context of Climate Change in Upper Bagmati River Basin
- Climate Variability and Trends in Water Induced Disasters in Lower Bagmati River Basin
- Potential of Wastewater Reuse for Water Security in Agriculture: A Case of Harisiddhi Wastewater Treatment System

NEC, like the last batch, has continued to contribute to research on urbanisation and water through one of the studies. The study showed that the traditional water sources are in poor condition due to very limited use as a result of tap stands at individual homesteads. People who lack the utility sources have conserved a few water sources to the best of their capacities, though the quality of water is not assured in such cases. Massive groundwater extraction by water entrepreneurs who own personal wells proved to be detrimental to the water level in the area; the local people, however, are completely aware of the significant losses in water level due to this process. The drying up of traditional water sources used for many rituals has created chaos among the community members, leading them to change their cultural as well as traditional beliefs while also leading to extra stress on the nearby sources. In contrast, urbanisation in some cases seemed to have contributed to rejuvenating a few water sources through joint efforts of the municipality and community, thus leading to protection of a few water sources and stone spouts in the area.

Research findings on water security and conservation in the Upper Bagmati basin, through the water



*Picture 1: Traditional community source left abandoned*

*Picture 2: Community water source during the dry season*

*Picture 3: Community water source during the wet season*

*Picture 4: Karmanasa river where the effluent of treatment plant is disposed. The water is pumped by some farmers during dry season.*

*Picture 5: Abandoned water tap; the after effects of the earthquake*

*Picture 6: Treatment Plant effluent mixed with surface drain and this water is used for irrigation*

sample tests, concluded that there is an increase in electrical conductivity in the river water from the source towards the downstream. As the river flows downstream, the river gets more polluted. Higher concentrations of Total Dissolved Solids (TDS) and ammonia indicate organic pollution from domestic sewage, industrial waste, and fertilizer run-off. Higher concentration of nutrients was observed as it passed through city areas where many municipal and industrial drains drain into the river. The study from key informant interviews concluded that residents in Bagmati basin know the source of their domestic water supply, and a few also perceive threats to the availability of drinking water they depend upon. The majority of policy makers in the Bagmati basin wanted stronger federal laws that can improve water quality, which they see as essential for development. Members of the public too perceive threats to their water and also want strong federal regulations to protect their water supplies.

The study in Harisiddhi VDC focusing on reuse of wastewater was carried out to assess the potential of treated wastewater to be used for agriculture as a mean to secure irrigation water. Wastewater from all the households is conveyed to a centralized wastewater treatment plant. It was found that the quality of treated effluent did not meet the standard for safe use, and the quantity of treated wastewater is less than the irrigation demand and therefore not technically feasible for irrigation. There is a gendered difference on the attitude toward the use of wastewater in agriculture; male farmers prefer the use of wastewater from a water security point of view whereas female farmers discard it because of unsanitary conditions and associated health impacts. Different age groups have different perspectives regarding wastewater use in agriculture. The study concluded that people above 60 years of age have good practical knowledge on the impacts of wastewater use in agriculture.

## Batch 3

### Theme: Climate Change and Livelihood Adaptation

The research of all the SAWA Fellows in the 3rd batch is ongoing, though the review of literature, fieldwork, and data collection for the same is nearly complete. Also, the monitoring visit from SaciWATERS has been completed for all the institutions, and the fellows have been provided advice on how best to proceed with their work keeping in line with the SAWA mandate. In CWR and PGIA, most of the fellows have completed a major part of the analysis, but the other two institutions are in a nascent stage of developing the proposals due to the late start of their sessions.

- [Centre for Water Resources \(CWR\), Anna University](#)

The larger study area remained the same for CWR as in the first two batches, i.e., Vellar river basin. The Lower Vellar is selected in particular, since extreme climate events are more prone in this basin. The Lower Vellar river starts from Tholudur Anicut and finally falls into Portnova in Bay of Bengal. The basin is situated between latitude 11°13'N-12°00'N and longitude 78°13'E-79°47'E. The total area of this basin is 1753 sq. kms. The annual rainfall of the sub-basin is 1165 mm.

The primary research objective is to understand peoples' perception on climate change, the effect of climate change on livelihoods, and various adaptation strategies to climate change. The research also incorporates the role of water resources in livelihood diversification and its impact on displacement and migration. One of the research topics brings out the policy gaps of the disaster management plan by assessing the performance of the implementing institutions. The extent of climate change impacts is proposed to be computed using a livelihood vulnerability index.



*Picture 1: Vellar bridge in Tittagudi village, Cuddalore district, Tamil Nadu (Picture taken on 31.07.2016). Even though it was a Southwest monsoon period, the river remained dry in the downstream region.*

*Picture 2: Drip irrigation for cultivation of sugarcane in Pulikarambalur village, Cuddalore district, Tamil Nadu.*

*Picture 3: Raise of bunds around the farms to prevent the invasion of animals in Pulikarambalur village, Cuddalore District, Tamil Nadu. (In recent days there is increased animal invasion in search of food and water from the nearby reserve forest).*

*Picture 4: Sand mining in Vellar river in Kozhiyoor village, Cuddalore district, Tamil Nadu (anthropogenic activity aggravating the present condition of the river bed).*

## Methodology

Much of the studies are using primary data like recording peoples' perception, effects of climate change felt by the people, details about assets of the people, and the source of income. For assessing the roles and responsibilities of line departments and the institutions in Cuddalore district, semi-structured interviews have been carried out with the authorities as well as voluntary organizations.

Secondary data consists of literature review and based on it the methodology was formed; it also includes demographic data and the record of extreme weather events to understand the impact of climate change. Climate variables considered in this study are precipitation and temperature. Long-term data for a period of about 20 years has been collected for the purpose of analysis. The data collected is being analyzed using probabilistic techniques to measure the impacts, and trend analysis is being used to project the climate change. The effectiveness of the role of institutions in governing the disasters will be tabled in the form of Strength, Weakness, Opportunities, Threats (SWOT) analysis.

- [Post Graduate Institute of Agriculture \(PGIA\), University of Peradeniya](#)

The five students of the third group of SAWA Fellows carried out their research in the study sites of Hakwatuna Oya major irrigation system, Deduru Oya reservoir and the resettlement sites, Bayawa minor irrigation system, and another three selected minor irrigation systems within Deduru Oya river basin. The research objectives were focused on addressing the adaptations to climate change impacts considering water resources management, food security, and livelihood and ecosystem sustainability within their study sites. These issues were addressed under five research topics, namely:

- Impacts of climate change and irrigation management on irrigation water demand in Hakwatuna Oya irrigation scheme in Sri Lanka,
- Investigation of strategies for climate change adaptation in terms of food quality and ecosystem sustainability in paddy cultivation,
- Evaluating existing levels of livelihood capitals of the smallholder rural farmers and prioritizing the water interventions within the Bayawa cascade in Sri Lanka,
- Role of governance and institutional arrangement in strengthening resilience to shocks and stresses to livelihoods in minor irrigation systems, and
- Social and livelihood impacts of Deduru Oya dam construction and water diversion.

Research methodologies included field surveys, field and laboratory experiments, analysis of secondary data using statistical techniques, and mathematical model simulations.

According to results, compared to the mean annual rainfall during 1972 to 2001, the rainfall is expected to increase by 32% and 27% from 2041 to 2070 under respective climate change scenarios (A2 and B2 scenarios). As a result, the total water availability from rainfall and irrigation water issues from the Hakwatuna Oya reservoir in Maha season (the major cultivation season) would increase in the future with an overall water deficit reduced in both Yala and Maha seasons. The benefits from climate change could be further enhanced by adjusting the planting time to coincide with the months of more rainfall.

Climate change adaptation strategies of the farmers in Bayawa area include reduction of use of chemical inputs in agriculture, application of animal and green manure, retaining plant residues, minimum tillage, crop rotation and diversification, use of integrated biological and cultural pest control, cultivation of legume crops during the inter-season, cultivation of traditional rice varieties, and the use of aquatic organisms as nutrient source. The minor irrigation systems in the study area are governed by the Department of Agrarian Development and/or Provincial Councils towards sustainability goals, and providing support services to a community based system centered on farmer organizations. Other agencies play a supportive role, operating independently of each other with very little coordination. There is a need for a strong functional coordination mechanism between major institutions. Strengthening of Farmers' Organizations as the main institution in managing minor tanks becomes very important in this respect. The impacts of Deduru Oya reservoir construction includes loss of cultivated lands and shifting of the livelihoods of the resettled people mostly from farming to daily wage labourers. Vulnerability of both males and females to the physical displacement was also observed.



Picture 1: Condition of the well water in the resettlement sites

Picture 2: Use of bio-pesticides for the control of fungal disease in paddy soil

Picture 3: Use of light traps to control natural enemies in paddy fields

Picture 4: Land inundated by the construction of new reservoir

Picture 5: New houses for the displaced community in "Kobeigane" area

- [Nepal Engineering College \(NEC\)](#)

The 3rd batch of fellows are at present, developing their research proposal; after a series of consultations with the potential supervisors, a few of them have submitted their proposals. The issues they will be dealing with in their research are climate change induced migration and adaptation to secure livelihoods. The other issue is the government and local initiations on building resilient communities against climate change impacts. Research has been proposed to see the applicability and viability of adaptation measures of the local people towards climate change impacts. The tools that are being anticipated to be used in their research are participatory tools of inquiry. The fellows will defend their thesis by the end of March 2017, though the project ends in December 2016.

- [BUET](#)

The students' research is largely focusing on risk assessment, adaptation strategies, and the impacts of climate change on livelihood. These issues were addressed under five research topics, namely:

- Multi-hazard risk assessment and adaptation strategies,,
- Strom surge risk assessment and livelihood adaptation strategies,
- Effect of livelihood diversification due to climate change and its impact on displacement and migration,



Picture 1: Livestock farming as a means of livelihood diversification

Picture 2: Women farmer spraying homemade manure in field

Picture 3: Plastic pond: capturing water after domestic use in a plastic pond as a means to meet crop water demand during dry season

Picture 4: Homemade manure for farming

Picture 5: Farmers practicing mulching as a means to reduce the water requirement



Picture 1: Erosion of a coastal riverbank in southwest Bangladesh

Picture 2: Grain formation phase of Boro rice

Picture 3: Relocation and migration of hazard affected coastal people

Picture 4: Shallow tubewell - a source of irrigation water

- Impact of climate change on coastal reserves of Bangladesh and scope of modification of existing adaptation programs,
- Effectiveness of EBA to climate change impacts in study area with a focus on sustainable livelihood, and
- Salinity problems, crop production, and different livelihood adaptation strategies in the southwest region of Bangladesh.

### Summing Up:

The thematic areas in the three batches of the SAWA Fellows were consistent with the four research issues aimed for in the proposal for the SAWA Fellowship programme - climate change and variability, water security, food security, and livelihood adaptation. The research done by the young scholars of the four institutions in South Asia has undoubtedly brought forth a better understanding about climate change and water related issues in the region. Some areas of strength of the fellowship programme can clearly be identified after reviewing the vast body of research produced by the SAWA Fellows. There have been listed below:

- Developing a systemic understanding of water and other natural resources:* Much of the work conducted by the SAWA fellows have made them aware and potentially the readers of their work, of the need to bring together a systemic understanding of water, land, and vegetation. The theme selected for the first batch, i.e., climate variability and food security, actually required such an approach, but this systemic approach has been adopted in other batches too. This body of work collectively points towards the importance of firstly, analysing water in conjunction with other natural resources, and secondly, having a systemic understanding of natural resources within a framework of a geo-hydrological unit (as adopted by CWR and PGIA for all batches).
- Highlighting the need for interdisciplinary research:* To a very large extent, the young scientists that mostly come from a pure science disciplinary background have managed to incorporate the training they were imparted on the societal aspects of water resources into their research. This did not only include their using interdisciplinary research methods, but highlighting through their research that a purely scientific view of water resource management, though useful, is likely to be incomplete. A few examples where interdisciplinary elements were handled with great competence were in terms of understanding the guiding forces behind crop diversification, identifying how the larger scientific phenomenon of climate change can be understood by members of community differentially, and the way institutions can function for implementation or non-implementation of efficient scientific solutions.
- Learning across batches of SAWA Fellows:* Though the thematic thrust of the batches was different, there were cross-learnings across the batches of SAWA fellows, when seen in totality. There were results (as in case of the achievements of WUAs) that conformed to the results established in earlier batches in different context; this enabled triangulation of results, throwing up a larger and more robust finding. There was a great deal of complementarity among the knowledge generated when the scholars over batches studied the same river basin or irrigation systems.
- Learning across countries:* The larger aim of this programme has been to develop a common



framework for understanding water resource management in South Asia as a whole. Though the water endowment and issues embedded in them vary by country, some of the findings conducted in different countries both complemented and supplemented each other. There were studies conducted in, say, Bangladesh and India that highlighted both the limited participation of women in local institutions managing water, as well as the conditions that promote such participation. A study conducted in India, for example, identifies male-selective out-migration from the village as a condition that promotes the same. The study from Bangladesh goes on to highlight the positive outcomes that are associated when women's participation is high. A study from Sri Lanka, though not focusing on gender, concludes that institutions work better when the marginalized participate; thus it complements the findings of the research carried out in Bangladesh. A related result from Nepal demonstrates how differently wastewater irrigation is viewed by men and women, with the latter having a stronger sense for sustainable health outcomes.

- e) *Policy relevance*: Much of the work that has been carried out by the SAWA Fellows has strong policy relevance, some directly and others, indirectly. Some of the findings established through such studies move away from the commonly established understanding about water resources. For example, a study carried out in Sri Lanka, highlighting water distribution in the tail reaches of the canal system rather than the head reaches, throws new insights into how an irrigation system may work in humid regions. A study conducted in India bringing into focus the point that non-system tanks actually are more efficient than cascade tanks, has a great relevance for tank rejuvenation programmes being carried out in a big way in other parts of the country.

There was however, some scope for improvement in the research that was conducted by the SAWA Fellows.

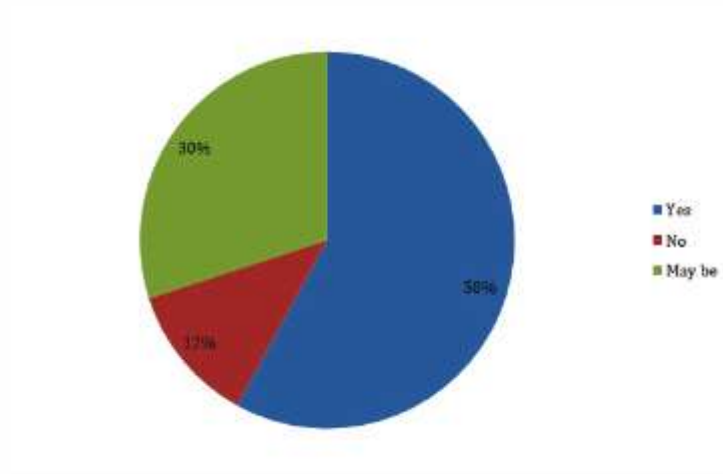
- a) Though gender was handled in a few of the studies, it could have meaningfully been a cross-cutting theme in many of the studies, where it was not touched upon.
- b) Climate change was handled by very few studies, though there were a large number of studies that looked at climate vulnerability. This is understandable, given the Fellows were encouraged to base their work on fieldwork and had no opportunity to compare the same with a benchmark.
- c) Though a number of social science research methods were used in many of the studies, the application of the same can be sharpened in the future.

### 5.3 Objective 3

#### Developing new linkages and collaborations

To share knowledge and ideas with a wider audience, it is important not only to expand the existing networks but also to establish new networks and collaborate with professionals in the relevant fields. 58% of the grantees (Figure 10) said that they were able to develop new linkages and collaborations in the relevant field through the SAWA Fellowship and the Master's programme.

Following is a summary of the kinds of linkages that have been established by the SAWA Fellows, which is drawn from their responses to the online questionnaire:



**Figure 10: Developing new linkages and collaborations**

- Linkages with the SAWA Fellows from other countries has aided in sharing of knowledge.
- Linkages with different sections of the community developed through the fieldwork.
- Collaborated with water professionals from different government and non-governmental organisations through training and research activities.
- Met with experts such as professors and veterans working in water resources sector through participation in international conferences and workshops.
- Membership in non-governmental organisations helped in participating in various community outreach activities.
- There is a prospect of establishing linkages in future owing to wide knowledge base provided by the Fellowship.

Following is a story shared by a SAWA Fellow on how the network has helped her in getting placed in a job.

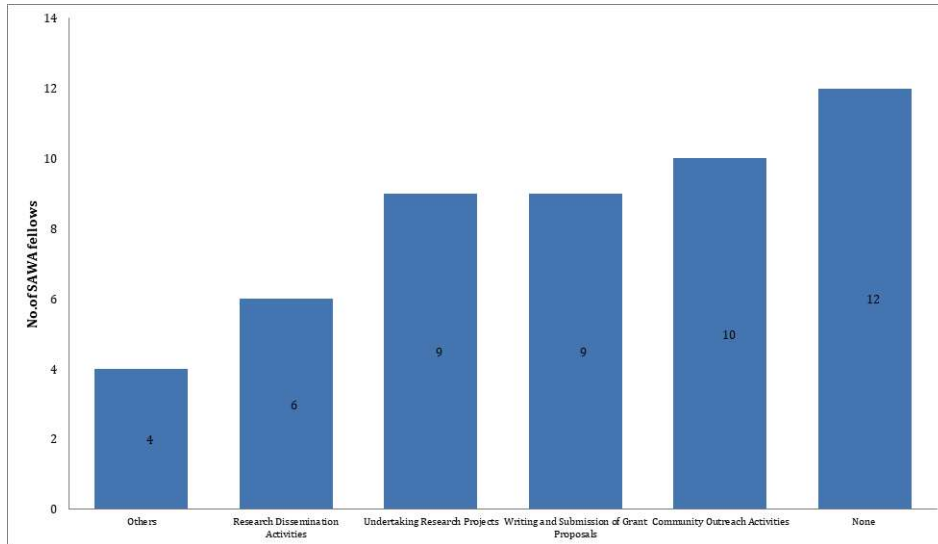
*“I got my present job through a link with government officers, which I have built while collecting data for my research. I could make links with water professionals and professors in four countries as well as with water professionals and researchers who are in very high positions in Sri Lanka”.*

**-R.P. Sunudy Chandrasiri**

### **Collaboration in research activities**

The following chart (Figure 11) shows the collaboration of SAWA Fellows in various research activities during and also post completion of their Master's degree.

The percentage of students involved in community research activities is the highest at 24%. 18% of them are involved in writing and submission of grant proposals and another 18% are undertaking research projects. Overall, the percentage of students involved with research activities is low.



**Figure 11: Collaboration in research activities**

Note: The above chart is a representation of the responses from all the three batches

### Membership with national/international networks

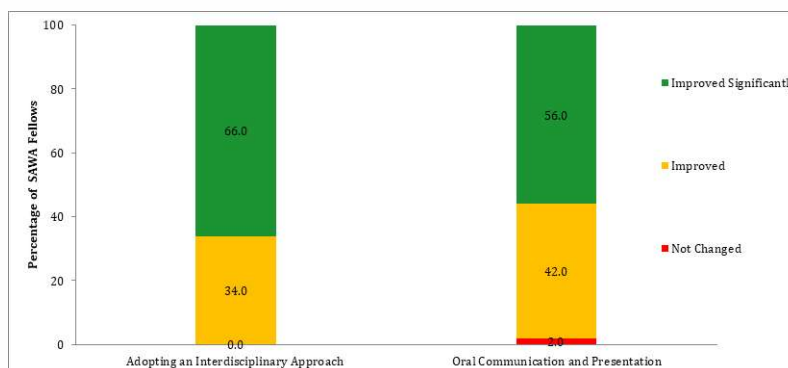
12 SAWA Fellows are the members of national and international networks such as CapNet Lanka of United Nations Development Program (UNDP), American Society of Civil Engineers (ASCE), National Wildlife Federation (NWF), and International Network on Participatory Irrigation Management (INPIM).

## 5.4 Objective 4

### Competencies

The SAWA Fellowship sought to train the students to adopt an interdisciplinary lens for research through courses and training workshops. The Fellows were asked to assess their competencies in research skills before and after joining the course.

The following chart depicts the competency of students in adopting an interdisciplinary approach to understand and analyse issues related to climate change and water; and their competency in oral

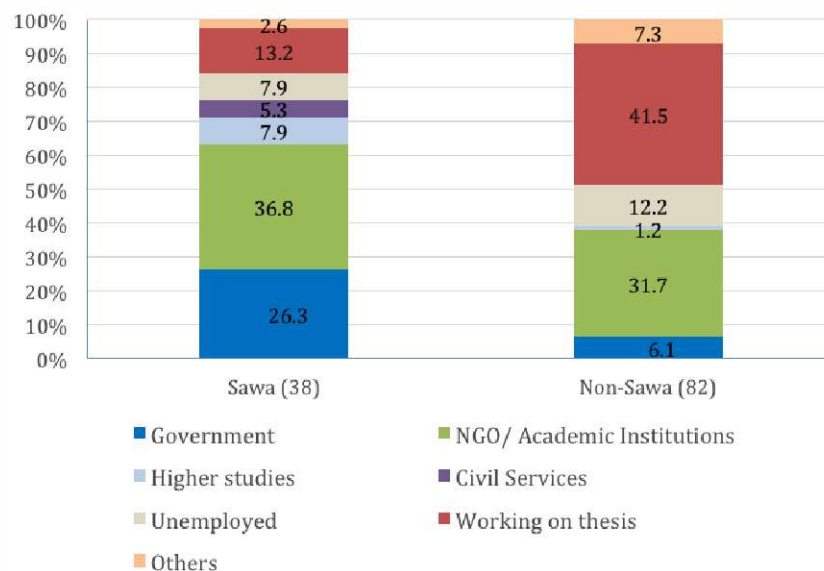


**Figure 12: Competency in Research skills**

communication and presentation skills, before and after joining the course. It should be noted that the perception of the Fellows can be and is at variance with the experts' views.

### Employability status

The SAWA Fellows are employed in various government organisations, academic institutions, and



**Figure 13: Employability status of SAWA Fellows and non-SAWA students**

*Note: It is not worthwhile making comparisons of employment of the SAWA with non-SAWA students at PGIA since only those who obtain a fellowship enroll into M.Phil. in IWRM while all the others join M.Sc. in IWRM. The latter is devoid of the research component and all of them have jobs while pursuing masters. Hence the sample for non-SAWA students does not include PGIA.*

NGOs in the water and related sectors. SaciWATERS carried out an internal survey to compare the employment status of the first two batches of SAWA Fellows (38 Fellows) with that of their counterparts. The following chart shows the details.

21 Fellows have been employed, with seven of them working in the government sector and 14 working in academic institutions and NGOs. The remaining three fellows are pursuing higher studies. More detailed information of their employment is provided in Annexure 9.

Though the above chart (Figure 13) is not a full representation of the status of employment, it gives some insights into the percentage of students employed in various sectors<sup>2</sup>. Some major observations from the data are listed below:

1. The chart shows that the percentage of SAWA students employed in the government sector is 26.3% which is significantly high, and is also a way in which IWRM principles could be a part of various action plans of the government. Also when compared to the non-SAWA students, the percentage of SAWA students employed in the government sector is significantly high.
2. There are 18 female SAWA Fellows who have found employment.

<sup>2</sup> The civil services exam is conducted for recruitment to various Civil Services of the Government of India, including the Indian Administrative Service (IAS), Indian Foreign Service (IFS), Indian Police Service (IPS), and Indian Revenue Service (IRS).

3. Another major observation is that the number of students still working on their thesis is significantly higher for non-SAWA students as compared to the SAWA Fellows. Data shows that at BUET, a total of only six students of 2013-2015 batch of M.Sc. IWRM have been able to complete the program within the stipulated time, out of which five are SAWA Fellows.
4. SAWA students' employment in academic and research organizations is also higher as compared to the non-SAWA students. The rate of unemployment of SAWA students is 7.9%<sup>3</sup>, lower compared to non-SAWA, which is 12.2%. One reason of the unemployment of the SAWA female Fellows is due to their migration post-marriage to other places/countries.
5. Out of the 38 SAWA Fellows, two are pursuing their PhDs abroad and one of the fellows from BUET is pursuing higher studies in Bangladesh itself. Whereas out of the 81 non-SAWA students, only one of them is pursuing higher studies.

The Fellows were asked about their expectation of the nature of employment opportunity on completion of the IWRM course. 59% of the students responded that they would be interested to work in the area of water resources and watershed management, and water sector in general with various government organisations, research organisations, or NGOs. 8% of them have responded that they would want to share the knowledge gained through IWRM course with others by engaging in academics. While few of them have been able to find employment in their field of interest, the remaining students are in search for jobs. An account of the ways in which the SAWA Fellows are employing IWRM approach in their projects is given in Section 5.6.

## 5.5 Objective 5

SAWAS, an interdisciplinary flagship journal of SasiWATERS, was started in 2009 with an aim to provide space for alternative and critical thinking. It aims to share water-related problems as well as constructive analyses of deadlocks and failures, and create an intellectual debate on South Asian water. The journal was tied up with the SAWA Fellowship project in 2012. Since then, three volumes and six issues including two special issues have been published, and one special issue is slated for release by April 2017.

The volumes have covered a wide range of water-related issues in South Asia with contributions from academics, activists, and researchers working on related water issues with specific reference to young researchers (or) young water professionals. The volumes have 32 articles, seven book reviews, two critical reviews, and three commentaries on related water issues. Details of the published articles are mentioned in Annexure 10. The themes covered under the issues are mentioned below:

- **Water, justice, gender and disability** (Special issue, February 2017)

This issue aims to understand how gender and disabilities affect the distributive, procedural, and recognition components of water justice in South Asia with specific reference to how gender and disabilities intersect to shape access to agricultural and drinking water; decision-making power in relation to water governance and recognition of multiple identities in water resource development (e.g. hydropower, drinking water schemes and irrigation projects); and the role of careers of persons with disabilities in securing water access and/or their

---

<sup>3</sup> Out of six who are unemployed, one student from CWR is awaiting job confirmation as Management Trainee at Food Corporation of India.

representation in household decision-making processes.

- **Urbanisation and peri-urbanisation: Challenges for water governance in South Asia:** (Special issue)

Over the years, there has been an upsurge of scholarship exploring rural-urban relationships and transformations around water. This research has served to challenge the conventional dichotomy between rural and urban water supply in water resources planning and research, urging researchers, policy makers, and development practitioners to take a peri-urban conceptual lens; that is, looking at how urbanisation reallocates water from rural to urban purposes and raising questions about water rights, equity, and justice. Analytically, this research has come to be located in a wide range of intellectual traditions: political economy, urban political ecology, the institutional analyses and development framework, discursive analyses, and the analysis of rights, entitlements and legal pluralism, which have been reflected in the contents of the special issue.

- **In memoriam of Ramaswamy R. Iyer**

The special issue of SAWA journal was brought out to honour the work and contribution of Ramaswamy Iyer towards creating an alternate vision of water, one that is holistic and interdisciplinary in nature. Mr. Iyer became known for producing a rich body of commentary on water policy and environmental issues. He last served as an honorary research professor at the Centre for Policy Research in New Delhi. As an officer of the Indian Audit and Accounts Services, Mr Iyer worked as Secretary of Water Resources in the Government of India. He was the initiator and principal writer of the draft for the country's first National Water Policy in 1987. After his retirement from the government he worked on water-related issues, in particular on regional cooperation on river water in South Asia.

This issue carries pieces by some of the people who had worked closely with Mr. Iyer to understand the trajectory of his professional life. This is a small tribute to him from the community engaged in the issues of democratisation of the water sector to benefit the poorest and most marginalized sections of our society, which he cared for, and wrote and researched about.

- **Volume 5, Issue 1**

This volume has three interesting papers on different topics - micro irrigation systems, water privatization issues in India, and food security issues in coastal Bangladesh. This volume also has an interesting perspective from Paula Hanasz titled "Water into wine: Why is de-liberative governance of South Asia's rivers is little more than a talk shop"

- **Volume 4, Issue 2**

This volume of the journal reflects on WASH, drawing from cases in Bangladesh, India, and Nepal.

- **Integrated perspectives on water management in South Asia**

This series of the SAWAS discusses the importance of incorporating interdisciplinarity in water research and education. Priya Sangameswaran, Vishal Narain, and K.J. Joy sensitize on the need

to appreciate the value of interdisciplinarity in water management through research, education, and advocacy in their paper. The paper draws on ideas from the “International Conference on Interdisciplinarity in Water Education: Challenges, Perspective and Policy Implications” held in Kathmandu, Nepal in October 2010.

The paper by Edwin Rap, Anjal Prakash, and Margreet Zwarteveen brings to light experiences and challenges of WaterNet (Southern and Eastern Asia), Crossing Boundaries (South Asia) and Concertación (Andes, Latin America), focusing on the networks' approaches to interdisciplinarity and gender and capacity building and research & policy advocacy. Seema Kulkarni presents her insights on the “Situational analysis of women water professionals in South Asia”. This paper draws upon research conducted as part of the Crossing Boundaries project. Fauzia Mannan further explores the subject through her paper “The times of hope and despair: Gender at the crossroads of water and sanitation in Bangladesh”.

Following is the contribution made by SAWA Fellows in the SAWA journal:

- Achieving food security in sStorm surge-prone coastal polders of southwest Bangladesh by ***Md. Gulam Kibria, Debanjali Saha, Tamanna Kabir, Taznin Naher, Sultana Maliha, M. Shahjahan Mondal***

The SAWA students in particular made very less contribution to the journal due to its high competition, and also since it is a peer-reviewed journal, the articles were reviewed by a number of experts to ensure quality.

## **5.6 Involvement in Research Uptake Action**

A few students of 1st and 2nd batch are involved in research uptake action with particular reference to working with NGOs, community, and women's groups at different capacities. Ms. Chandrasiri from the 1st batch is working as a field coordinator in the Climate Change Adaptation project of the UNDP in North Western Province of Sri Lanka. She is coordinating with the community groups in the development and management of small tanks for agricultural purposes.

Ms. Chathurika Perera, SAWA Fellow from the 1st batch worked as an intern at SaciWATERs during January to June 2016 under the project “Transnational Policy Dialogue for Improved Water Governance of Brahmaputra River.” The project aims to create a platform to discuss the issues, challenges, and opportunities towards improved co-management of the river basin. To accomplish this aim, one of the objectives was to review the existing transboundary protocols/treaties/accords to understand the processes shaping the institutional arrangements for managing the transboundary Rivers. Ms. Perera was involved in the review of one such agreement, i.e., the Mekong River Commission. She did an in-depth analysis of the lengthy process of dialogues and negotiations through which the riparian countries of the river basin underwent before entering into a formal agreement. Such analysis will help to explore the challenges in the evolution and functioning of these institutions along with their relative success and failure in managing transboundary water resources.

Ellakiya Priyaa A, from the 1st batch at CWR, is currently working as an Associate Project Engineer with National Agro Foundation, an NGO that works on watershed development programmes. It had initially taken up projects at the local level and at present they have expanded their projects to other parts of India also. They implement the programmes in an integrated way, for which the knowledge

acquired by the SAWA Fellow through the course work, trainings, and research comes into use. Mr. Rajendra Shrestha is associated with an NGO called Environment and Public Health Organization (ENPHO) in the capacity of an outreach director.

## 5.7 Overarching Benefits of the SAWA Fellowship

The SAWA Fellows are currently involved with government organisations, NGOs, and research organisations in different capacities and have been able to employ IWRM approaches. This subsection describes the overarching benefits of the SAWA Fellowship through reports, feedbacks, and stories received from the students and the coordinators.

Ms. Monisha of CWR, is currently serving in the Institute of Water Studies, which is one of the wings of the Tamil Nadu Water Resources Department, a government agency which is the apex policymaking body responsible for the development and management of water resources in the State of Tamil Nadu. She says *“The nature of courses and the training I have undergone enabled me to play a significant role in preparing the project report in the aspect of IWRM approach.”*

A study done by CWR SAWA Fellow on water markets in the peri-urban areas of Chennai was used by Prof. Ambujam in an endowment lecture. As Prof. Ambujam said *“The work was very much appreciated and has also been published”*.

Chathurika Perera is a SAWA Fellow from 2013 batch at PGIA. The following is her testimony:

*“Water sector has always been my area of interest and the fellowship has provided me with the financial support and opportunity to explore beyond the technical research and conduct a much more broad social, technical, and economic research. It has provided me with an opportunity to intern at SaciWATERS. As an outcome of my fellowship I was able to publish all the chapters of my thesis as paper publications in national and international conferences and journals. These publications and receiving a fellowship together with the international experience gained through the internship at SaciWATERS paved my way and facilitated me to obtain enough marks to win a full scholarship (International Macquarie Research Excellence Scholarship/ iMQRES) to pursue my PhD in Environmental Science (Department of Environmental Science/Faculty of Science and Engineering) at Macquarie University, NSW Australia”*.

Md. Gulam Kibria from BUET is currently working as an Assistant Engineer in Bangladesh Water Development Board of the Government of People's Republic of Bangladesh. He finds this department very challenging, as it involves dealing with different levels of stakeholders, their demands, and conflicts. He finds his responsibilities very compatible with his academic background and knowledge. He mentions that he has gained confidence from the interdisciplinary study he undertook during the IDRC-SAWA Fellowship programme. He concluded by saying that the knowledge of interdisciplinary study is more effective than pure technical or pure social study in professional life.

It has also been observed that the coordinators at the PIs who come from a hardcore engineering and hydrology background are gradually accepting an interdisciplinary approach towards research and also encouraging students to look at issues from such a lens. Following are the testimonies of the coordinators on how the SAWA Project has had an impact on their career.

*“I have an academic background in civil engineering. I used to teach technical subjects in the academic program at IWFM. Through the SAWA Fellowship Program, I became familiar with the*



*concept of interdisciplinarity in water resources development and management. The regional trainings that were held under the program helped me to gain that knowledge. My teaching and thinking approach has now changed from pure technical to interdisciplinary. I now teach subjects like water right and equity, people's participation in water management, water governance, conflict management, etc., which I could not even think of before. I now realize the value of integration in water resources management”.*

- Prof. Shahjahan Mondal, IWFM, BUET

*“I have been trained as a technical person and always thought water to be composed of two molecules of hydrogen and one molecule of oxygen, but the other cross cutting issues related to water such as benefits to human, policies, gender, and others have changed my thought after being engaged in Interdisciplinary Water Resources Management Program in 2008. At present, I have made a paradigm shift and started visualizing water as H<sub>2</sub>O-P4 (P4 stands for People, Pollution, Profit and Politics)”*

- Mr. Robert Dongol, NEC

Dr. N.K. Ambujam is Director and Professor of CWR in Chennai. She was the nodal person behind the introduction of Master of Engineering (M.E.) in IWRM at CWR in 2006 as a part of the CB project. She was the project coordinator and she mentions that it was a highly satisfying experience. IDRC-SAWA Fellowship started in 2013 and she said, “*CB project with SAWA fellowship was a flagship programme at CWR*”. Meanwhile, in her personal career progress, she has been nominated as member of many higher-level committees at the national and state level. Another major achievement is that CWR has been given the prestigious status of “**Centre for Excellence in IWRM**” by the University Grants Commission for a period of five years (2015-2020).

# Challenges and Lessons Learnt

## 6

### 6.1 Major Challenges

1. Employment of the Fellows in the water sector has remained a challenge especially at NEC.
2. Ensuring satisfactory interdisciplinary research work has also been a challenge. The social science courses at the institutions are being taught by in-situ faculty who have exposure to these courses but are not trained in them. Also, the thesis supervisors are the ones who have been trained in natural sciences.
3. There is a lack of gender lens in students' research, in spite of the training and focus on it in the first phase. Training on gender-related aspects and application of these concepts is limited to the course and are taught by faculty of the PIs who, in spite of having training in these courses, have a science-based background in most cases.
4. Coordinating the organization of regional workshops with the PIs is a challenge. These are government universities with strict norms to be adhered to and the coordinator does not have autonomy to take decisions related to the finances.
5. Very few students have been able to publish in refereed journals due to huge costs and high levels of quality control attached to it.

### 6.2 Lessons Learnt

1. The fellowship has benefited women researchers in South Asia by providing them with assistance to pursue higher studies and continue their research. The next phase hence proposes to have a more focused and intensive fellowship program in a leadership mode.
2. The regional workshops are conducted every year with an aim to impart knowledge and familiarize students with interdisciplinary research concepts and methodologies. In addition to that, these workshops have also opened new avenues for collaboration among young water researchers in South Asia. This collaboration has been observed in the form of sharing of knowledge, insights, and findings among the SAWA Fellows across South Asia.
3. Need for formulation of a common selection criteria across all the Participating Institutions.
4. There is a need for involvement of the experts with a social sciences background in order to provide handholding support and also to ensure a greater degree of interdisciplinary element in the students' research.
5. The project has definitely created a knowledge base on water and climate change with perspectives from four South Asian countries through research theses and a number of publications. Consolidation of the research work of the three batches will be brought out in the form of an edited book, which will serve as a valuable addition to the existing knowledge base.

# Annexes

S.no	Title	Page number
1	List of Publications by SAWA Students	62 - 67
2	Report of the Regional Training Workshop in 2013	68 - 78
3	Report of the Regional Training Workshop in 2014	79 - 88
4	Report of the Regional Training Workshop in 2015	89 - 99
5	List of Thesis Topics of SAWA Students	100 - 103
6	Report of the Review Workshop 2015	104 - 107
7	Review Workshop 2016	108 - 116
8	Publications in SAWA Journal by Young Water Professionals	117 - 117
9	List of Articles Published in SAWAS Journal	118 - 120
10	Employment Details of SAWA Fellows	121 - 124

# Annexure 1

## List of Publications

### Refereed Journals

- **Arivoli E.** and N. K. Ambujam, 2016, Performance Evaluation of Rehabilitated Irrigation Tanks using Hydrological Modelling, *International Journal of Innovative Research in Science, Engineering and Technology*, Vol. 5, Issue 5, pp: 6645-6656.  
[https://www.ijrset.com/upload/2016/may/6\\_Performance.pdf](https://www.ijrset.com/upload/2016/may/6_Performance.pdf)
- **Arivoli E.** and N. K. Ambujam, Role of Rehabilitated Tanks in Improving Water Security in Gomukhi sub-Basin of Vellar Basin, *International Journal of Research in Engineering and Technology*.  
<http://esatjournals.net/ijret/2016v05/i04/IJRET20160504037.pdf>
- **Sivaranjani U.** and M. Krishnaveni, 2016, Rainfall Variability under Changing Climate: An Impact Study on Drinking Water Security at Village Level, *International Journal of Humanities and Social Science*. (accepted for publication)
- **Kibria, M. G., Saha, D., Kabir, T., Naher, T., Maliha, S.** and Mondal, M. S. (2015). "Achieving Food Security in Storm-surge Prone Coastal Polders of South-west Bangladesh", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 1 (2015), pp 26-43.  
<http://www.sawasjournal.org/files/v5i12015/paper-2.pdf>
- **Sellaturai, T., Sivananthawerl, T., Galagedera, L.W.** and Mowjood, M.I.M. (2015). Organic matter content of a lowland paddy soil as affected by plant growth and urea utilization, *Tropical Agricultural Research*, Vol. 26 (2): 415-421.  
[https://www.pgia.ac.lk/files/Annual\\_congress/journal/v26/Journal-No%202/Poster/19-%2074.%20Ms.Thusyanthi%20PGIA%202014%20%20OK.pdf](https://www.pgia.ac.lk/files/Annual_congress/journal/v26/Journal-No%202/Poster/19-%2074.%20Ms.Thusyanthi%20PGIA%202014%20%20OK.pdf)
- **Pelpitiya, I.P.S.K., Dayawansa, N.D.K.** and Gunawardena, E.R.N. (2015). Impacts of land cover dynamics and shallow groundwater abstraction on sustainability of Hakwatuna Oya irrigation system, *Tropical Agricultural Research*, Vol. 27 (1): 13-26.  
[https://www.researchgate.net/publication/301238318\\_Impacts\\_of\\_land\\_cover\\_dynamics\\_and\\_shallow\\_groundwater\\_abstraction\\_on\\_sustainability\\_of\\_Hakwatuna\\_Oya\\_irrigation\\_system](https://www.researchgate.net/publication/301238318_Impacts_of_land_cover_dynamics_and_shallow_groundwater_abstraction_on_sustainability_of_Hakwatuna_Oya_irrigation_system)
- **Diyawadana, D.M.N., Pathmarajah, S.** and Gunawardena, E.R.N. (2015). Perception-driven coping strategies for climate change by smallholder farmers in *Hakwatuna-oya* major irrigation scheme in Sri Lanka, *Tropical Agricultural Research*, Vol. 27 (4): 336-349.  
<https://tar.sljol.info/articles/10.4038/tar.v27i4.8211/galley/6280/download/>
- **Kirinde, G.W.R.W.M. R.M.W.K., Dayawansa, N.D.K.** and Mowjood, M.I.M. (2016). Water regimes and ecosystems in lowland paddy field: A case study in Awlegama, Kurunegala, Sri Lanka, Paper accepted for publication in *Tropical Agricultural Research*, Volume 28.
- **Kumara, G.M.P., Rathnasekara, H., Perera, M.D.D., Mowjood, M.I.M.** and Galagedera, L.W. (2015). Market Orientation and Market Participation of Farmers in Awlegama, Wariyapola, Sri Lanka: Constrains and Potentials for Crop Diversification and Commercial Transformation, *International*

*Journal of Social and Economic Research*, Vol. 5 (4): 132-149.

<http://www.indianjournals.com/ijor.aspx?target=ijor:ijser&volume=5&issue=4&article=013>

- **Kumara, G.M.P., Samarakoon, S.M.L.D.,** Wijewardena, Y.G.D.P., Mowjood, M.I.M. and Galagedera, L.W. (2016). Evaluation of paddy field system layout for Other Field Crops in a minor irrigation system in Bayawa, Sri Lanka, *Tropical Agricultural Research*, Vol. 28 (1): 13-26.  
[http://www.worldresearchlibrary.org/up\\_proc/pdf/249-146113480111-17.pdf](http://www.worldresearchlibrary.org/up_proc/pdf/249-146113480111-17.pdf)
- **Saumyarathne, N.G.R.,** Gunawardena, E.R.N. and Dayawansa, N.D.K. (2016). Water conflicts among different water users and uses in the Hakwatuna Oya watershed in the Deduru Oya basin, *Tropical Agricultural Research*, Vol. 28 (1): 38-49.  
<https://tar.sljol.info/articles/10.4038/tar.v28i1.8182/galley/6256/download/>
- **Rajendran, M.** Gunawardena, E.R.N. and Dayawansa, N.D.K. (2016). Impact of climate change on water demand of paddy: A case study from Hakwatuna Oya irrigation scheme in Sri Lanka, Paper accepted for publication in *Tropical Agricultural Research*, Volume 28.
- **Perera, A.C.S.,** Punyawardena, B.V.R. and Dayawansa, N.D.K. (2015). Recent changes of rainfall regime of Hakwatuna Oya watershed of Sri Lanka, *Tropical Agricultural Research*, Vol. 28 (1): 50-63.  
<https://tar.sljol.info/articles/abstract/10.4038/tar.v28i1.8183/>
- **Diyawadana, D.M.N.,** Pathmarajah, S. and Gunawardena, E.R.N. (2015). Vulnerability of smallholder farmers to climate change or variability: A case study from Hakwatuna Oya irrigation scheme in Sri Lanka, *Tropical Agricultural Research*, Vol. 28 (3): 223-237.  
[https://www.pgia.ac.lk/files/Annual\\_congress/journal/v28/Journal-No%203/Papers/2-%2056%20Mahesh\\_1\\_%20Issue%20-3.pdf](https://www.pgia.ac.lk/files/Annual_congress/journal/v28/Journal-No%203/Papers/2-%2056%20Mahesh_1_%20Issue%20-3.pdf)
- **Jayasiri, M.M.J.G.C.N.,** Dayawansa, N.D.K. and Gunawarden, E.R.N. (2016). Assessment of environmental flow release from Deduru Oya reservoir, to mitigate possible impacts on downstream ecosystem, Paper accepted for publication in *Tropical Agricultural Research*, Volume 28.
- **Samarakoon, S.M.L.D.,** Dayawansa, N.D.K. and Gunawardena, E.R.N. (2016). Land use changes resulting from construction of Deduru Oya reservoir and its impact on livelihood, *Tropical Agricultural Research*, Vol. 28 (2): 162-174.  
[https://www.researchgate.net/publication/317211727\\_Land\\_use\\_changes\\_resulting\\_from\\_construction\\_of\\_Deduru\\_oya\\_reservoir\\_and\\_its%27\\_impacts\\_on\\_livelihood](https://www.researchgate.net/publication/317211727_Land_use_changes_resulting_from_construction_of_Deduru_oya_reservoir_and_its%27_impacts_on_livelihood)

### Conference Proceedings

- **Ellakiya Priya** and Carolin Arul, 2015, Impact of Climate Variability on Agro-Ecosystem and its Vulnerability on Livelihood, 2nd International Conference on Engineering Technology and Science, Muthayammal College of Engineering, Namakkal, Tamil Nadu.
- **Kibria, M. G.** and Khan, M. S. A. (2017). "Embankment Failure Processes and Associated Inundation in a Coastal Polder of Bangladesh", *Proceedings of 6th International Conference on Water and Flood Management (ICWFM-2017)*, 4-6 March 2017, Dhaka, Bangladesh. [Abstract accepted]

- **Naher, T.**, Saleh, A. F. M. and Khan, M. S. A. (2017). "Development of Livelihood Security Index for Farmers in the Coastal Area of Bangladesh", *Proceedings of 6th International Conference on Water and Flood Management (ICWFM-2017)*, 4-6 March 2017, Dhaka, Bangladesh. [Abstract accepted]
- **Tehsin, S.** and Mondal, M. S. (2017). "Assessing Agricultural Water Security for Different Agro-ecosystems Using Analytic Hierarchy Process: A Case Study", *Proceedings of 6th International Conference on Water and Flood Management (ICWFM-2017)*, 4-6 March 2017, Dhaka, Bangladesh. [Abstract accepted]
- **Kabir, T.**, Salehin, M. and Kibria, M. G. (2016). "Impacts of Post-disaster Slow Rehabilitation of a Coastal Polder on Coastal Livelihoods: A Case Study on Aila", *Proceedings of the 3rd International Conference on Civil Engineering for Sustainable Development (ICCESD 2016)*, 12~14 February 2016, Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh (ISBN: 978-984-34-0265-3), pp 506-512.
- **Kibria, M. G.**, Khan, M. S. A. and Saha, D. (2016). "Local Adaptation Practices in Response to a Super Cyclone in the Coastal Region of Bangladesh", *Proceedings of the 3rd International Conference on Civil Engineering for Sustainable Development (ICCESD 2016)*, 12~14 February 2016, Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh (ISBN: 978-984-34-0265-3), pp 15-23.
- **Kibria, M. G.**, Khan, M. S. A. and Kabir, T. (2016). "Storm Surge Damages in a Coastal Polder: A Case Study on Cyclone Aila", *Proceedings of the 3rd International Conference on Civil Engineering for Sustainable Development (ICCESD 2016)*, 12~14 February 2016, Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh (ISBN: 978-984-34-0265-3), pp 447-456.
- **Saha, D.** and Mondal, M. S. (2016). "Assessing the Impact of Climate Change on Sunflower Yield Using the AquaCrop Model", *Proceedings of the 3rd International Conference on Civil Engineering for Sustainable Development (ICCESD 2016)*, 12~14 February 2016, Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh (ISBN: 978-984-34-0265-3), pp 457-468.
- Habib, M. A., **Saha, D.** and Mondal, M. S. (2016). "An Assessment on the Perception Alteration of the Local People on the Conventional Land Use Pattern to Achieve Livelihood Sustainability", *International Conference on Sustainable Development (ICSD 2016)*, 4-5 February 2016, University of Liberal Arts (ULAB), Dhaka, Bangladesh. [Full paper accepted, presented and in press]
- **Kibria, M. G.**, **Saha, D.** and Mondal, M. S. (2016). "Canal Re-excavation: A Viable Option for Agricultural Productivity Enhancement in a Coastal Region of Bangladesh", *International Conference on Sustainable Development (ICSD 2016)*, 4-5 February 2016, University of Liberal Arts (ULAB), Dhaka, Bangladesh. [Full paper accepted, presented and in press]
- **Saha, D.** and Mondal, M. S. (2016). "Assessing the Impacts of Climate Change on Dry Season Crop Yields Using the AquaCrop Model", *International Conference on Sustainable Development (ICSD 2016)*, 4-5 February 2016, University of Liberal Arts (ULAB), Dhaka, Bangladesh. [Full paper accepted, presented and in press]
- **Kibria, M. G.** and Khan, M. S. A. (2015). "Sectoral and Temporal Damage Variation Due to Cyclonic Storm Surge: A Case Study on Aila", *Proceedings of 11th Global Engineering, Science and Technology Conference*, 18 - 19 December, 2015, BIAM Foundation, Dhaka, Bangladesh (ISBN:

978-1-922069-92-4).

- **Naher, T.** and Saleh, A. F. M. (2015). “Farmers' Decision Making Model for Growing Sesame and Sunflower in Coastal Bangladesh”, *Proceedings of 5th International Conference on Water and Flood Management (ICWFM-2015)*, 6-7 March 2015, Dhaka, Bangladesh (ISBN: 978-984-33-8801-8), pp 239-248.
- **Kabir, T.**, Salehin, M. and Kibria, M. G. (2015). “Delineation of Physical Factors of Cyclone Aila and Their Implications for Different Vulnerable Groups”, *Proceedings of 5th International Conference on Water and Flood Management (ICWFM-2015)*, 6-7 March 2015, Dhaka, Bangladesh (ISBN: 978-984-33-8801-8), pp 319-328.
- **Saha, D.** and Mondal, M. S. (2015). “Simulation of Boro Rice Yield in South-west Coastal Bangladesh Using the AquaCrop Model”, *Proceedings of 5th International Conference on Water and Flood Management (ICWFM-2015)*, 6-7 March 2015, Dhaka, Bangladesh (ISBN: 978-984-33-8801-8), pp 81-88.
- **Chandrasiri, R.P.S.P., Kumara, G.M.P., Kirinde, G.W.R.W.M. R.M.W.K.,** Galagedera, L.W. and Mowjood, M.I.M. (2014). Water sharing practices and the conflicts rising among the farmers in a minor tank system in Yala Season: A case study of Bayawa tank, Awlegama, Sri Lanka, *Water Resources Research in Sri Lanka, Symposium Proceedings of the Water Professionals' Day 2014*, Geo-Informatics Society of Sri Lanka, pp 115-121.
- **Pelpitiya, I.P.S.K.,** Dayawansa, N.D.K. and Gunawardena, E.R.N. (2014). Impacts of agricultural practices and shallow groundwater abstraction in Pothuvila GN division in Hakwatuna Oya watershed area, *Proceedings of the Special Session on Sustainable Design and Construction and Resilience Engineering Applications on Disaster Mitigation, 5th International Conference on Sustainable Built Environment 2014*, pp 234-240.
- **Perera, A.C.S.,** Punyawardena, B.V.R. and Gunawardena, E.R.N. (2014). Drought occurrence of the DLb Agro-ecological region of the Hakwatuna Oya watershed, *Water resources Research in Sri Lanka, Symposium Proceedings of the Water Professionals' Day*, Geo-Informatics Society of Sri Lanka, 63-73.
- **Perera, A.C.S.,** Punyawardena, B.V.R. and Gunawardena, E.R.N. (2014). Occurrence of drought in the Hakwatuna Oya watershed in Sri Lanka, *Proceedings of the Special Session on Sustainable Design and Construction and Resilience Engineering Applications on Disaster Mitigation, 5th International Conference on Sustainable Built Environment 2014*, pp 231-233.
- **Kirinde, G.W.R.W.M.R.M.W.K.,** Mowjood, M.I.M., and Dayawansa, N.D.K. (2015) Development of an Index to assess the water regime of paddy field ecosystem: A case study in Awlegama, Wariyapola. *International Research Symposium on Engineering Advancements 2015 (RSEA 2015)* SAITM, Malabe, Sri Lanka, pp 283-286.
- **Kirinde, G.W.R.W.M.R.M.W.K.,** Chandrasiri, R.P.S.P., Mowjood, M.I.M. and Dayawansa, N.D.K. (2015). Variation of diversity of dragonfly in paddyfield ecosystem, Awlegama, Wariyapola, Sri Lanka with respect to different growth stages and water quality, *Symposium Proceedings of the Water Professionals' Day*, *Water Resources research in Sri Lanka*, (N.D.K. Dayawansa and R.P. De Silva Eds.), Geo-Informatics Society of Sri Lanka, pp 57-65.

- **Sellathurai, T.**, Galagedera, L.W. and Mowjood, M.I.M. (2015). Characterization of alternative wet and dry spells using rainfall indices: A case study in Awlegema, Sri Lanka, *Symposium Proceedings of the Water Professionals' Day*, Water Resources research in Sri Lanka, (N.D.K. Dayawansa and R.P. De Silva Eds.), Geo-Informatics Society of Sri Lanka, pp 15-24.
- **Kumara, G.M.P.**, Rathnasekara, H., Samarakoon, S.M.L.D., Wijesinghe, S.K.D. Mowjood, M.I.M. and Galagedera, L.W. (2016). Factors affecting to participation and cultivation extent of paddy and other field crops: Heckman two stage model approach in *Awlegama, Wariyapola, Sri Lanka*. In *proceeding of: International conference of Academic World*, 20th March, Singapore, pp 11-17.
- **Kumara, G.M.P.**, Wijesinghe, S.K.D. Mowjood, M.I.M. and Galagedera, L.W. (2016). Assessment of suitability of paddy fields in a minor irrigation system for Other Field Crops (OFC) based on Soil Physical Properties in proceeding of the *4th International symposium on Advanced in Civil and Environmental Engineering Practices for Sustainable Development (ACEPS)*, 3rd March, Faculty of Engineering, University of Ruhuna, Sri Lanka, pp 23-30.
- **Kumara, G.M.P.**, Mowjood, M.I.M. and Galagedera, L.W. (2016). Assessment of spatio-temporal variability, behavior and availability of groundwater during dry and wet period in command area under minor irrigation system. (Accepted) *12th International Conference of the International Institute for Infrastructure Resilience and Reconstruction*, University of Peradeniya, on 5th-7th August 2016 at Kandy, Sri Lanka.
- **Samaekoon, S.M.L.D.**, Dayawansa, N.D.K. and Gunawardena, E.R.N. (2016). Evaluation of legal framework for resettlement in Sri Lanka based on resettlement procedure in Deduru Oya reservoir project, *Proceedings of the International Research Symposium on Engineering Advancements 2016 (IRSEA 2016)* SAITM, Malabe, Sri Lanka, pp 157-158.
- **Jayasiri, M.M.J.G.C.N.**, Dayawansa, N.D.K and Gunawardena, E.R.N. (2015). Comparison of methods to assess environmental flows: A Review, *International Research Symposium on Engineering Advancements 2015 (RSEA 2015)* SAITM, Malabe, Sri Lanka, pp 46-49.
- Understanding of Farm Household's vulnerability to climate variability in Dadhikot VDC, Bhaktapur Nepal. Poster presented in Young women scientist conference held during October 22-23, 2016 Korea. Poster presented by Ms. **Sangita Dandekhya**
- Land Use Change due to Urbanization and its Impact on Local Food Security: Case of Madhyapur Thimi Municipality selected for presentation in *International Conference for Sustainable Development* going to be held in February 16-18, 2017 in Dhaka, Bagladesh. Paper based on research findings of Mr. **Rajendra Shrestha**

### Other Publications

- **Saha, D.** (2015). "Assessment of the Impact of Climate Change on Sunflower Yield in Coastal Bangladesh Using the AquaCrop Model", *Yearly Newsletter 2014*, Bangladesh National Committee of the International Commission on Irrigation and Drainage (BANCID).
- **Kirinde, G.W.R.W.M.R.M.W.K.**, Mowjood, M.I.M. and Dayawansa, N.D.K. (2015). Biodiversity assessment of paddy field ecosystems using birds as a biodiversity indicator, *Proceedings of the*



*twentieth International Forestry and Environment Symposium*, 16-17 October, 2015, Waikkal, Negombo. P11.

- **Kumara, G.M.P.**, Perera, M.D.D., Galagedara, L.W. and Mowjood, M.I.M. (2015). Use of Three Computer Models in Agriculture: A Review. *Proceedings of 2nd International Conference on Agriculture and Forestry*, Colombo, Sri Lanka, 10th -12th June 2015, p 60.
- **Sellathurai, T.**, Kamaleswaran, S., Galagedara, L.W. and Mowjood, M.I.M. (2015). Impact of alternative wetting and drying on the soil surface organic matter in a lowland paddy field, *ICDA 2015*, Faculty of Agriculture, University of Jaffna. P 44.
- **Koralegedera, K.G.I.D., Kirinda, G.W.R.W.M.R.M.W.K.**, Mowjood, M.I.M. and Karunarathne, A.K., Biodiversity in organic and conventional rice fields: A case study in Awlegama, Kurunegala, Sri Lanka, *Proceedings of the South Asian Symposium on Sustainable Environment Management*, 17-18 March, 2016, p 19.
- **Jayasiri, M.M.J.G.C.N.**, Dayawansa, N.D.K and Gunawardena, E.R.N. (2016). Social water use in assessing environmental flows; A case study in Deduru Oya basin, *Proceedings of the International Research Symposium, Special Session on Community Forestry, Sri Lanka Next – A Blue Green Era Conference*, 17-19 October, 2016, Colombo, Sri Lanka. Pp 16-17.
- **Saumyarathne, N.G.R.**, Gunawardena, E.R.N. and Dayawansa, N.D.K. (2016). Water Productivity, land productivity and profitability of paddy cultivation under agro wells, in stream and irrigation scheme water users in Hakwatuna Oya watershed, *Proceedings of the International Research Symposium, Special Session on Community Forestry, Sri Lanka Next – A Blue Green Era Conference*, 17-19 October, 2016, Colombo, Sri Lanka. Pp 19-20
- Poster presented on 'Impact of climate variability on agricultural productivity' in *Tamil Nadu World Water Week 2014* by **P. Anitha**
- Poster presented on 'Land use and Food security- nexus; The Challenge of transformation' in *Tamil Nadu World Water Week 2014* by **S. Monisha**
- Poster presented on 'Wavering climate- flaw and flow towards sustainable livelihood' in *Tamil Nadu World Water Week 2014* by **A. Ellakiyapriyaa**
- Poster presented on 'IAMWARM-An irrigation project of Tamil Nadu funded by the World Bank' in *Tamil Nadu World Water Week 2014* by **A. Vidya**
- Poster presented on 'Farm level adaptation to climate variability' in *Tamil Nadu World Water Week 2014* by **A. Malarmathi Divinya**

# Annexure 2

## Regional South Asia Water (SAWA) Fellows Training on Integrated Water Resources Management



### Proceedings Report

October 3 - 8, 2013, Kathmandu, Nepal

## Summary

As part of the South Asia Water (SAWA) Fellowships, a training programme on Integrated Water Resource Management was organized in Kathmandu, Nepal on 3-8 October 2013. The training programme was financially supported by International Development Research Centre (IDRC), Canada, and UNDP Cap-Net.

The objectives of the programme were to; 1) promote IWRM with a focus on issues such as gender, climate change, and food security at subcontinental level; 2) enhance understanding of water issues and best practices for mitigation at the regional level; 3) train participants to deal with issues of water and regional cooperation; 4) increase exposure to water issues of the neighbouring countries; 5) initiate and encourage “regional co-operation” among water professionals in the long run; 6) promote an interdisciplinary approach to water resource management and research.

The training programme targeted the twenty recipients of the IDRC-SAWA Fellowships from four institutions in four South Asian countries: Bangladesh (Institute of Water and Flood Management - Bangladesh University of Engineering and Technology), India (Centre for Water Resources - Anna University), Nepal (Nepal Engineering College) and Sri Lanka (Post Graduate Institute of Agriculture – University of Peradeniya). Five additional participants were nominated by the local host, Nepal Engineering College, giving us a total of twenty-five participants.

The sessions focused on the issues of interdisciplinarity in the context of IWRM, gender, equity, climate change, as well as the different issues affecting water resource management in the four countries. Further, the training programme gave the participants theoretical and field experience of interdisciplinary research methodologies as well as participatory methodologies. The sessions were interactive in nature. Participants got the chance to apply classroom learning in the field, with two field trips during the programme. One was to Matatirtha village where participants learned about the community managed water distribution system. Additionally, a full day field exercise was held in Naubise Phant where participants used various participatory methods in order to understand the functioning and impact of the irrigation system, managed by a Water Users' Association. A half-day session on leadership was also held, seeking to build capacity of the participants.

# 1. Introduction

## 1.1 Relevance of the Training Programme

As mentioned above, water availability is being affected by climate change and climate variability in many regions in South Asia. Additionally, due to an increase in population and urbanisation, there are changes in consumption and production patterns, which have huge impacts on food security and livelihoods especially in relation to gender. Thus, water issues cannot be examined in isolation or with the traditional technical driven approach. Water professionals, whether in the government or in the private sector, have to make tough decisions with respect to utilisation of increasingly limited water resources. In order to do this in an effective, equitable, and sustainable manner, a holistic interdisciplinary approach is required, which is often lacking in traditional civil engineering curricula. This training programme sought to impart training on interdisciplinary approaches to water resource management, inculcating an approach to examining water resources that is holistic in nature. Importantly, this training programme saw an introduction of a session completely devoted to inculcating leadership skills in the participants.

## 1.2 Organizers

**Nepal Engineering College (NEC):** Nepal Engineering College was established in 1994 as a non-profit institution under a private sector initiative to serve the technical education needs of Nepal in areas of engineering and technology for accelerated economic growth, reaching to wider section of Nepalese students and making the quality technical education accessible and affordable. NEC offers Bachelor and Masters level courses in engineering, technology, and allied disciplines, including a Masters course in IWRM. <http://www.nec.edu.np>

**South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERs):** SaciWATERs is a policy research institute in Hyderabad, India working on the issue of water resources education, capacity building, research, and action in South Asia. It is committed to bringing about structural changes in the dominant water resources management paradigm in South Asia by focusing on transforming water resources knowledge systems through working with universities and academic institutions. The key ideas are in an interdisciplinary approach to undertaking water resources issues from a pro-poor, gendered, and human development perspective and emphasis on exchange, interaction, and collaboration at South Asia level. SaciWATERs is active in three domains - Education, Research, and Advocacy. [www.saciwaters.org](http://www.saciwaters.org)

## 1.3 Sponsors and Co-Sponsors

**International Development Research Centre (IDRC)** is a Canadian Crown Corporation that initiates, encourages, and supports research in developing countries in order to help find practical and sustainable solutions to social, economic, and environmental problems that are being faced in these countries. Additionally, IDRC on the means for applying and adapting scientific, technical, and other knowledge to the economic and social advancement of those regions. <http://www.idrc.ca>

The SaciWATERs-Cap-Net Network (SCaN) is a platform for partnership towards capacity building in Integrated Water Resources Management (IWRM) in South Asia region. It comprises autonomous regional and national institutions and individuals committed to capacity building in the water sector. The network was conceptualized by SaciWATERs, which hosts the network and acts as its legal, administrative, and financial umbrella. [www.saciwaters.org/scan](http://www.saciwaters.org/scan)

Cap-Net, UNDP is a global network of autonomous international, regional, and national institutions and networks committed to capacity building in IWRM. Cap-Net supports capacity building networks. These networks have proven to be effective at promoting the understanding of IWRM. [www.cap-net.org](http://www.cap-net.org)

## **2. Workshops Objectives, Participants Profile and Expected Outcomes**

### **2.1 Objectives**

- 1) To help participants deepen their knowledge of water and issues that surround holistic water management at the South Asia level such as gender, equity, climate change, and food security.
- 2) To enhance understanding of water issues and best practices for mitigation at the regional level.
- 3) To train participants to deal with issues of water and regional cooperation.
- 4) To increase exposure to water issues of the neighbouring countries in order to facilitate a deeper understanding of water issues at the pan-South Asian level.
- 5) To initiate and encourage “regional co-operation” among water professional in the long run.
- 6) To promote an interdisciplinary approach to water resource management and research.
- 7) To train participants to not just be good water professionals, but be leaders in their effective fields.

### **2.2 Participants profile**

The participants for this training programme were those who were selected as fellows as part of the South Asia Water (SAWA) Fellowship, through a competitive process from each of the four partner institutes. Five fellows from each country were in attendance, as well as an additional five people from the host institution, leading to a total of twenty-five participants. All participants were pursuing post-graduate level courses in IWRM. Many had a civil engineering background, thus introduction to the above-mentioned issues was important.

### **2.3. Outcomes expected**

It is expected that the participants would have increased sensitivity to issues of gender and equity in the context of water resource management. The participants would also have an enhanced understanding of water issues and best practices for mitigation of these issues at the regional level. Additionally, the participants would be more conscious of the different transboundary issues in South Asia and the importance of regional cooperation in addressing these issues. Most importantly, due to the special session on leadership, they would now understand what steps are needed in order to become effective leaders in the future.

## **3. Programme Details**

### **3.1 Key resource persons and facilitators**

- Dr Neena Rao: Director, Projects and Partnerships, South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERS); Hyderabad, India

- Dr Mashfiqus Salehin: Professor, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology; Dhaka, Bangladesh
- Dr N.D.K Dayawansa: Senior Lecturer in Agricultural Engineering, University of Peradeniya, Peradeniya; Sri Lanka
- Dr B.V. Mudgal: Associate Professor, Centre for Water Resources, Anna University; Chennai, India
- Dr Khem Raj Sharma: Director of Nepal Engineering College-Center for Postgraduate Studies; Kathmandu, Nepal
- Dr M. Dinesh Kumar: Executive Director, Institute for Resource Analysis and Policy; Hyderabad, India
- Mr Dipak Gyawali: Pragma (Academician) of the Nepal Academy of Science and Technology (NAST) and Research Director, Nepal Water Conservation Foundation; Kathmandu, Nepal
- Dr Aditya Bastola: Executive Director, Consortium of Social Science Researchers in South Asia; Kathmandu, Nepal
- Dr Binod Bhatta: Director-Research, Forestry and Natural Resources Management (F/NRM) Specialist, Alliance for Social Mobilization - Alliance Nepal; Kathmandu, Nepal
- Dr Niraj Joshi: Associate Professor (Research Coordinator), Nepal Engineering College, Center for Postgraduate Studies; Kathmandu, Nepal
- Ms Sukanya Patwardhan: Practice Leader-Diversity, Ethics, and Sustainability Coaching, Tata Management Training Centre; Pune, India.
- Mr Robert Dongol: Assistant Professor, Nepal Engineering College; Kathmandu, Nepal
- Mr Arjun Surendra: Research Associate, SaciWATERS; Hyderabad, India.

### 3.2 Methods used for facilitation

The workshop was held for six days, and the following were the methods that were used for facilitation:

**Interactive Sessions:** The sessions were interactive in nature. Each classroom session included classroom lectures using PowerPoint, followed by a discussion for about 15 minutes. Participants were encouraged to take an active part during the discussions. Some sessions were even more interactive, having exercises for individuals.

**Group Exercises:** Participants were divided into working groups for different activities. Multiple group exercises were conducted during the programme. For the field practicum, five groups of five students each were formed. For other sessions, such as the leadership session, students were split into pairs. Participants found these tasks interesting and useful as it provided them with an opportunity to apply theoretical frameworks learnt during the lecture sessions in analysis and interpretation of practical situations. Other than these exercises, groups were also assigned some tasks such as giving a recap of the previous day's events in order to make the workshop participatory.

**Field Exposure:** A half-day field visit was organized to provide exposure to participants on water transfer mechanisms operating in Matatirtha village on the outskirts of Kathmandu. Additionally, a full day of field practicum was also undertaken at Naubise Phant irrigation system about 45 kilometers east of Kathmandu, where participants carried out focus group discussions, key informant interviews, and unstructured individual interviews in order to understand the functioning and impacts of the irrigation system.

**Evaluation:** There was an inbuilt mechanism of participatory evaluation throughout the training workshop. Instruments used for evaluation included feedback reports and questionnaire.

### 3.3 Content of the training sessions

#### Day 1

##### 1. Introduction to the training programme: Dr Neena Rao and Arjun Surendra

This session gave the participants an overview of the aims, objectives, and structure of the training programme. Ice-breaking exercises were conducted, through which students had the opportunity to introduce themselves to each other, as well as to faculty representatives from all the partner institutions and build a rapport with them.

##### 2. IWRM concepts and principles: Experiences of Bangladesh: Prof. Mashfiqus Salehin

This presentation further elaborated on the concepts and key issues of IWRM with a special focus on Bangladesh. It gave an overview of the key issues in water management in the world and in Bangladesh, especially in the Ganga Bhramaputra Meghna (GBM) basins. Further, an important point that was discussed was the differences between interdisciplinary approaches and multidisciplinary approaches in tackling these issues. The issue of climate change and its effect on water resources was also discussed. The presentation also touched upon previous water management approaches, and what was lacking in them such as lack of equity, fragmented approaches, and a lack of people's participation in project designs and implementation.

##### 3. Overview of water resources management in Nepal: Prof. Khem Raj Sharma

The session discussed the current state of water resources management in Nepal. An overview of the various plans and policies related to water institutes by the government of Nepal was given. The presentation pointed out that climate change, water resources degradation, equity, and political instability are the biggest issues impacting effective water resource management. The presentation closed after mentioning a few initiatives in IWRM taken up in Nepal.

##### 4. Overview of water resources management in Sri Lanka: Dr N.D.K. Dayawansa

The presentation gave an introduction into the climate and water balance of Sri Lanka, as well as a brief note on the historical practices of water management. It mentioned the importance of minor irrigation systems such as small tank systems in Sri Lanka. A historical overview of the evolution of water policy in the country was also presented. The presentation then mentioned the water allocation and distribution mechanism and policy at the central and local levels. The session ended with a discussion on the issues faced in Sri Lanka in large-scale water resource development.

## **5. Overview of water resources management in India: Dr B.V. Mudgal**

A brief overview of the status of water resources availability in India was presented with the help of maps and data. The presentation delved into the causes of water-related problems in India, such as uneven distribution of water, pollution of freshwater resources, over extraction of groundwater etc. Additionally, problems such as floods and droughts, groundwater management, and lack of drinking water resources were elaborated. Various attempts by policy makers to address these issues were presented. The important aspect of climate change and its impacts in the Indian and Tamil Nadu contexts were discussed.

## **6. Climate change and its impacts on water security, food security, and vulnerability: Dr. M Dinesh Kumar**

The session discussed the variability in major climate parameters in India, using historical data at the macro and micro level. It provided a theoretical understanding of major climate parameters, various (terrestrial and extra-terrestrial) physical processes which influence these parameters, and how variability in each parameter can induce changes in the physical and bio-physical processes, which have implications for water management. The session also provided hard empirical data on several climate variables such as rainfall, humidity, temperature, and wind speed, to illustrate climate variability.

## **7. Groundwater crisis in South Asia: Dr. M. Dinesh Kumar**

The session discussed the importance of groundwater as a resource in South Asia. The rationale for increasing use of groundwater resources was stated. Also stated were the ecological and hydrological impacts of excessive groundwater use, i.e., the dangers of over-exploitation, and thus the benefits of interventions in this context. The various physical options for groundwater management in the context of semi-arid and arid regions of South Asia, and their scope and limitations were mentioned. The presentation ended with a summary of various options that could be used in the South Asian context in order to better manage groundwater resources.

## **Day 2**

The day began with a recap of the previous day's sessions by one of the students.

### **1) IWRM – Who does the integration and how?: Mr. Dipak Gyawali**

The session initially started by providing examples of cases where the IWRM framework has not worked as expected. The presentation examined the problems of having a fixed framework in these regards and went on to say that apart from flawed policies, there are also flawed approaches to examining issues related to water resources holistically. The presentation pointed out the differences between “eagle-eye science” and “toad-eye science” and how both were necessary in conjunction. The presentation introduced the concept of “Desakota” as a theory and went on to examine water resource management from the lens of culture theory. The presentation ended with a note on the changing assumptions and new realities emerging as in the case of Nepal's power system.

### **2) Gender, Water Rights, and Equity: Dr. Aditya Bastola**

This session started by defining the term gender and differentiating it from sex. Gender roles and social relationships were examined. As part of this session, the participants were given an individual



exercise, where they were to examine their roles and responsibilities at the household level, the community level, and as water professionals. The session then examined the issues of gender and equity in the context of water resources – listing the various barriers that were prevalent in society that prevented equitable access. The session then examined the seriousness of issues relating to lack of access, and how traditional education in water resource management does not adequately equip water professionals to handle these issues with sensitivity. Participants were asked to once again recall their roles as in the first exercise. The session then examined the ways in which the principles of gender sensitivity and equity should be included in water resource management. The session concluded by stating the benefits that could be derived from an inclusive approach.

### **3) Student group presentations on study area and challenges faced**

This session had four presentations on the respective study areas, carried out by groups of participants from each country. Participants from Bangladesh gave an overview of the impacts of climate change on the southwest region of Bangladesh. They explained how their research topics fit in with the problems facing Bangladesh. Participants from Sri Lanka gave an overview of the Deduru Oya river basin flowing through Kandy, Matale, Kurunegala, and Puttalam districts of Sri Lanka and the issues, problems, and success stories in water management therein. Like the participants in Bangladesh, they too showed how their research fits in with the issues mentioned. Participants from Nepal gave an overview of the Bhagmati river basin and the issues of water quality and water resource management that were seen there. Participants from India gave an overview about the Vellar river basin that lies in the northern part of Tamil Nadu state in south India.

### **4) Interdisciplinary research design: Prof. Mashfiqus Salehin**

The session provided an introduction to research design - how one must “prepare” for research and how the research concept is developed. Also discussed was the importance of developing a SPQR (Situation, Problem, Question, and Response). An example of SPQR from a case in Bangladesh was given for better understanding. Similarly, using examples, the session explained how conceptual frameworks are devised and how socio-technical research tools and methods are used to answer the research questions.

### **5) Introduction to field sites: Prof. Khem Raj Sharma**

As a part of the training programme, a field visit and a field practicum were organised. This session gave an overview of both the selected sites. The first site, which would be a half-day field visit was Matatirtha VDC, a peri-urban area on the outskirts of Kathmandu. The first part of the session gave a background of the VDC, and elaborated on the urbanization trends and changing modes of water transfer that were in operation. The session also covered the implications of unchecked water transfers, and the initiatives being taken at the VDC level in order to tackle these issues.

The second part of the session covered the Naubise Phant irrigation system, located around 45 kilometres east of Kathmandu. The system is managed by a Water Users' Association. The session explained the structure and functioning of the WUA and how increased irrigation coverage has led to changes in agriculture and livelihood amongst the beneficiaries.

### **6) Group work: SPQR presentation**

In this session the participants were tasked with the preparation a research proposal based on the

information gained in the previous session. This was done under the guidance of project faculty. Each group had to come up with a research question and identify qualitative and quantitative methods they would use to address the question.

### **Day 3**

#### **1) Interdisciplinary research tools/methods - Bio-physical investigation/measurements: Dr. B.V. Mudgal**

This session gave the participants an overview of bio-physical measurements that are needed in order to accurately determine the sources, extent, dependability, and quality of water resources for their utilisation and control. An example of a water balance for a wetland was given along with the kind of data that was needed to estimate the water resource potential of the wetland. The various primary and secondary sources for such data were also discussed, including free and reliable data sources that could be found online. The presentation ended with the statement “That which cannot be measured, cannot be managed”.

#### **2) Quantitative Methods - Questionnaire Survey: Dr. Niraj Prakash Joshi**

The session gave an introduction into designing an effective questionnaire survey. The session started with an explanation on the differences between qualitative and quantitative data, and how depending on the research question, either or both the methods/data could be used. Under the topic of quantitative data collection, the session examined the various steps involved in the process, from design to execution, to coding and data entry. The different types of questionnaires and survey instruments that could be used were also discussed. It was explained that even before getting to the questionnaire stage, it is important to have clear objectives and hypotheses. The various pitfalls to avoid in this process were explained in great detail. A brief explanation on the conduct of interviewers/enumerators during questionnaire surveys was also given.

#### **3) Introduction to Participatory Research Tools: Dr. Binod Bhatta**

The purpose of this session was to introduce the participants to tools and methods of participatory research and to highlight the importance of using participatory research methods. The session started by describing the differences between the traditional technology-led approaches to water resource management and how it is changing now to a more participatory approach, blending technology with local knowledge. It explained what participation was, why it was important, and the multiple forms and levels of participation. The session went on to explain the principles of Rapid/Participatory Rural Appraisal (RRA or PRA) and listed the various tools that could be used as a part of this. The session also pointed out how a participatory approach is more inclusive, and leads to sharing of information, as opposed to traditional interview methods, where the relationship between the interviewer and the person being interviewed is more extractive. The issues of ethical principles involved in such work were discussed. The session ended with a detailed explanation on carrying out timeline analysis and focus group discussions.

#### **4) In-house exercise:**

The participants were split into groups in order to hold a simulated focus group discussion. One of the groups was assigned the role of inhabitants in a village, while the other was assigned the role of facilitators. The facilitators were given some time to organise their thoughts and plan the discussion,

in order to elicit information from the “villagers” about water-related problems being faced in the village. The exercise was followed by a feedback session.

### **5) Field Visit to Matatirtha VDC**

Participants were taken to study the water transfers at Matatirtha VDC on the outskirts of Kathmandu. At the location, they were able to see how the local community harnessed and distributed water from mountain springs. They interacted with members of the Water Users' Association in the village, and obtained information about pricing, distribution structure, structure, and functioning of user associations and also about different arrangements of water sharing with the neighbouring villages. In addition, they gained information about the system of water supply to urban areas of Kathmandu through water tankers. They also understood that the lack of adequate public water supply infrastructure was exacerbating the water withdrawals and water transfers from this peri-urban area.

### **Day 4**

#### **Field Practicum – Naubise Phant Irrigation System**

A full day field practicum at the Naubise Phant irrigation system was carried out. The participants had the opportunity to put into practice their learnings from the classroom sessions. The area is about 45 kilometers east of Kathmandu. Here the irrigation department of Nepal had constructed the irrigation system by diverting water from a river. Participants were split into five groups with different research questions to be answered. Participants then engaged with the members of the local community, the Water Users' Association, and other key informants with the help of the Nepali students for translations. After collection of information, participants went to visit the source of the water intake. This proved to be an interesting experience for the students, for some of whom had never been involved in participatory research in this manner before, thus effectively building capacity.

### **Day 5**

#### **1) Leadership Session: Ms. Sukanya Patwardhan**

The half-day session focused on the development of leadership skills of the participants. Considering the age group and profile of the participants, the session was delivered in a highly interactive manner. The learning objective of this session was to sensitise the participants on the necessity of developing the leadership skills as they engage with various stakeholders in the larger community to achieve their objectives.

- What makes a leader?
- The importance of a holistic approach to leadership through the well-being of the individual assessment of one's well-being.
- Drawing an action plan as a future leader in the water management sector.

As part of the session, multiple exercises were conducted including a trust in leadership exercise.

## 2) Data analysis and report/presentation preparation

In this session, participants analysed the information collected through interviews and discussion during the previous day's field exercises. Students were expected to carry out analysis and present their findings on the next day.

### Day 6

#### 1) Group Presentations

This session involved presenting the results of the field exercises that were held. Participants made a presentation of their research findings, describing the methodology used to carry out the analysis.

- Group 1 presented on gender roles in the study area and their relation to water accessibility.
- Group 2 examined the water distribution inefficiency in the Naubise Phant irrigation system
- Group 3 studied the Impact of Naubise Phant irrigation system on agricultural productivity
- Group 4 examined the Impact of the Naubise Phant irrigation system on livelihoods of the beneficiaries.

After the presentations, each group was given feedback, and for most of the participants, this was the first experience of such participatory and qualitative research work. It proved beneficial to have this kind of field practicum.

#### 2) Opportunities for Transboundary Water Management in GBM basins: Prof. Mashfiqus Salehin

The session sought to provide an introduction into issues involved in transboundary water management, using the case of the Ganga, Meghna and Brahmaputra basins as an example, as collectively, these basins extend to cover five countries. The session explained water management issues in the GBM basins, in terms of the spatial and temporal inequalities in flow of water, leading to both floods and droughts. Other water management issues in each of the countries were discussed. The session described water management plans and policies of the different countries and the history of regional cooperation between the nations. The session explored different existing water management interventions as well those proposed in the future and their regional implications. An example given was the proposal to link rivers in India. The session described various opportunities and roadblocks to regional cooperation, and showed examples of places where regional cooperation would be beneficial. Also shown were examples of successful transboundary agreements regarding water sharing in different parts of the world. The session concluded after speaking of the way forward, as well as the lessons that should be learned by GBM countries from past experiences, and from other places in the world.

#### 3) Closing ceremony

The training programme thus drew to a close with the closing ceremony. Representatives from each partner institution, both students and faculty, said a few words about the training programme. Prof Khem Raj Sharma proposed the vote of thanks, after which certificates of participation were distributed to each participant. The session drew to a close with concluding remarks from Dr. Neena Rao.

# Annexure 3

## Regional Training for South Asia Water Studies (SAWAS) Fellows on Interdisciplinary Research Methods



### Proceedings Report

December 18 – 22, 2014, Dhaka, Bangladesh

In association with



**SaciWATERS**



## Summary

As part of the South Asia Water Fellowships (SAWA), a training programme on Interdisciplinary Research Methods was organized in Dhaka, from 18–22 December 2014. The training programme was titled “Regional South Asia Water (SAWA) Fellows Training on Interdisciplinary Research Method”. The programme was financially supported by International Development Research Centre (IDRC), Canada.

The objective of the programme was to acquaint the participants with qualitative and quantitative research methods. The training programme targeted the twenty recipients of the IDRC-SAWA Fellowships from four institutions in four South Asian countries: Bangladesh (Institute of Water and Flood Management - Bangladesh University of Engineering and Technology), India (Centre for Water Resources - Anna University), Nepal (Nepal Engineering College) and Sri Lanka (Post Graduate Institute of Agriculture – University of Peradeniya). Five additional participants from the first batch of SAWAS Fellows also participated in the program from BUET.

The workshop content covered the overview of IWRM across South Asia, gender and water, qualitative and quantitative research methods, and followed by a field visit. The sessions were interactive in nature. Participants got the chance to apply classroom learning to the field, with field trip during the programme to the Narayanganj-Narshingdi Irrigation project in the peri-urban area of Dhaka. Students conducted FGDs, key person interviews, and household surveys based on the topic assigned to each group. Overall, the participants were happy with the sessions and the field activity.

## Organizers

Bangladesh University of Engineering and Technology (BUET) is the oldest and leading university in Bangladesh in technology. The Institute of Flood Control and Drainage Research was established in 1974 in BUET, and renamed Institute of Water and Flood Management (IWFM) in 2002. IWFM is a premier institute for the advancement of knowledge and development of human resources in water and flood management. The Institute offers postgraduate degrees for professionals and fresh graduates in water resources development, with the objectives of training and enhancing the knowledge and skills of professionals in planning and management of land and water resources, and widening their perspectives on Integrated Water Resources Management (IWRM). Since IWRM is a multidisciplinary process requiring a holistic understanding of the system with a good blend of engineering, agricultural, socioeconomic, and environmental analyses; a multidisciplinary course curriculum has been created. The multidisciplinary programmes are aimed at engineers, planners, hydrologists, agriculturists, and physical and social scientists. Research activities of the institute focus on priority areas in water management, with major emphasis on water resources management in the floodplain environment, river and coastal hydraulics, wetland hydrology, hazard management, urban water management, irrigation and water management, environmental impact of water development, water resources policy, and climate change. A Climate Change Study Cell has been recently established at IWFM. IWFM will be collaborative institution in this project.

The South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERS) is a policy research institute in Hyderabad, India and working on the issue of water resources education, capacity building, research and action in South Asia. It is committed to bringing about structural changes in the dominant water resources management paradigm in South Asia by focusing on transforming water resources knowledge systems through working with universities and academic institutions. The key ideas are an interdisciplinary approach to undertaking water resources issues from a pro-poor, gendered, and human development perspective and emphasis on exchange, interaction, and collaboration at South Asia level. SaciWATERS is active in three domains- Education, Research and Advocacy. [www.saciwaters.org](http://www.saciwaters.org)

## Sponsors

International Development Research Centre (IDRC) is a Canadian Crown Corporation that initiates, encourages, and supports research in developing countries in order to help find practical and sustainable solutions to social, economic, and environmental problems that are being faced in these countries. <http://www.idrc.ca>

## **Workshops Objectives, Participants Profile, and Expected Outcomes**

### **Objectives:**

The main objective of this training programme was to build capacity of the SAWA Fellows towards research methods used in social research. As the students of the partner institutes are trained through their curriculum in technical aspects of water resource management, this training aimed to orient them mainly to social inclusion in their decision-making.

### **Participants' Profile:**

The participants for this training programme were those who were selected as Fellows as part of the 2nd batch of South Asia Water (SAWA) Fellowships, through a competitive process from each of the four partner institutes. Five Fellows each from Sri Lanka and Bangladesh and four Fellows each from India and Nepal were in attendance, as well as an additional five people from the host institution, leading to a total of twenty-three participants. All participants were pursuing post-graduate level courses in IWRM. Most had a conventional civil engineering background and few were with agriculture background. Due to the diverse background of the participants, it was therefore important to introduce them to research methodology.

### **Outcomes Expected:**

It is expected that at the end of the workshop the Fellows will have fundamental know-hows of a qualitative research approach and will learn to appreciate the importance of including social dimensions within the technical solutions they design as a part of their assignments in future.



## Programme details

### Key resource persons and facilitators

- Dr. N.D.K. Dayawansa, Senior Lecturer in Agricultural Engineering at the University of Peradeniya, Peradeniya; Sri Lanka
- Dr. Carolin Arul, Assistant Professor, Centre for Water Resources, Anna University; Chennai, India
- Mr. Robert Dongol, Assistant Professor, Nepal Engineering College; Kathmandu, Nepal
- Dr. Vishal Narain, Associate Professor, Management Development Institute; Gurgaon, India
- Dr. Rezaur Rahman, Professor, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology; Dhaka, Bangladesh
- Dr. Hamidul Haq, Professor, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology; Dhaka, Bangladesh
- Dr. Surijit Bala, Professor, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology; Dhaka, Bangladesh
- Dr. Shahjahan Mondal, Assistant Professor, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology; Dhaka, Bangladesh
- Dr. Mashfiqus Salehin, Professor, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology; Dhaka, Bangladesh
- Dr. Anamika Barua, Executive Director, South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERS); Hyderabad, India
- Dr. Manoj Jatav, Research Fellow, SaciWATERS; Hyderabad, India
- Mr. Sumit Vij, Research Fellow, SaciWATERS; Hyderabad, India
- Ms. Jyoti Nair, Research Associate, SaciWATERS; Hyderabad, India

### Methods used for facilitation

The workshop was conducted for five days. The following methods of facilitation were used.

**Interactive Sessions:** The sessions were interactive in nature. Each classroom session included classroom lectures using PowerPoint, followed by a discussion for 15 minutes. Participants were encouraged to take an active part in the discussions.

**Group Exercises:** Participants were divided into different working groups with each country represented in each group. For the field practicum, four groups were formed.

**Field Exposure:** A half-day field visit was organized to provide exposure to the water irrigation project in Narayanganj-Narshingdi irrigation plant in Narayanganj.

## Content of The Training Sessions

The programme was held for a total of five days, between 18-22 December 2014 in Dhaka. Each day had multiple sessions.

### Day 1: Inaugural Session

*Chief Guest: Prof. Khaleda Ekram (Vice Chancellor, BUET)*

*Special Guest: Dr. Anamika Barua*

*Dr. Shahjahan Mondal (Assistant Professor, BUET)* welcomed the dignitaries. He gave a brief introduction to the training workshop.

*Dr. Sultan Ahmed (Former Doctoral SAWA Fellow)* was called upon to reflect his views on the SAWA Fellowship programme. He shared his experiences and how the SAWA Fellowship has helped him and other fellows in pursuing studies. He focused on how the SAWA Fellowship gives exposure and helps understand the importance of interdisciplinary approach in water resource management.



*Dr Anamika Barua (Executive Director, SaciWATERs)* welcomed all the participants. She gave a background of the IDRC-SAWA Fellowship. She pointed out that most of the interventions made are for the benefit of the people, but most of the times these interventions are in conflict with what people demand. Thus, the engineering institutes were chosen to give the potential decision makers exposure to concepts of social science research. Water professionals need to focus beyond technicalities. A gender focus within the fellowship exists to encourage women to enter this field. She also encouraged the fellows to contribute to the SAWAS Journal.

*Dr. Tarekul Islam (Professor and Director – IWFM, BUET)* spoke of how the SAWA training gives a platform for capacity development of graduates in IWRM water security, food security, gender, and climate change. The important component of the project is the regional training as it provides opportunity for students to build network and capacities. He thanked the VC to be able to attend the program.

Overview of the training program and the programme details were given by Mr. Sumit Vij from SaciWATERs. In this session, all the participants had an opportunity to introduce themselves.

### IWRM Concepts and Principles: Experiences Of Bangladesh by Prof. Rezaur Rahman

This presentation elaborated on the concepts and key issues of IWRM with a special focus on Bangladesh. Environmental and social effects of flood management were discussed. He noted that until quite some time flood management was considered key to IWRM in Bangladesh due to the recurring flooding events, but this idea has changed with time.



### Gender in IWRM (Bangladesh): Dr. SURIJIT BALA

This presentation focused on the emphasis given to participatory water management and the role of

women in the management within the National Water policy. The focus was on the integration of the concept of gender and equity into the water management policy as well as into the practice of irrigation, groundwater management, watershed management etc. A gender approach implemented under the IPSWAM project in Bangladesh was discussed.

### **Overview of Water Resources Management in India: Dr. CAROLIN ARUL**

A brief overview of the status of water resources available in India was given with the help of maps and climate-related data. The presentation then looked into the causes of water-related problems in India such as the uneven distribution of water, pollution of freshwater resources, over extraction of groundwater etc. The efforts and challenges faced by the policy makers to address these issues, and the existing gaps were detailed. Additionally, problems such as floods and droughts, salinity, fluoride, ground water management, lack of drinking water resources, and interstate and transboundary water conflicts were elaborated. The important aspect of climate change and its impacts in the India with specific reference to Tamil Nadu was discussed.

### **Overview of Water Resources Management in Nepal: Mr. Robert Dongol**

The session discussed the current status of water resources management in Nepal. An overview of the various plans and policies related to water institutes by the government of Nepal was given. The presentation pointed towards the electricity demand being managed through hydropower. The presentation closed after mentioning a few initiatives in IWRM taken up in Nepal.

### **Day 2**

The day began with a recap of the previous day's sessions by two students from Bangladesh and India.

### **Overview of Water Resources Management in Sri Lanka: : Dr. N.D.K. Dayawansa**

The presentation gave an introduction into the climate and water balance of Sri Lanka, and a brief note of the historical practices of water management. A historical overview of the evolution of water policy in the country was also presented. It mentioned the importance of minor irrigation systems such as small tank systems in Sri Lanka. The presentation then mentioned the water allocation and distribution mechanism and policy at the central and local levels. The session ended with a discussion on the issues being faced in in large-scale water resource development in Sri Lanka.



### **Foundations of Research and Designing Research: Dr. Vishal Narain and Mr. Sumit Vij**

This session covered the fundamentals of research and research design. The presentation gave an overview of research paradigms, essential steps of research design, and ethics of research. Within the research paradigm, students were given the basic know-how of positivism and interpretivism. The session also introduced students to the basics of conducting a literature review and steps towards writing a thesis.



Sumit Vij took a session on appreciative inquiry. The steps towards appreciative inquiry, i.e., discovery, dream, design, and delivery were discussed.

### **Qualitative Data Analysis & Writing: Dr. Vishal Narain and Dr. Hamidul Haq**

Dr. Vishal Narain elaborated the concepts of qualitative research such as ethnographic methods. Principles of fieldwork such as methodological pragmatism, naturalization, socialization, and the researcher's personality were discussed. Steps to be followed during fieldwork were elaborated and the need for sampling was introduced.



Students were introduced to the process of analysis of field notes and the steps involved in the conversion of field notes to research article by Dr. Narain and Sumit Vij.

Dr. Hamidul Haq introduced the participants to the concepts of Participatory Research Approach. The purpose of this session was to introduce the participants to tools and methods of participatory research as well as to highlight the importance of using participatory research methods. Mapping, diagramming and ranking tools were elaborated. Characteristics of focus group discussions, transect walk, and resource and institutional mapping were discussed with students participating in a demonstration activity.

### **Statistical Sampling:**

#### **Dr. M. Shahjahan Mondal**

This session aimed to introduce the basic concepts of sampling and ways to select a sampling method. This session also involved problem-solving exercises for the participants.



### **Questionnaire Development and Administration: Dr. M Shahjahan Mondal**

This presentation was to build upon the concepts of social research through developing research questionnaire for field survey. The types of questionnaires, relevance of questions to be asked, and construction and administration of the questionnaire were discussed.

## **Day 3**

### **Brief Overview on Programs of IDRC: MR. Eric Emith**

Eric Smith gave the participants an overview of the programs on scholarships and fellowships under the aegis of IDRC.

### **Quantitative Data Analysis: Dr. Manoj Jatav and Dr. Anamika Barua**

This session gave the participants hands-on training on the SPSS software. They were instructed on the fundamentals of using the software for statistical analysis. They were given demonstration on data entry, data cleaning, and data analysis using different statistical techniques such as central tendency, correlation etc.

## Introduction of Field Study Sites: Dr. Sujit K Bala

Narayanganj-Narshingdi (N-N) irrigation project is a flood control, drainage, and irrigation project (FCDI). It had Phase-I (Area-A) & II (Area B) with gross area of 29,000 ha and 16,000 ha, respectively. JICA carried out the feasibility study in 1978 and recommended it for implementation. A demonstration unit (D/U) under Area-A of 1300 ha was completed in 1984 with grant from JICA and proved to be extremely beneficial for the local people. Block-A1 of Phase-I was completed in 1993 with an increased area of 3000 ha. The location map of the N-N project of Phase-I&II and D/U, A-1, A-2, A-3 and Area-B was shown. The purpose of the project was to protect homesteads and infrastructures from the monsoon floods of the Meghna and Lakhya rivers and to promote high value and diversified agriculture, and to increase production of HYV monsoon rice.

### Group work – SPQR

In this session, the participants were to prepare a research proposal in groups, based on the information gained in the previous session. This was done with the guidance of project faculty. Each group had to come up with a research question and identify qualitative and quantitative methods they would use to address the question.

### Day 4

#### Field Practicum – Narayanganj - Narshingdi Irrigation System

Participants were split into four groups with different research questions that were to be answered. Participants then engaged with the members of the local community, the Water Users' Association, and other key informants with the help of the BUET students for translations. This exercise proved to be useful for the student as most had never experienced primary information collection.

### Day 5

#### Data Analysis and Report/Presentation Preparation

This session was the time given to participants in order to analyse the information collected through interviews and discussion during the previous day's field exercises. Students were expected to carry out analysis and present their findings on the same day.

#### Group Presentations

This session completely involved presenting the results of the field exercises that were held. Participants were charged with making a presentation of their research findings and to describe the methodology they used in order to carry out the analysis.

- Group 1: Equity in Agricultural Benefit Sharing in the Area of N-N Irrigation Project
- Group 2: Assessment of Industrial Impact on Agricultural and Fisheries Livelihood in the Narayanganj-Narshingdi Irrigation Project
- Group 3: Farmers' Participation In Narayanaganj-Narshingdi Irrigation Project
- Group 4 : Identifying the Role of Human Interventions Affecting the Condition of Embankment

After the presentations, each group was given feedback by Dr. Salehin, Dr. Anamika Barua, and Dr. Shahjahan Mondal, regarding improvements and further steps. This exercise proved beneficial to the participants.

### **Closing ceremony**

The training programme drew to a close with the closing ceremony. Representatives from each partner institution, both students and faculty said a few words about the training programme. Dr. Tarekul Islam and Dr. Anamika Barua proposed the vote of thanks, after which certificates of participation were distributed to each participant.

# Annexure 4

## Regional Training for South Asia Water Studies (SAWAS) Fellows on Interdisciplinary Research Methods



### Proceedings Report

28 Nov – 03 Dec, 2015, Kandy, Sri Lanka



SaciWATERS



## Summary

As part of the South Asia Water (SAWA) Fellowship, a training programme on Interdisciplinary Research Concepts and Methodologies was organized in Kandy, Sri Lanka from 28 October - 3 December 2015. The training programme was financially supported by International Development Research Centre (IDRC), Canada and CapNet.

The objective of the programme was to acquaint the participants with the qualitative and quantitative research methods. The training programme targeted the 22 recipients of the IDRC-SAWA Fellowships from four institutions in four South Asian countries: Bangladesh (Institute of Water and Flood Management - Bangladesh University of Engineering and Technology), India (Centre for Water Resources -Anna University), Nepal (Nepal Engineering College) and Sri Lanka (Post Graduate Institute of Agriculture –University of Peradeniya). Five additional participants from the 2nd batch of SAWA Fellows also participated in the program from PGIA.

The workshop content covered the overview of IWRM across South Asia, gender and water, qualitative and quantitative research methods, and was followed by field visit. The sessions were interactive in nature. Participants got the chance to apply classroom learning in the field, with field trip during the programme to an irrigation system in Dambulla. Students used PRA tools and made presentations of their field learnings on the last day of the workshop.



## Introduction

### Background – The SAWA Fellowship

South Asia's agricultural economies are vulnerable to extreme environmental events. Better management of water and other natural resources is fundamental to the development of the region. Climate variability and change, food insecurity, population growth, and urbanisation have intensified environmental disasters in the recent past. Poor land and water resource allocation, utilization, and pollution have robbed the poor, particularly women, of livelihood and dignity. Such broad, yet closely linked issues can only be effectively tackled through a holistic interdisciplinary approach. The IDRC-SAWA Fellowships seek to address these issues, by providing the opportunity to train a generation of water professionals to tackle water issues using multidisciplinary approaches that are sensitive to women, the poor, environment, and sustainability.

This project continues as part of an earlier project coordinated by SaciWATERS, namely the Crossing Boundaries project. This project is funded by the International Development Research Centre (IDRC) and is implemented by SaciWATERS and its four partner institutions, namely:

- Institute of Water and Flood Management (IWFM) of the Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh;
- Center for Water Resources (CWR), Anna University, Chennai, India;
- Center for Post Graduate Studies, Nepal Engineering College (NEC), Kathmandu, Nepal; and,
- Post Graduate Institute of Agriculture (PGIA), University of Peradeniya, Peradeniya, Sri Lanka.

The objectives of the project are firstly; to create a new generation of interdisciplinary water professionals in South Asia trained to deal with issues of climate change adaptation, water, and food security; in order to do this, this project has instituted the IDRC-SAWA fellowships. Secondly, the project aims to generate action-oriented research in the aforementioned fields through Master's degrees in Integrated Water Resource Management in Bangladesh, India, Nepal, and Sri Lanka. Thirdly, it has been noted that women and girls are often the primary users, providers, and managers of water in rural and urban households, thus being the most affected by planning and policy in water resources. It has often been seen that women's voices are not taken into consideration when forming policy. Additionally, it is seen that women are underrepresented in the field of water resources engineering and policymaking. This project seeks to address this imbalance by awarding 80% of the fellowships to women; the rest of the fellowships will be awarded to men from lower socio-economic groups. Fourthly, it aims to share knowledge and ideas about water issues in the South Asian context, through meetings and exchanges between fellows. This is especially important as it fosters the spirit of regional and transboundary cooperation in the fellows, which would hopefully lead to larger regional cooperation in future. Such interdisciplinary, regional, and transboundary co-operation is essential for IWRM approaches. Fifthly, the projects supports free access to the journal "South Asian Water Studies" and encourages young water professionals to publish peer reviewed journal articles.

## Organizers

Postgraduate Institute of Agriculture (PGIA), a semi-autonomous institution of the University of Peradeniya, was established in 1975 with the objective of in-country capacity building for

postgraduate education in Agricultural Sciences and related disciplines. During the last 35 years, the institution has awarded more than 2000 M.Sc., M.Phil. MBA and Ph.D. degrees. In addition, it has immensely contributed to the development of the country and the region through research and capacity building programmes. PGIA organises its annual research symposium, the PGIA Annual Congress, which facilitates the diffusion of postgraduate research in agriculture and related disciplines to a wider audience. Due to the close association between the Faculty of Agriculture, University of Peradeniya; PGIA gets the support of more than 100 academics with Ph.D. level qualifications for its academic and research programmes. In addition, PGIA gets the assistance of postgraduate academics, researchers, and other professionals from various organisations in the country. Hence, it has established a reputation as a centre of excellence in postgraduate education in agriculture and related disciplines in the region. PGIA conducts its academic activities under the Board of Study in Agricultural Engineering, one of the most active of the eleven boards of study of the PGIA. In order to develop a critical mass for the Integrated Water Resources Management (IWRM), the Board of Study in Agricultural Engineering launched a postgraduate program on IWRM in 2001. The M.Phil. and M.Sc. in IWRM programme helps to meet the manpower requirements of the private, public as well as NGO sectors, and contributes to solving critical issues in the water sector through its research programs.

SaciWATERs, the South Asia Consortium for Interdisciplinary Water Resources Studies, is a policy research institute in Hyderabad, India working on the issue of water resources education, capacity building, research, and action in South Asia. It is committed to bringing about structural changes in the dominant water resources management paradigm in South Asia by focusing on transforming water resources knowledge systems through working with universities and academic institutions. The key ideas are in interdisciplinary approaches to undertaking water resources issues from a pro-poor, gendered, and human development perspective and emphasis on exchange, interaction, and collaboration at South Asia level. SaciWATERs is active in three domains - Education, Research, and Advocacy. [www.saciwaters.org](http://www.saciwaters.org)

## **Sponsors**

International Development Research Centre (IDRC) is a Canadian Crown Corporation that initiates, encourages, and supports research in developing countries in order to help find practical and sustainable solutions to social, economic, and environmental problems that are being faced in these countries. <http://www.idrc.ca>

Cap-net UNDP is an international network for capacity development in sustainable water management. It is made up of a partnership of autonomous international, and regional and national institutions and networks committed to capacity development in the water sector. Cap-net UNDP was initiated at the UNDP symposium on water capacity development in 1996 and launched in 2002 by the UNDP and UNESCO-IHE's Institute for Water Education with funding from the Dutch government. Since then, Cap-net UNDP has grown into a global hub for capacity development and networking in sustainable water management with additional funding from the Swedish and Norwegian governments, as well as the European Union. The Cap-net UNDP programme is a part of the water and ocean governance programme of UNDP, within the Sustainable Development Bureau for Policy and Programme Support. The programme is executed by the United Nation's Office of Project Services' (UNOPS), Water and Energy Cluster.

## Workshops Objectives, Participants' Profile, and Expected Outcomes

### Objectives

The main objective of this training programme was to build capacity of the SAWA Fellows towards research methods used in social research. As the students of the partner institutes are trained through their curriculum in technical aspects of water resource management, this training aimed to orient them mainly to social inclusion in their decision-making.

### Participants' profile

The participants for this training programme were those who were selected as fellows as part of the 3rd batch of South Asia Water (SAWA) Fellowships, through a competitive process from each of the four partner institutes. Five fellows each from Sri Lanka and Bangladesh and four fellows each from India and Nepal were in attendance, as well as an additional five people from the host institution, leading to a total of twenty-seven participants. All participants were pursuing postgraduate level courses in IWRM. Most had a conventional civil engineering background and few had an agriculture background. Introduction to concepts of qualitative research and gender were important to develop an interdisciplinary perspective in their approach towards water issues.

### Outcomes expected

It is expected that at the end of the sessions and the fieldwork, the Fellows will have fundamentals know-how of the qualitative research approach and will appreciate the importance of including social dimensions within the technical solutions they design as part of their assignments in future.

## Programme Details

### Key Resource Persons and Facilitators

- Dr. N.D.K. Dayawansa: Senior Lecturer in Agricultural Engineering at the University of Peradeniya; Peradeniya, Sri Lanka
- Prof. B. V. Mudgal: Professor, Centre for Water Resources, Anna University; Chennai, India
- Prof. Kem Raj Sharma: Professor, Nepal Engineering College; Kathmandu, Nepal
- Dr. Shahjahan Mondal: Assistant Professor, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology; Dhaka, Bangladesh
- Dr. Samad: Theme Leader, IWMI; Colombo, Sri Lanka
- Prof. E.R.N. Gunawardena: Professor, Faculty of Agriculture; University of Peradeniya
- Prof. W.A.D.P. Wanigasundara: Faculty of Agriculture, University of Peradeniya
- Dr. Vishal Narain: Associate Professor, Management Development Institute; Gurgaon, India
- Prof. Sucharita Sen: Professor, Jawaharlal Nehru University; New Delhi, India
- Dr. Anamika Barua: Executive Director, South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERS); Hyderabad, India

- Dr. Manoj Jatav: Research Fellow, SaciWATERS; Hyderabad, India
- Ms. Monica Priya: Research Associate, SaciWATERS; Hyderabad, India

### Methods used for facilitation

The workshop lasted for six days, with multiple sessions on each day. The following methods of facilitation were used.

**Interactive Sessions:** The sessions were interactive in nature. Each classroom session included classroom lectures using PowerPoint, followed by a discussion of about 15 minutes. Participants were encouraged to take an active part during the discussions.

**Group Exercises:** Participants were divided into different working groups with each country student in each group. For the field practicum, four groups were formed.

**Field Exposure:** A full day field visit was organized to provide exposure to participants on irrigation system in Dambulla.

### Content of the Training Sessions

The programme was held for a total of six days, 28 October – 3 December 2015 in Kandy. Each day had multiple sessions; the programme agenda is provided below.

#### Day 1: Inaugural Session

*Chief Guest: Prof. U.B. Dissanayake, Vice Chancellor, University of Peradeniya*

*Dr. N.D.K. Dayawansa, (Senior Lecturer, PGIA) welcomed the dignitaries. She gave brief introduction to the training workshop.*

*Prof. U.B. Dissanayake, (Vice Chancellor, University of Peradeniya) welcomed all the guests and expressed satisfaction to know of such initiative where SaciWATERS has joined hands with the institutions from South Asia to encourage students to work on water management issues and also said that it is a means of fostering a relationship between the four countries.*

*Dr. Anamika Barua (Executive Director, SaciWATERS) welcomed all to the workshop. She gave background of the IDRC-SAWA Fellowship. She pointed out that most of the interventions made are for the people to benefit, but most of the time these interventions have conflict with what people demand. Thus, the engineering institutes were chosen give the potential decision makers exposure*



to concepts of social science research. Water professionals need to be focused beyond technicalities. A gender focus within the fellowship exists to encourage women to enter this field. She also encouraged the fellows to contribute to the SAWAS Journal.

This was followed by an introduction of all the fellows present there and the four country coordinators speaking about how SAWA Fellowship and the Crossing Boundaries project have benefited the institutions in training water professionals with an interdisciplinary lens.

### **Panel Discussion on IWRM**

The panel discussion on Integrated Water Resources Management mainly focused on IWRM experience sharing by the four countries. Dr. Anamika Barua chaired the session.

### **Overview of IWRM in India: Prof. B. V. Mudgal**

He initiated the discussion by posing a question on how the impact of climate change on water resources can be measured. He then pointed out on how every nation is looking at maximizing benefits through technological innovations, thus ignoring sustainability, and how the conflict between development and sustainability is reaching a tipping point. Focusing on India, he said that in the last few decades, the population has risen threefold and thus the per capita demand for water, but the development of water resources is showing downfall. He then spoke about Earth Summit 1992, which has been the first ever framework that laid thrust on IWRM.

### **Trajectory of IWRM Journey, Nepal: Prof. Kem Raj Sharma**

The presentation started with the genesis of IWRM at Nepal Engineering College. This entire session mainly focused on the expectation from graduates of NEC upon completion of their Master's programme, the diversity in the background of the students that enroll into the programme, and the thematic areas of IWRM. The focused areas of research by these students was discussed and the presentation ended with the achievements, challenges, and future opportunities.

### **Overview of IWRM in Bangladesh: Dr. Shahjahan Mondal**

An overview of the Flood Control project as an IWRM initiative was given. The presentation then went on to talk about the environmental impacts of the Flood Control project, and seasonal water resources management in Bangladesh. It further laid emphasis on drinking water issues in Bangladesh.

### **Overview of Water Resources Management in Sri Lanka: Dr. N.D.K. Dayawansa**

The presentation gave an introduction into the climate and water balance of Sri Lanka, as well as a brief look into historical practices of water management therein. A historical overview of the evolution of water policy in the country was also presented. It mentioned the importance of minor irrigation systems such as small tank systems to water security in Sri Lanka. The presentation then mentioned the water allocation and distribution mechanism and policy at the central and local levels. The session ended after the issues faced in Sri Lanka in large-scale water resource development were discussed.

## Water Management Issues and Challenges - Examples from South Asia: Dr. Madar Samad

This session focused on building a water resilient economy in South Asia. The context was set by giving an overview of the poverty and food requirements in South Asia, South Asia's water crisis, and how climate extremes in different seasons are having an impact on the water resources. The session laid emphasis on comprehensive assessment of water for agriculture, which is critical to ensure food security. It then focused on the importance to understand water-food-energy nexus and discussed on how the use of solar power is an upcoming trend which is a positive sign. The session also gave an insight into how investments in water storage improve water and food security, and also on upgradation of rainfed agriculture. The session ended with a discussion on policy and institutional reforms which are key to building a water resilient economy.

### Day 2

#### Concepts and Principles of IWRM and its current practices: Prof. Nimal

In this session Prof. Nimal started with a quote given by US President Jimmy Carter, which is “nature cannot be controlled”. He then began his presentation with five paradigms of Water Resources Management wherein IWRM is the fifth paradigm. He went on to discuss the three dimensions of sustainability, which are water in the environment, society, and economy that underpin the political nature of IWRM. The session then focused on IWRM as a paradigm shift, as it departs from the sectoral approach, with spatial focus on the river basin, and the importance of the integration between sectors and administrative units, which is vital to realize IWRM.

#### Understanding and Doing Gender: Prof. Sucharita Sen

The session essentially focused on theoretical and conceptual frameworks used in gender studies and the methodological guidelines to integrate gender into research. This session was the most interactive session in the entire workshop which has encouraged the students to look at water management issues from a gender lens.

#### Introduction to PRA Tools: Prof. W.A.D.P. Wanigasundara

The session gave an introduction to various PRA tools. It was a short session that was followed by presentations by each group of students. Each group was assigned a topic such as showing the influence of various institutions in a village through Venn Diagram, identifying the key stakeholders etc. The session was highly interactive in nature.





### **Documentary: Flow**

Directed by Irena Salina, the movie builds a case against the growing privatisation of the world's dwindling fresh water supply with an unflinching focus on politics, pollution, human rights, and the emergence of a domineering world water cartel.

Interviews with scientists and activists intelligently reveal the rapidly building crisis, at both the global and human scale, and the film introduces many of the governmental and corporate culprits behind the water grab, while begging the question, "Can anyone really own water?"

### **Day 3**

#### **Research Paradigms and Design: Dr. Vishal Narain**

The session began with an introduction to paradigms in research, which are positivism, interpretivism, and critical social science. It then gave a detailing of various steps in research design, which essentially are knowing your paradigm and identifying one's contribution to the existing knowledge pool. Further the thesis design of positivism and interpretivism were discussed. While positivism has definite design, interpretivism does not have a fixed style or format.

#### **Qualitative Research - Methods and Approaches: Dr. Vishal Narain**

The session focused on ethnographic methods and various tools that are used in fieldwork. It started with developing an understanding of what is ethnography, when does it suit the research, principles of fieldwork, and steps to be followed in fieldwork.

Steps in fieldwork were elaborated upon along with the ways to deal with key informants. The need for sampling was introduced, and the session ended with various ways of assessing qualitative data.

#### **Postgraduate Thesis Development: Dr. Anamika Barua**

This session gave an overview of the stages involved in thesis development. The first stage is developing a research design, which involves literature review. The presentation focused on how to do a literature review and the difference between a good and bad literature review, and also on referencing. The second stage is research methodology wherein an overview of the various methods of data collection and description of methodological frameworks for analysis was given. The presentation then ended by giving key points on writing a conclusion, referencing, and placing of annexures.

## Quantitative Methods using SPSS: Dr. Manoj Jatav and Prof. Sucharita Sen

This session gave the participants hands on training on the SPSS software. They were instructed on the fundamentals of using the software for statistical analysis. They were given demonstration on the data entry, data cleaning, and data analysis using different statistical techniques such as central tendency, correlation etc.



## Day 4

### Sampling Methods, Questionnaire Design and Administration: Dr. Shahjahan Mondal

This presentation was to build upon the concepts of social research through developing a research questionnaire for field survey and understanding the sampling methods. The types of questionnaire, importance of relevance of questions to be asked, and construction and administration of the questionnaire were discussed.

### Introduction to the field site: Dr. N.D.K. Dayawansa

Galkiriyagama is a major irrigation system managed by the Mahaweli Authority of Sri Lanka. The water allocation to the farmers in this system is based on the bulk water allocation concept in which farmers together with the officials decide how much of water they require based on the crops to be grown. To facilitate the process, participation of the farmers is made through farmer organisations.

### Preparation by the Students for the Fieldwork - Short Proposals

In this session, the participants were to form groups and prepare a research proposal based on the information gained in the previous session and the topics assigned to them. This was done with the guidance of project faculty. The participants of the training were given the following four topics to be studied by collecting relevant information.

- Assessment of the performance of farmer organisation in the area
- Water management issues at distributary canal level
- Cultivation practices adopted under water stressed conditions and their effectiveness
- Drinking water, health issues, and women in the area

Each group had to identify qualitative and quantitative methods they would use in order to address the research question.

## Day 5

### Field Practicum – Damulla

Participants were split into four groups with different research topics. Participants then engaged members of the local community, the Water Users' Association, and other key informants in discussions and interviews with the help of the PGIA students for translations. This exercise proved to be useful for the students as most had never experienced primary information collection.





## Day 6

### Preparatory Session for Students to Present Field Observations:

This session was the time given to participants in order to analyze the information collected through interviews and discussion during the previous day's field exercises. Students were expected to carry out analysis and present their findings on the same day.

### Group Presentations

This session completely involved presenting the results of the field exercises that were held.

GROUP 1: Assessment of the performance of farmer organization in the area

This group presented their findings and observations in the form of a live TV show.

GROUP 2: Water management issues at distributary canal level

This group made a PowerPoint presentation to share their findings and observations.

GROUP 3: Cultivation practices adopted under water stressed conditions and their effectiveness

This group made a PowerPoint presentation to share their findings and observations.

GROUP 4: Drinking water, health issues, and women in the area

This group presented their observation in the form of a skit.

After the presentations, each group was given feedback by Dr. Shahjahan Mondal, Prof. B. V. Mudgal, and Prof. Kem Raj Shrama as to improvements and further steps. This exercise proved beneficial to the participants.



### Closing ceremony

The training programme thus drew to a close with the closing ceremony. Representatives from each partner institution, both students and faculty, said a few words about the training programme. Dr. N.D.K. Dayawansa proposed the vote of thanks, after which certificates of participation were distributed to each participant.

# Annexure 5

## List of Thesis Topics

Name of the student	SAWA Batch	Thesis title	Institution
<b>Ms. R.P.S.P. Chandrasiri</b>	1 <sup>st</sup>	Assessment of water management on sustainability of paddy cultivation under variable rainfall in Bayawa, Kurunegala, Sri Lanka	PGIA
<b>Ms. A.C.S. Perera</b>	1 <sup>st</sup>	Impact of climate variability on water availability and paddy productivity in the “Hakwatuna Oya” irrigation scheme in Sri Lanka	PGIA
<b>Mr. D.M.N. Diyawadana</b>	1 <sup>st</sup>	Impacts of climate change and policy environment on rural smallholder farmers in Hakwatuna-Oya major irrigation scheme, Kurunegala, Sri Lanka	PGIA
<b>Ms. T. Sellathurai</b>	1 <sup>st</sup>	Impact of rainfall variability on soil organic matter and nitrogen in lowland paddy field: A case study in Bayawa minor irrigation system	PGIA
<b>S. Thusyanthi</b>	1 <sup>st</sup>	Identification and assessment of processes and functions affected by extreme events due to climate variation in paddy field in a tank cascade system	PGIA
<b>Ms. G.W.R.W.M.R.M.W. Kirinde</b>	2 <sup>nd</sup>	Alternative water regimes cum enhanced ecosystem as an adaptation for climate variability in paddy cultivation	PGIA
<b>Ms. N.G.R. Saumyarathna</b>	2 <sup>nd</sup>	Effect of climate variability on water availability, allocation, productivity, and conflicts in Hakwatuna Oya watershed in Deduru Oya basin	PGIA
<b>Hemanthi Dhammika</b>	2 <sup>nd</sup>	Small-scale water interventions for improving livelihood of rural smallholder farmer in a selected small tank cascade system in Sri Lanka	PGIA
<b>K. Kirinde</b>	2 <sup>nd</sup>	Water regimes cum enhanced ecosystem as an adaptation for climate variability in paddy cultivation	PGIA
<b>Pradeep Kumara</b>	2 <sup>nd</sup>	Identification and assessment of technical and socioeconomic aspects in cultivation Other Field Crops (OFC) in Bayawa minor irrigation system	PGIA
<b>Ms. W.M.S.M. Wijekoon</b>	3 <sup>rd</sup>	Role of governance and institutional arrangement in strengthening resilience to shocks and stresses to livelihoods in minor irrigation system	PGIA
<b>Lakmini</b>	3 <sup>rd</sup>	Social and livelihood impacts of Deduru Oya dam construction and water diversion	PGIA
<b>Indika</b>	3 <sup>rd</sup>	Investigation of strategies for CC adaptation in terms of food quality and ecosystem in paddy cultivation	PGIA

Name of the student	SAWA Batch	Thesis title	Institution
<b>Sudarshani</b>	3 <sup>rd</sup>	Evaluating existing levels of livelihood capitals of the smallholder rural farmers and prioritizing the water interventions within the Bayawa – cascade in Sri Lanka.	PGIA
<b>Rajendran</b>	3 <sup>rd</sup>	Impact of climate change and irrigation management on irrigation water demand in Hakwatuna Oya irrigation scheme in Sri Lanka	PGIA
<b>Ms. Debanjali Saha</b>	1 <sup>st</sup>	Prospect of rabi crops in southwest coastal area under climate change scenarios	BUET
<b>Md. Gulam Kibria</b>	1 <sup>st</sup>	Storm surge propagation and crop damage assessment in a coastal polder of Bangladesh Storm surge propagation and crop damage assessment in a coastal polder of Bangladesh	BUET
<b>Tamanna Kabir</b>	1 <sup>st</sup>	Assessment of biophysical factors for storm surge hazard and their implications for food security	BUET
<b>Taznin Naher</b>	1 <sup>st</sup>	Crop decision-making model and impacts of crop selection on the livelihood of farmers in coastal area	BUET
<b>Sultana Maliha</b>	1 <sup>st</sup>	Changes on land use and soil properties and their impact on rice yield in Dacope Upazila, Khulna	BUET
<b>Aniqua</b>	2 <sup>nd</sup>	Valuation of ecosystem services of tidal river management in Pakhimara Beel: An ecosystem based approach to ensure water security	BUET
<b>Samiul Kader Khan</b>	2 <sup>nd</sup>	A comparative study on assessing gender perspectives for adopting different farming practice in coastal Upazila of Tala in Satkhira	BUET
<b>Sumayyah Tehsin</b>	2 <sup>nd</sup>	Assessing agricultural water security in different agro-ecosystems of southwest Bangladesh using analytic hierarchy process	BUET
<b>Sadiul Alam</b>	3 <sup>rd</sup>	Multi hazard risk assessment and adaptation strategies	BUET
<b>Sabrina Mehzabin</b>	3 <sup>rd</sup>	Strom surge risk assessment and livelihood adaptation strategies	BUET
<b>Umme Hani</b>	3 <sup>rd</sup>	Effect of livelihood diversification due to climate change and its impact on displacement and migration	BUET
<b>Ayesha</b>	3 <sup>rd</sup>	Impact of climate change on coastal reserves of Bangladesh and scope of modification of existing adaptation programs	BUET
<b>Kazi Mita</b>	3 <sup>rd</sup>	Effectiveness of EBA to climate change impacts in study area with a focus on sustainable livelihood	BUET
<b>Swarnali Mahmood</b>	3 <sup>rd</sup>	Impact of polder on agricultural water management and livelihood in the southwest region: A case study	BUET
<b>Anitha P</b>	1 <sup>st</sup>	Impact of climate variability on agricultural productivity in Lower Vellar, Anaivari Odai, and Chinnar sub-basins	CWR
<b>Elakiya Priyaa A</b>	1 <sup>st</sup>	Impact of climate variability on agro-ecosystems and its vulnerability to livelihood	CWR

Name of the student	SAWA Batch	Thesis title	Institution
<b>Malarmathi Divinya A</b>	1 <sup>st</sup>	Impact of climate variability on cropping pattern and crop diversification in Manimukthanadhi sub-basin	CWR
<b>Monisha S</b>	1 <sup>st</sup>	Land cover dynamics and its impact on vulnerability of agro -ecosystems and food security	CWR
<b>Vidhya A</b>	1 <sup>st</sup>	Impact of IAMWARM on food security in Vellar basin	CWR
<b>Sivaranjani Umapathi</b>	2 <sup>nd</sup>	Rainfall variability under changing climate: An impact study of drinking water security at village level	CWR
<b>Priyadarshini</b>	2 <sup>nd</sup>	Impact of crop diversification on water use and water security at village level	CWR
<b>Hemalatha Murugesan</b>	2 <sup>nd</sup>	Role of water users' associations in improving water security: A case study of Upper Vellar sub-basin	CWR
<b>Durgadevi Gnanaguru</b>	2 <sup>nd</sup>	A study of agriculture and domestic water footprint and its impact on water security of Veppanthatai block of Vellar basin	CWR
<b>Arivoli Elangovan</b>	2 <sup>nd</sup>	Role of rehabilitated tanks in improving water security in Gomuhi sub-basin of Vellar basin	CWR
<b>S. Esakkiammal</b>	3 <sup>rd</sup>	Community and ecosystem based adaptation to climate change impacts towards sustainable livelihood in Vellar river basin	CWR
<b>E. Nivedha</b>	3 <sup>rd</sup>	Adaptation strategies to climate change in Vellar basin	CWR
<b>G. Rajaswedha</b>	3 <sup>rd</sup>	Effect of climate change and climate variability on livelihoods in Vellar river basin	CWR
<b>Pavithra T S</b>	3 <sup>rd</sup>	Role of governance in strengthening resilience to water shocks and stresses	CWR
<b>Sri balaji</b>	3 <sup>rd</sup>	Effects of livelihood diversification and its impact on displacement and migration	CWR
<b>Sangita Dandekhya</b>	1 <sup>st</sup>	Understanding the vulnerability of farm household in upper Bagmati basin to climate variability	NEC
<b>Pratikshya Neupane</b>	1 <sup>st</sup>	Impacts of water induced disasters on food security	NEC
<b>Durga Adhikari</b>	1 <sup>st</sup>	Impacts of changing land cover dynamics on vulnerability of agro-ecosystems and food security	NEC
<b>Rajendra Shrestha</b>	1 <sup>st</sup>	Urbanisation as a driver of land use and land cover change and its impacts on local food security	NEC
<b>Jyoti Dahal</b>	2 <sup>nd</sup>	Effect of urbanisation and urban water extraction on water security of Jhaukhel	NEC
<b>Bandana Shrestha</b>	2 <sup>nd</sup>	An assessment of water security situation in terms of water quality in Upper Bagmati Basin, Nepal in present and future climatic conditions	NEC

Name of the student	SAWA Batch	Thesis title	Institution
<b>Shyam Prasad Pant</b>	2 <sup>nd</sup>	Water resources conservation and management practices in context to climate change in Upper Bagmati river basin	NEC
<b>Archana Chaudhary</b>	2 <sup>nd</sup>	Climate variability and trends in water induced disasters in lower Bagmati river basin	NEC
<b>Manina Baidya</b>	2 <sup>nd</sup>	Potential of wastewater reuse for water security in agriculture: A case of Harisiddhi wastewater treatment system	NEC
<b>Sanchita Kaduwal</b>	3 <sup>rd</sup>	Climate change and variability effects on livelihoods in the upper, middle and lower Bagmati river basin	NEC
<b>Sumana Parui</b>	3 <sup>rd</sup>	Assessment of appropriate community based adaptations (CBA) and ecosystem based adaptations to climate change impacts with a focus on sustainable livelihoods	NEC
<b>Kul Man BK</b>	3 <sup>rd</sup>	Role of governance, institutions, and social safety net programmes in strengthening resilience to shocks and stresses to livelihoods	NEC
<b>Neekita Joshi</b>	3 <sup>rd</sup>	Severity of climate induced drought and its impact on migration: An Assessment through mapping in Ramechhap district using GIS and remote sensing	
<b>Neha Basnet</b>	3 <sup>rd</sup>	Assessment of the viability of adaptation measures in response to the impact of climate change. (Study of Patlekhhet VDC)	NEC

# Annexure 6

## IDRC South Asia Water Studies Fellowship

### Review Workshop 'Climate Change and Food Security'

Hotel Plaza, Hyderabad May 29, 2015



In Association with



**SaciWATERS**

Sponsored by



## Summary

As part of the South Asia Water (SAWA) Fellowship, a review workshop was organised for the 1st batch of SAWA Fellows on 29 May 2015 on the broader theme of “Climate Change and Food Security”. The training programme was divided into three sessions pertaining to theme of climate change and food security, namely, social and policy approach, impact led assessment, and land use and land change. The training programme was financially supported by International Development Research Centre (IDRC), Canada.

The objective of the programme was to provide a platform to the 1st batch of the SAWA Fellows to present their research work among their peer and external reviewers. The purpose of the workshop was to provide feedback on the study done by the Fellows for further improvement to a publishable material. The training programme targeted the twenty recipients of the IDRC-SAWA Fellowships from four institutions in four South Asian countries: Bangladesh (Institute of Water and Flood Management - Bangladesh University of Engineering and Technology), India (Centre for Water Resources -Anna University), Nepal (Nepal Engineering College), and Sri Lanka (Post Graduate Institute of Agriculture –University of Peradeniya). Unfortunately four students could not join at the review workshop.

## Organizers

**SaciWATERS, the South Asia Consortium for Interdisciplinary Water Resources Studies**, is a policy research institute in Hyderabad, India and working on the issue of water resources education, capacity building, research and action in South Asia. It is committed to bringing about structural changes in the dominant water resources management paradigm in South Asia by focusing on transforming water resources knowledge systems through working with universities and academic institutions. The key ideas are in an interdisciplinary approach to undertaking water resources issues from a pro-poor, gendered, and human development perspective and emphasis on exchange, interaction, and collaboration at South Asia level.

SaciWATERS is active in three domains - Education, Research, and Advocacy. [www.saciwaters.org](http://www.saciwaters.org)

## Sponsors

**International Development Research Centre (IDRC)** is a Canadian Crown Corporation that initiates, encourages, and supports research in developing countries in order to help find practical and sustainable solutions to social, economic, and environmental problems that are being faced in these countries. <http://www.idrc.ca>

## Workshops Objectives, Participants' Profile, and Expected Outcomes

### Objectives

The main objective of this training programme was to bring together the 1st batch of SAWA Fellows from Bangladesh, Sri Lanka, Nepal, and India to present their Master's dissertation work among their peers and external reviewers. The external reviewers were assigned students based on their area of expertise. Each reviewer was to provide comments and suggestions to the fellows so as to enable them to develop a publishable material out of their research work.

### Participants' Profile

The participants for this review workshop were those who were selected as Fellows as part of the 1st batch of South Asia Water (SAWA) Fellowships, through a competitive process from each of the four partner institutes. All participants were pursuing postgraduate level courses in IWRM. Fellows were in the last phase of completion of their Master's dissertation work.

### Outcomes Expected

It is expected that the students will make use of the constructive feedback received from the reviewers and will further improve their study to be able to publish the same.



## Programme Details

### External Reviewers

- Prof. Chandan Mahanta – Professor, Indian Institute of Technology, Guwahati
- Dr. Priyane Amerasinghe - Head, International Water Management Institute, Hyderabad
- Prof. S. Janakarajan – Professor, Madras Institute of Development Studies, Chennai
- Prof. N.C. Narayanan – Professor, Indian Institute of Technology, Mumbai
- Dr. Vishal Narain – Associate Professor, Management Development Institute, Gurgaon

### Facilitators

- Dr. Anamika Barua - Executive Director, SaciWATERS, Hyderabad, India
- Ms. Jyoti Nair - Research Associate, SaciWATERS, Hyderabad, India.

The SAWA Fellows presented their Master's dissertation, with each student allotted 15 minutes for presentation with 10 minutes' discussion and comments from the reviewers. Each reviewer was assigned with a few papers based on their area of expertise prior to the workshop. Respective reviewers gave specific comments after the student's presentation. The agenda and list of topics with reviewers assigned is appended in the end of the document. The students took note of the comments specifically given to them and also benefitted from other students' presentations which dealt with similar topics. Dr. Anamika Barua summed up the workshop with a brief presentation on the requirements for publication.

SaciWATERS

# South Asian Water Fellowship

 IDRC | CRDI  
International Development Research Centre  
Centre de recherches pour le développement international

Canada

## Annexure 7

### IDRC -South Asia Water Fellowship

Review Workshop  
'Water Security'

23 May 2016



## Summary

A review workshop on “Water Security” was conceptualised under the aegis of “South Asia Water (SAWA) Fellowship” project and organized by SaciWATERs with support from IDRC and CapNet. The workshop was held on 23 May 2016 in Hyderabad. The purpose of the workshop was to give feedback on the research work done by the 2nd batch of SAWA Fellows with an idea that the suggestions and feedback received will help in developing their research findings into a publishable material. Since, the focus of the Fellowship is to bring in an interdisciplinary lens into research on climate change and water, the workshop apart from providing feedback, also intended to self-evaluate through students' abstracts in terms of “how far have we reached in terms of interdisciplinarity”?

Extended abstracts of each student were sent to the external reviewers well in advance and the reviewers presented their observations during the workshop. In addition, the reviewers also reflected on each students' abstract individually and the comments were shared with the students. The reviewers are themselves engineers by profession who eventually have learned, appreciated, and applied interdisciplinary approach to water issues. Apart from the reflections on students' research, there were sessions on “Interdisciplinary Approach to Water Resource Management” and “Problem to Proposal”. The workshop targeted 18 recipients of the IDRC-SAWA Fellowship from four institutions in four South Asian countries: Bangladesh (Institute of Water and Flood Management - Bangladesh University of Engineering and Technology), India (Centre for Water Resources - Anna University), Nepal (Nepal Engineering College), and Sri Lanka (Post Graduate Institute of Agriculture – University of Peradeniya).

## Organizers

**SaciWATERS, the South Asia Consortium for Interdisciplinary Water Resources Studies**, is a policy research institute in Hyderabad, India and working on the issue of water resources education, capacity building, research, and action in South Asia. It is committed to bringing about structural changes in the dominant water resources management paradigm in South Asia by focusing on transforming water resources knowledge systems through working with universities and academic institutions. The key ideas are in an interdisciplinary approach to undertaking water resources issues from a pro-poor, gendered, and human development perspective and emphasis on exchange, interaction, and collaboration at South Asia level. SaciWATERS is active in three domains - Education, Research, and Advocacy. ([www.saciwaters.org](http://www.saciwaters.org))

## Sponsors

**International Development Research Centre (IDRC)** is a Canadian Crown Corporation that initiates, encourages, and supports research in developing countries in order to help find practical and sustainable solutions to social, economic, and environmental problems that are being faced in these countries. (<http://www.idrc.ca>)

**Cap-Net UNDP** is an international network for capacity development in sustainable water management. It is made up of a partnership of autonomous international, and regional and national institutions and networks committed to capacity development in the water sector. Cap-Net UNDP was initiated at the UNDP Symposium on Water Capacity Development in 1996 and launched in 2002 by the United Nations Development Programme (UNDP) and the UNESCO-IHE Institute for Water Education with funding from the Dutch Government. Since then, Cap-Net UNDP has grown into a global hub for capacity development and networking in sustainable water management with additional funding from the Swedish and Norwegian Governments, and the European Union. The Cap-Net UNDP programme is a part of the Water and Ocean Governance Programme of UNDP, within the Sustainable Development Bureau for Policy and Programme Support. The programme is executed by United Nation's Office of Project Services (UNOPS), Water and Energy Cluster.

## Workshops Objectives, Participants' Profile, and Expected Outcomes

### Objectives

The main objective of this workshop was to provide feedback on whether and how the students have incorporated interdisciplinary lens in their research and also to help in filling the existing gaps in their research to further develop it into a publishable material.

### Participants' Profile

The participants for this review workshop were those who were selected as Fellows as part of the 2nd batch of the South Asia Water (SAWA) Fellowship, from each of the four partner institutes. All participants were pursuing postgraduate level courses in Integrated Water Resources Management (IWRM). Fellows were in the last phase of completion of their Master's dissertation work.

### Outcomes Expected

It is expected that the students will make use of the constructive feedback received from the reviewers and will further improve their study to be able to publish the same.

## Programme Details

### External Reviewers

- Prof. Dr. Peter Mollinga - Professor of Development Studies, School of Oriental and African Studies (SOAS), University of London
- Prof. Nimal Gunawardena - Professor, Department of Agricultural Engineering, University of Peradeniya, Sri Lanka

### Resource persons

- Dr. Anju Gaur - Water Resources Specialist, World Bank
- Mr. Sumit Vij - PhD Researcher at Public Administration and Policy Group, Wageningen University

### Facilitators

Dr. Anamika Barua - Executive Director, SaciWATERS, Hyderabad, India

Ms. Monica Priya - Research Associate, SaciWATERS, Hyderabad, India

## Content

### Recap of The Experiences from CB Project

Prof. Peter Mollinga was a key person behind conceptualizing the Crossing Boundaries project. At a later stage, Prof. Nimal became the project director during his engagement with SaciWATERS. Following are the highlights that emerged from this session:

- Water education in South Asia is engineering and hydrology focused and there is an absence of the social component. This was the thinking that went into conceptualizing the project.
- "Gender" has always been the most sensitive issue and the hardest challenges faced in the project.
- The project has been successful in creating a resource base of books and educational materials on IWRM.
- Recommendation to establish an alumni group consisting of Fellows from the CB and the SAWA project.

### Experience Sharing by The Co-ordinators:

The coordinators from the Partner Institutions (PI) gave an overview of how these programs have been firmly established over the years and how the Fellowship has brought a change in the way water resource management is looked at. Also they shared the research focus in each of the PIs.

#### Prof. B.V. Mudgal:

- The focus at CWR is examining the issues of water security, food security, and livelihood adaptations in the context of climate change and climate variability in the Vellar river basin.
- To address issues of climate change, a paradigm shift is needed from exploitative technologies to regenerative technologies. The only way to do this is through an integrated approach.

"I have gained a lot of exposure from these projects. I am a converted person, although a hard-core civil engineer by profession with hydraulics background."

- Prof B.V. Mudgal

#### Prof. Khem Raj Sharma:

- Students' research has been able to capture a wide number of issues relating to water quality, livelihood integration, ecosystem services, institutional and policy processes, water security, and management.
- One of the major achievements at NEC has been starting the IWRM programme, which is a unique programme in the country and is much appreciated.
- The institution has been able to disseminate the ideologies of IWRM to other academic institutions through workshops. One distinct achievement in this regard has been that these institutions have started courses relating to IWRM.

### Prof. Shahjahan Mondal:

- The SAWA Fellowship project has been instrumental in shaping the academic program at BUET.
- The Fellowship programme has helped in recruiting good students in terms of commitment, seriousness, and quality of work.

BUET is a technical university and when we go for interdisciplinary course curricula it is not easy to get it passed through the academic council. But there is a great sense that people are accepting this and it seems that interdisciplinary aspect is getting mainstreamed in the university.

### Dr. Dhammika Dayawansa:

- The research focus is in Deduru Oya area in Sri Lanka as there is an issue of water scarcity here during the dry season.
- The students' research also looks into the areas of water quality, soil erosion, and health and sanitation aspects.

### Reflection on SAWA Fellows' research by Prof. Nimal:

Extended abstracts of the students were sent to the external reviewers. Based on these abstracts, the reviewers made observations and comments. Prof. Nimal structured the presentation that gave a brief overview of each of the research projects and then the concluding remarks. He categorised the 18 projects into three categories based on their area of focus.

1. Impacts of climate variability (3 projects)
2. Assessment and the impact of climate variability using case studies (9 projects)
3. Projects trying to come up with certain interventions to cope with impending climate change (6 projects)

He observed that all these projects have two basic components. One component is relating to the technical aspects, which is understood as using different models in order to predict climate change. The other component is going the field, meeting the community and using various PRA tools, and then trying to incorporate the needs of the society and to match the climate change scenario. Following are his remarks:

### Remarks:

- All the projects have addressed relevant and current issues.
- All the projects have used field research methodology like questionnaire survey, FGDs, KPIs, transect walk etc. Although this is appreciated there is a gap of interdisciplinary focus.
- Gender aspects have been included in few of the projects.
- Use of technological aspect in the projects has been very well looked after.
- The most interesting aspect seen is combining technology and social science. Some of the techniques, indices, and frameworks that have been used by the students to integrate

technological aspects into social aspects are new. Staff and the students need to be appreciated on this.

This was followed by a short discussion with the students on the following question: **“Do you find it easy to link the technological information with the field findings and your experiences and challenges in the field?”**

Following were the responses from students

Lack of rapport-building due to lack of time. This therefore restricts the interaction to question and answer mode.

Lack of confidence-building with the community that is hindering the data collection.

The major challenge in Nepal has been the devastation caused by the earthquakes, which hindered in the fieldwork. Another issue has been finding the right person to interview, as people were dislocated.

As a final observation it was suggested that the students include all the problems and constraints encountered into their thesis so that the final outcome is also justifiable.

#### Reflection on SAWA Fellows' Research by Prof. Mollinga:

Professor Mollinga talked about the collection as a whole. He looked at it from a question of **“How far have you reached in terms of interdisciplinarity?”**

Following are some observations:

- The idea of participatory methods in data collection has really gone in, in the form of focused group discussions and interviews, even though it is a part of a technical study. This is a very positive development.

The scope of data collection has definitely improved as compared to conventional engineering programs

Interdisciplinarity ≠ using participatory methods

- There is a tendency in the papers somewhere that we are interdisciplinary because we are using participatory methods.
- Doing this kind of fieldwork brings out a lot of issues of rapport-building with your research population, your positionality, the local politics, the complexity, and contested nature of local issues and impacts. These kind of issues have to be written in the methodology section because there will be a lot of learning from this in the future.
- The nature of technical sciences and natural sciences on one side, and the social sciences on the other is different. It is a forced dichotomy. The type of research that is very strong in the papers is fieldwork and data collection with very little analysis being done.
- Anthropology, sociology, and certain kinds of economics are not about data, as such. It is about investigating and documenting relations, causalities, processes etc.

Interdisciplinarity is about how do you combine the data collection part of your research with this slightly different way of thinking on the social relations side.



- On the social sciences side there is very little theoretical grounding that will help you think in an interdisciplinary way, while there is sufficient literature review on the technical aspect.

## What is Interdisciplinary?

### Interdisciplinary is About Wicked Problems.

- They are analytically wicked, that is, they are complex.
  - They are multi causal, multidimensional, and are not simple or linear.
  - To defend interdisciplinarity as a front line of academic pursuit, use the word complexity. Complexity in this sense means multiple causes working together at the same time and influencing each other.
- The second element of the wickedness is kind of political wickedness, for that there is no one best solution.

**One way to operationalise these two forms of wickedness is by the notion of problem shed. A problem shed is like a conceptual construct in which you model what exactly your research question is.**

The concluding observations made was regarding the capacity of the kind of interdisciplinary conceptual modelling of the research question, and whether the Fellows felt sufficiently prepared for that. Based on the above mentioned concepts, the papers were classified as interdisciplinary, poor disciplinary, and something in between these two. This was followed by a group discussion wherein the each country group was asked to discuss two questions and then come up with a few key points.

1. What could have been done or what should have been done to prepare you for this type of interdisciplinary integrated research?
2. What demands or suggestions do you have for your teachers and the institutes while you study to be able to do it more successfully/ efficiently?

### Discussion Highlights:

- A research time frame to be designed and followed
- Developing rapport and establishing contacts in the field much before the start of actual fieldwork.
- Reviewers of our work in the university from both sociology and natural sciences background
- There is a need to strengthen the conceptual learning
- More supporting literature on interdisciplinary research
- More time is needed in deciding the research problem
- Reading materials available are more technical in literature. Insufficient reading material on interdisciplinarity to make a sound basis.

- Bring in more interdisciplinary faculty
- Group research in the first semester

### **Interdisciplinary approach to Water Resources Management: Dr. Anju Gaur**

Dr. Gaur laid emphasis on the need of interdisciplinary water professionals in today's world in organisations like the World Bank and in various other government departments. Professionals with such skills are important to make projects functional. In this regard, she quoted an example of a minor irrigation project funded by the World Bank and implemented by the Government. Dr. Gaur mentioned how the presence of only engineers and absence of social scientists in such projects relating to technology, social welfare, and environment can hamper the implementation and the functioning of the project.

### **Problem to Proposal: Mr. Sumit Vij**

The session gave a brief introduction to the main components of a proposal. Following were the highlights of the session.

- Writing proposal is both about science and art. It is the art of writing and science of what you are doing.
- Interdisciplinary thinking and writing should start from the moment you start thinking about the proposal.
- The two important components of a proposal are its scientific and societal relevance.

# Annexure 8

## List of Publications by Young Water Professionals

- **Subramanyam, N.,** MacAlister, C. (2016). "Governance of flooding risks in informal settlements in satellite cities in the Mumbai region", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 3 (2016), pp 12-27.
- **Shrestha, A.,** Sada, R. (2016). "Urbanization, climate change, and water (in)security in peri-urban areas of post-earthquake Kathmandu valley", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 3 (2016), pp 28-41.
- **Singh, A.** (2016). "Knowledge incompatibilities and decline of common property resources: a case study of rainwater harvesting system in urban Bikaner ", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 3 (2016), pp 75-84.
- **Patni, S., Bada, K.** (2016). "The Waterscapes of governance", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 3 (2016), pp 109-113.
- **Fernandes, D.** (2016). "New slow city-living simply in the world", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 3 (2016), pp 114-116.
- **Singh, A.K.** (2016). "Neoliberalism and water: complicating the story of reforms in Maharashtra", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 3 (2016), pp 120-121.
- **Kibria, M. G., Saha, D., Kabir, T., Naher, T., Maliha, S.** and Mondal, M. S. (2015). "Achieving Food Security in Storm-surge Prone Coastal Polders of South-west Bangladesh", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 1 (2015), pp 26-43.
- **Hanasaz, P.** (2015). "Water into whine: Why deliberative governance of South Asia's rivers is little more than a talk shop", *South Asian Water Studies (SAWAS) Journal*, Volume 5, Issue 1 (2015), pp 59-61.
- Rahman, M., **Mridha, U.K.,** Hassan, N. (2014). "Evaluation of urban-Wastewater quality for irrigation: A case study of Khulna City, Bangladesh", *South Asian Water Studies (SAWAS) Journal*, Volume 4, Issue 2 (2014), pp 01-20.

# Annexure 9

## List of Articles in The Sawas Journal

### 1. Urbanisation and peri-urbanisation: Challenges for water governance in South Asia (Special issue):

#### Critical Review

- Understanding and governing the peri-urban: Some critical reflections by **Dik Roth**
- Down the drain: The tragedy of the disappearing urban commons of Bengaluru by **Hita Unnikrishnan, Seema Mundoli, B. Manjunatha, Harini Nagendra**

#### Original Articles

- Governance of flooding risks in informal settlements in satellite cities in the Mumbai region by **Nidhi Subramanyam, Charlotte MacAlister**
- Urbanisation, climate change, and water (in)security in peri-urban areas of post-earthquake Kathmandu valley by **Anushiya Shrestha, Rajesh Sada**
- Urban political ecology of water in Darjeeling, India by **Gopa Samanta, Kaberi Koner**
- Rural to urban groundwater market: Demand management option vs. environmental sustainability by **Prakash Nelliya**
- Knowledge incompatibilities and decline of common property resources: A case study of rainwater harvesting systems in urban Bikaner by **Anushree Singh**
- Applicability of decentralized, small-scale vs. centralized, large-scale sewage treatment plants for urban sanitation: A case study from Sri Lanka by **S. Thrikawala, M. I. Sudasinghe, L.W. Galagedara, E.R.N. Gunawardena, N.C. Narayanan**

#### Commentary

- Recognizing sustainability frontiers in the peri-urban by **Fiona Marshall**
- Institutional approaches to peri-urban research: Added value and conceptual approach by **Sharlene L. Gomes, Leon M. Hermans**
- The waterscapes of governance by **Sahil Patni, Kala Bada**

#### Book Reviews

- New slow city-living simply in the world's fastest city by **Denise Fernandes**
- Conflicts over natural resources in the global south: Conceptual approaches by **Nihar Gokhale**
- Neoliberalism and water: Complicating the story of reforms in Maharashtra by **Aditya Kumar**

Singh

## 2. In Memoriam of Ramaswamy R. Iyer

- Standing at the feet of a tall man by **Kuntala Lahiri-Dutt**
- A Tribute by **S. Janakrajan**
- An exemplary public intellectual by **Dipak Gyawali**
- Remembering Ramaswamy Iyer by **Depinder Kapur**
- Rivers have just lost a great voice of theirs
- My times and trysts with India's water wisdom by **Ranjan K Panda**
- Centre vs states by **Nitya Jacob**
- A dissenting voice in the water sector by **K. J. Joy**
- At the threshold between living and dying: Book review of Living Rivers, Dying Rivers by **Safa Fanaian**
- Selected Works of Mr. Ramaswamy R Iyer

## 3. Volume 5, Issue 1

- Exploring the socioeconomic impacts of micro-irrigation system (MIS): a case study of public tube wells in Gujarat, western India by **P.K. Viswanathan & Chandrasekhar Bahinipati**
- Achieving food security in storm surge-prone coastal polders of southwest Bangladesh by **Md. Gulam Kibria, Debanjali Saha, Tamanna Kabir, Taznin Naher, Sultana Maliha, M. Shahjahan Mondal**
- The late embrace of urban water-service privatisation in India: A political economy explanation by **Gregory Pierce**
- Water into whine: Why deliberative governance of South Asia's rivers is little more than a talk shop by **Paula Hanasz**
- Diverting the flow: Gender equity and water in South Asia. Margreet Zwarteveen, Sara Ahmed, Suman Rimal Gautam, editors. Zubaan 2012. 623 pp. by **Vishal Narain**

## 4. Volume 4, Issue 2

- Trajectory of urban river degradation: People's initiatives for conservation and restoration (A case of Hanumante River in Bhaktapur, Nepal) by **Rajesh Sada**
- Collating field experiences to inform structured approaches for gender and equity in WASH in India by **Sunetra Lala, Aidan Cronin, Malika Basu, Jyotsna**
- Maximizing the benefits of learning and knowledge management to tackle the sanitation

challenge in India by **Carmen Da Silva, Sunetra Lala, V Kurian Baby, Joep Verhagen**

- Evaluation of urban-wastewater quality for irrigation: A case study of Khulna City by **Masudur Rahman, Uzzal Kumar Mridha and Nazia Hassan**

## **5. Integrated Perspectives on Water Management in South Asia**

- Interdisciplinarity in water research, education, and activism in South Asia: Some reflections and the way forward by **Priya Sangameswaram, Vishal Narain and K. J. Joy**
- Organizing water education regionally: The innovations, experiences, and challenges of three southern water networks by **Edwin Rap, Anjal Prakash and Margreet Zwarteveen**
- Situational analysis of women water professionals in South Asia by **Seema Kulkarni**
- 'The Times of Hope and Despair': Gender at the crossroads of water and sanitation in Bangladesh by **Fouzia Mannan**

# Annexure 10

## Employment Details of Sawa Fellows 2013-2015 Batch

NAME OF THE STUDENT	TYPE OF ORGANISATION			
	Government Organization	Academic institution	National/ international NGO and others	Higher study
Md. Gulam Kibria	Bangladesh Water Development Board (BWDB)			
Debanjali Saha		IWFM, BUET		
Sultana Maliha				Institute of Modern Language, Dhaka University
Taznin Naher	Department of Agricultural Extension			
Tamanna Kabir		Stamford University, Civil Engineering Dept., Bangladesh		
Durga Adhikari			SILT Consultant	
Pratikshya Neupane	Department of Irrigation			
Rajendra Shrestha			Environment and Public Health Organization	
Sangita Dandekhya			ICIMOD, Inter-governmental Organization	
Perera, Chathurika Sewwandi				PhD at Macquerie University
Sellathurai, Thusyanthi		University College of Jaffna, Sri Lanka		
Chandrasiri, Sumudu Prasanthi			Plan International	

NAME OF THE STUDENT	TYPE OF ORGANISATION			
	Government Organization	Academic institution	National/ international NGO and others	Higher study
Ellakiya Priyaa A			Civil Services Examination	
Vidhya A		SRM, Easwari Engineering College, Affiliated to Anna University		
Monisha S	Institute of Water Studies, Water Resources Dept.			
Malar Mathi Divinya		Sriguru Institute Of Technology, Affiliated to Anna University		
Shristi Pradhan			Consultancy	

**Note:**

The following students have not taken up jobs as on September 2016:

1. Diyawadana, D.M.N.
2. Pelpitiya Kaushalya
3. Anitha P



## Employment Details of Sawa Fellows 2014-2016 Batch

NAME OF THE STUDENT	TYPE OF ORGANISATION				Higher study
	Government Organization	Academic institution	National/ international NGO and others		
Samjul	Bangladesh Agricultural Development Corporation				
U.M.H.R.D. Rathnayake	Natural Resources Management Centre of the Department of Agriculture				
Nishanka Jayasiri		Rajarata University of Sri Lanka			PhD at Saithama University, Japan
G.M.P. Kumara					
Manina Vaidya	Department of Water Supply and Sewerage				
Bandana Shrestha	Nepal Electricity Authority				
E. Arivoli		Assistant Professor (Civil), Valliammai Engineering College, Chennai			
G Durga Devi		Assistant Professor (Civil), Sri Vidya College of Engineering, Sivakasi			

NAME OF THE STUDENT	TYPE OF ORGANISATION			
	Government Organization	Academic institution	National/ international NGO and others	Higher study
U Sivaranjani			Assistant Project Co-ordinator, Watershed Development Trust, Hyderabad	
R. Priyadarshini				UPSC Exam Preparation

**Note:**

The following students are focusing on their thesis as their programme ends in October (BUET):

1. Aniqua Suahala
2. Sumayyah Tehsin

The following students are focusing on their thesis (NEC):

1. Shyam P Pant
2. Jyoti Dahal
3. Archana Chaudhary

The following students are in search of jobs as of 7 June 2016 (PGIA):

1. Mayuri Kirinde
2. N.G.R. Saumyarathne

The following student is waiting for job confirmation as she is on waitlist:

1. M Hemalatha, as Management Trainee at Food Corporation of India. She has also currently passed UPSC examination, the highest level of qualification in India to get into the Indian Administrative and Police Services. She is awaiting an interview.





The South Asia Consortium for Interdisciplinary Water Resources Studies, is committed to bringing about structural changes in the dominant water resources management paradigm in South Asia. Within that, SaciWATERS focuses on transforming water resources knowledge systems. Key ideas are an interdisciplinary approach to understanding water resources issues, from a pro-poor, human development perspective, with an emphasis on exchange, interaction and collaboration at South Asia level. For more details visit the website [www.saciwaters.org](http://www.saciwaters.org)