SaciWATERs

South Asian Water Fellowship

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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 being to generate 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, 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 'inter-disciplinary water professionals' in South Asia, trained to deal with issue of climate change, water and food insecurity and adaption by awarding IDRC SAWA Fellowships;
2. To generate action-oriented research theses via MScs and M.Phils in IWRM in four institutions in South Asia, which will closely study the impact of climate change, adaptation, food insecurity and resilience and help tackle these issues through the 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 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 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 in future in water sector jobs through the SAWA fellows' professional engagements.
4. Building capacity of specifically women water professionals, using an integrated and interdisciplinary approach, 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 that were used to evaluate the project are:

1. Selection of eligible students with motivation to work in interdisciplinary areas
2. Criteria to evaluate thesis on the basis of mainstreaming climate change, incorporating interdisciplinary lens, bringing in gender focus and effective application of interdisciplinary research methods
3. Academic performance of SAWA fellows in IWRM courses
4. Timeliness for submission of 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, which are 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 thesis focusing on the impacts of climate change, adaptation, food insecurity and resilience with gender as the crosscutting theme in a few of them.

Synthesis of research results under three broad themes 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 and food security was found to be linked strongly to flood and drought situations. Research also indicated that in addition to climate variability, food insecurity is also related to socio-economic factors, such as land use and availability of financial capital for farmers for crop production. The impact of climate variability was found to be high on small and marginal farmers as compared to the large farmers. It was further identified that although certain policies and programs are attempting to address the issues of climate change, but these 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 like 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 impact, to a large extent. It was also found that tank rehabilitation and functional Water User Associations (WUA's) in a large way have a positive impact on ensuring water security. Hence, in addition to 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 impact on water security. On the one hand while heavy extraction of water, water transfers and change in land use are causing water (in) security, on the other hand urban local bodies along with the community are taking measures to conserve the water bodies, in the case of Nepal.

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 for the batch of 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 four 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 strengths 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:

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, 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 point 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).

b. ***Highlighting the need for inter-disciplinary 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 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 were cross learnings across the different batches of SAWA fellows, when seen in totality. 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 that are associated when women 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 waste water irrigation is viewed by men and women and that the latter have 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 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 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.

1. Though gender was handled in a few of the studies, it could have meaningfully been a crosscutting theme in many of the studies, where it was not touched upon.
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 in addition 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.

In addition to the above, the project has built the capacity of students especially women, in using an integrated and interdisciplinary approach, by strengthening the ability to link technical, social and economic issues relating to water. The following story illustrates the research capacity built and the way she has been incorporating the approaches in her job:

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 organization initially had taken up works at the local, and now they have expanded their works to the 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 hence, providing global exposure is a testimony from a Master's grantee from PGIA given below:

"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 broader 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 though 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 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

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

Some of the key lessons learnt from the project are that it has benefited women researchers by providing assistance to pursue higher studies and continue their research, and the workshops in addition to providing training have facilitated in opening new avenues for South Asia collaboration. Further, it has been learnt that, to ensure a greater degree of interdisciplinary element in the student's research there is a need for involvement of experts from social sciences. While the project has definitely created a knowledge base on climate change and water, it would remain underutilized unless there is a creation of resource base consolidating the research work of the three batches.

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 project has been implemented. Sections three describes the methodology adopted to achieve the objective, 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.

1. Project Background and Description

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 urbanization have intensified environmental disasters in the recent past. Poor land and water resource allocation, over-utilization 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, 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 'inter-disciplinary water professionals' in South Asia, trained to deal with issue of climate change, water and food insecurity and adaption by awarding IDRC SAWA Fellowships;
2. To generate action-oriented research theses via MScs and M.Phils in IWRM in four institutions in South Asia, which will closely study the impact of climate change, adaptation, food insecurity and resilience and help tackle these issues through the 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 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 multi-disciplinary approaches sensitive to women, the poor, the environment and sustainability in South Asia through awarding of fellowships. The project aimed to create a paradigm shift in understanding the inter-linkages among the issues of agriculture, water and food security and adaptation to climate change by enabling integrated and gender sensitive water resource management through a regional, collaborative, partnership-based capacity building programme for water professionals.

The project awarded fellowships to Masters and MPhil 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 the 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.

2. Project Implementation

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 to the project.

Following chart depicts the fund flow to different institutions.

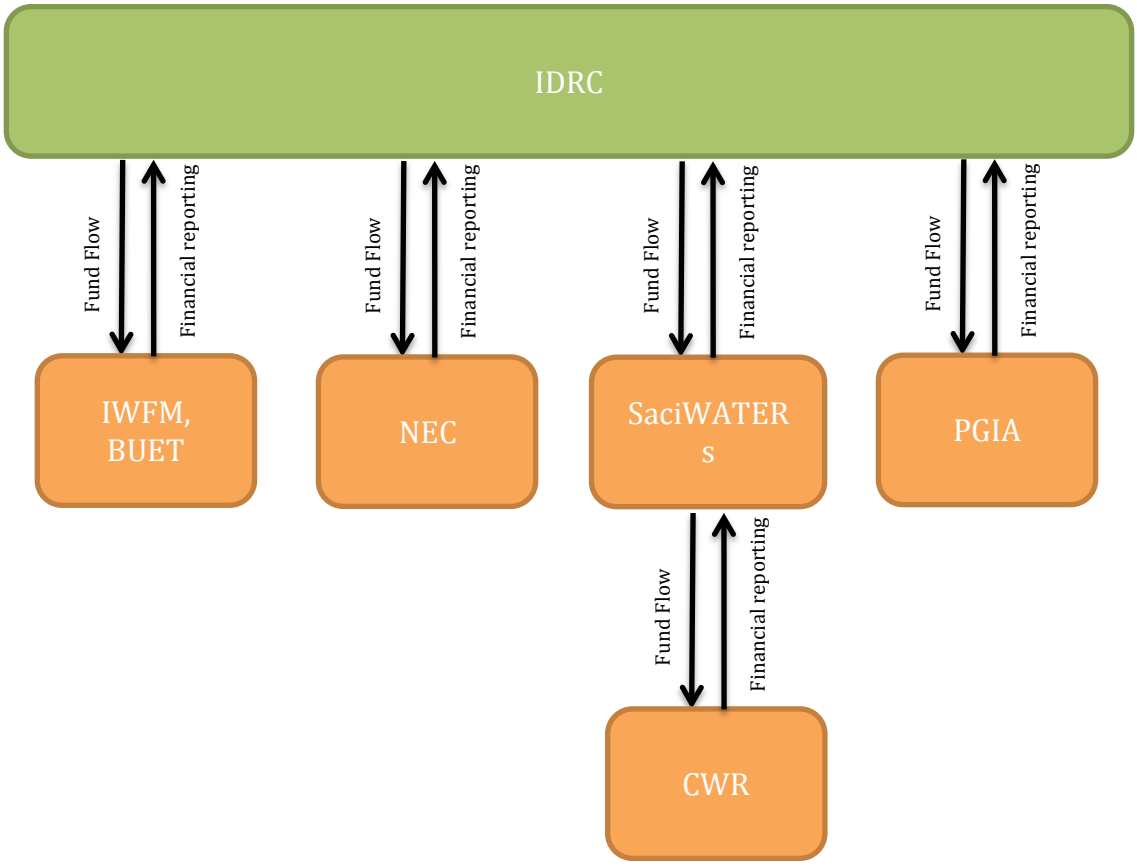


Figure 1: Fund Flow and Financial Reporting

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 the project implementation and management.

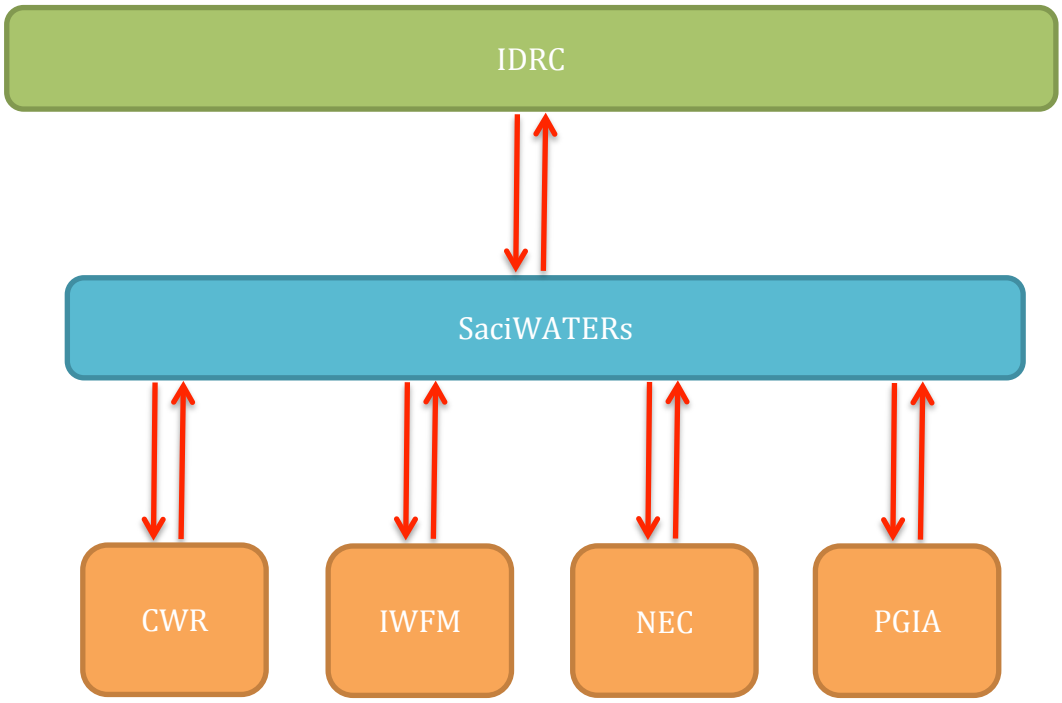


Figure 2: Project Implementation and Management

SaciWATERs was the central organization in planning of various project activities such as regional workshops after 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. 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 following were the key indicators that have been developed:

1. Selection of eligible students with motivation to work in interdisciplinary areas
2. Criteria to evaluate thesis on the basis of mainstreaming climate change, incorporating interdisciplinary lens, bringing in gender focus and effective application of interdisciplinary research methods
3. Academic performance of SAWA fellows in IWRM courses
4. Timeliness for submission of 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

3. Project Methodology

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 of selection of potential awardees:

The criteria for selecting the candidates to award the fellowship 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 in the selection process. The project sought to redeem the gender balance in water related research, jobs and policy in the South Asian region, hence 80% of the total fellowships were awarded to women. The Table 1 below 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 IWRM course were allowed to apply for the Fellowships, except in BUET where students were shortlisted based on the marks secured in the Entrance Examination. The weightage assigned to the other criteria are mentioned in the Table 1. Through the interview communication skills, leadership qualities, interest to work further 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 for awarding 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 of 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	• Water, Gender and Society • Socio-economic analysis • Interdisciplinary field research methodology in water management • Integrated water resources management
CWR	• Integrated water resources management • Gender and water • Participatory field research methodology • Legal aspects of water resources • Climate change and water resources

	• Environmental Impact Assessment for water resources • Integrated river basin management • Watershed conservation and management
NEC	• Society and water • Gender, Water and Social Inclusion • Legal and policy Dimensions of Water Management • Conflicts in water management • Integrated water resources management • Field Research methodology • Climate change, livelihood and adaptation
PGIA	• Gender in IWRM • Water and Society • River basin planning and management • Interdisciplinary field research methodology

- 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 firstly acquaint the fellows with the relevant concepts of social science and secondly, to build the capacity of the SAWA fellows towards methods to be used in interdisciplinary research. Accordingly, these workshops included lectures on IWRM in South Asia, gender and water as well as sessions on qualitative and quantitative research methods, much of it in an interactive mode.

These workshops were held at the end of the 1st semester to ensure that the students attending it 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 to apply the research methods learnt during the regional workshop.

- Field work 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 as well as during the regional training. It also ensured that the research findings were not just restricted to analysis based on secondary data but a mixed method approach was adopted that used both quantitative and qualitative methods thus making it 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 theses 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), 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, as this region has the highest incidence of poverty in the country, and is most vulnerable to climate change. In India, the students of CWR are 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 is focusing its research on livelihood security in the context of changing water use and climate

variability in the Bagmati River Basin, with some emphasis on urban areas along with rural. In Sri Lanka, PGIA is working on the Mahaweli river basin, the main river in Sri Lanka. With rapid urbanization 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 aim, 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. These visits also used to have a one-on-one discussion between the project coordinator and the awardees on challenges faced by them in conducting their research.

- Review Workshop

Review Workshops are held for each batch of SAWA fellows at the end of two years. The purpose of these workshops is to give feedback on the research work done by the students 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 interdisciplinary lens into the research on climate change and water, the workshop, apart from providing feedback also intends to self-evaluate through students' abstracts in terms of '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 the 4 universities are teamed to share their experiences from their respective countries and learn from each other. This included the field practicum wherein the groups were divided in a manner that each group had a representation from every institution and they were asked to prepare a research proposal based on their knowledge gained from the previous sessions and identify the methods based on the previous sessions as well as from their experiences. Also, the discussions 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 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 Table 2. In addition the regional workshops provided an exposure to the climate issues at the South Asia level through various sessions that 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. 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.

4. Progress towards Milestones

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 MPhil 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			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
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 1 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 third batch.

As per the university rules at PGIA, students are allowed to submit their thesis within 5 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 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 submitted their thesis timely 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, but 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 handholding support and to ensure a greater degree of interdisciplinary element in the student's 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:
    - Overview of Water Resources Management in Bangladesh, India, Nepal and Sri Lanka
    - Understanding Gender- Theoretical and conceptual frameworks
    - Doing Gender- Methodological guidelines
    - Research paradigms and design
    - Foundations of research and designing research
    - Qualitative Research: Methods and tools
    - Qualitative and Quantitative data analysis
    - Questionnaire development and administration

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

  Three regional workshops were held for three batches of students, 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 October 3rd to October 8th 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 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 about 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 NaubisePhant 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 informants. Following are the different themes undertaken by the groups for study:

- Gender roles in the study area and their relation to water accessibility
- Examining the water distribution inefficiency in the NaubisePhant irrigation system
- To study the impact of NaubisePhant irrigation system on Agricultural productivity
- To examine the impact of the irrigation system on livelihoods of the beneficiaries.

Detailed report of the workshop is presented in Annexure 2.

Picture 1: Regional Training Workshop in Nepal

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

The workshop was held in Dhaka, Bangladesh from December 18th to 22nd 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-Narshinghdi irrigation project in the peri-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:

- Equity In Agricultural Benefit Sharing In The Area Of N-N Irrigation Project
- Assessment of Industrial impact on agricultural and Fisheries livelihood in the Narayanganj- Narshingdi Irrigation Project
- Farmers' Participation In Narayanaganj-Narshingdi Irrigation Project
- Identifying the role of human interventions affecting the condition of embankment

Detailed report of the workshop is presented in Annexure 3 below.

Picture 2: Regional Training Workshop *in* Dhaka

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

The training program for the third batch of students was held in Kandy, Sri Lanka from 28th November to 3rd December 2015. The third workshop was different from the first two in a way that it focused on understanding and doing gender; and on research paradigms. As a part of the training, the students visited a farm organization. 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 organizations. The field visit was to Damulla farmer's organisation, where the students worked on the following topics:

- Assessment of the performance of Farmer Organization 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

Detailed report of the workshop is presented in Annexure 4.

Picture 3: Regional Training Workshop in Sri Lanka

- These training programs intended to provide training at an advanced level. Hence, they were scheduled at the end of 1st semester since by that time the students were already acquainted with the basics of IWRM, 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 know how's at the time of training. In addition 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.

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 upon climate change. Out of the 22 theses that are yet to be submitted, the focus of 10 of them is on climate change. The remaining theses have also tried to study the impacts of climate variability but it has

not been the focal point of their research. The list of theses topics are presented in Annexure 5.

- Two theses out of 37 and three out of 22 theses have mainstreamed gender in the research while few others have adopted a gendered lens but with a limited understanding. Overall there is a lack of gender lens in student's 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.

Research approach

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

Review Workshop

- Two review workshops were organized for the first and second batches. The first workshop was held on May 29 2015 in Hyderabad. It was centered on 'Climate change and food security'. The second workshop was held on May 23 2016 in Hyderabad that focused on the theme 'Water Security'. A detailed report of these workshops is presented in Annexure 6 and Annexure 7.

Picture 4: Review Workshop for 2013-2015 Batch

Picture 5: Reviewers and Coordinators at the Second Review Workshop

- During the first workshop students made presentations of their work and the reviewers were assigned 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 to acquaint the students with the science and art of proposal writing before they engage with research/academic/government organizations 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 a long academic and research experience, with expertise in development studies, climate change and adaptation, water management, public policy processes, urban and peri-urban ecosystems and ecosystem services, and qualitative research.

Picture 6: Experts Invited for the Review Workshop

Picture 1: Dr. S. Janakrajan, 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

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.

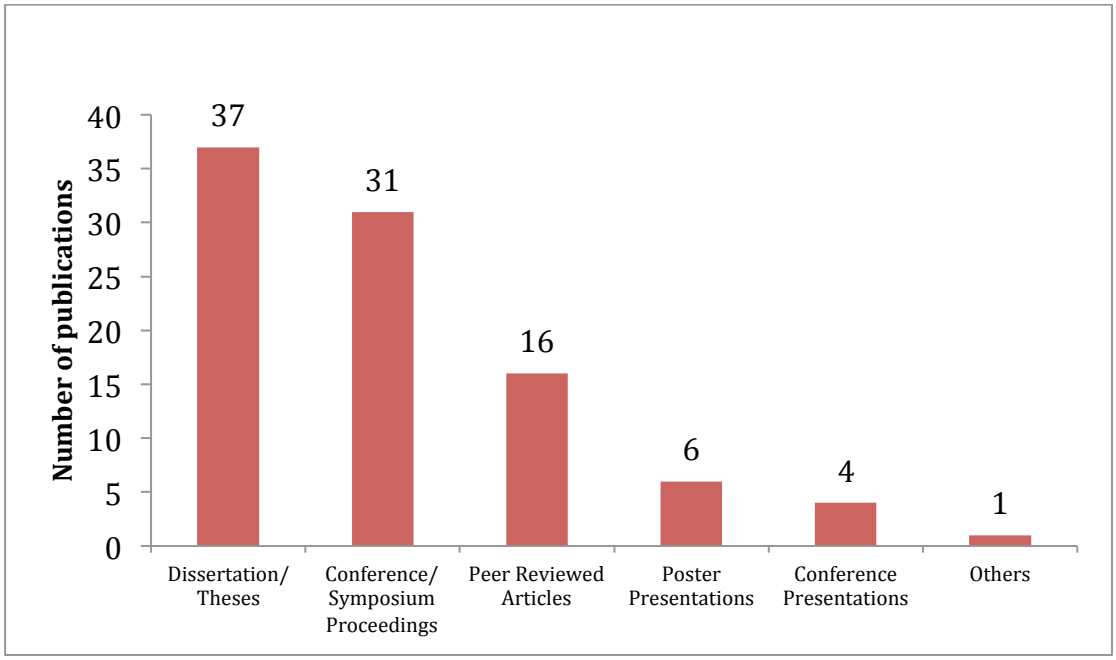


Figure 3: Summary of research publications

Few students have published in International Journals such as 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, International Research Symposium on Engineering Advancements etc. They presented on various topics like local adaptation practices to cyclones, impact of climate change on agro-ecosystems, development of livelihood security index, assessment of agricultural water security etc. 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 wider audience through number of international conferences. One of such conferences has been 'Peri-urban water conflicts: Perspectives and Issue of Water justice in South Asia' organized by SaciWATERs along with the Review workshop for the second batch SAWA fellows. Apart from building their capacity in investigating issues of water justice in the context of peri-urban South Asia, it also allowed for interaction with professionals/ researchers/ academicians from south Asia coming from NGOs, academic institutions, universities, think tanks, and regional research & implementation agencies.

Knowledge sharing via Regional Training and Review workshop

- Sessions on Situation Problem Query Response (SPQR)/research proposal, Participatory Rural Appraisal (PRA) tools, understanding and doing gender were 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.
- In addition every workshop had a panel on 'Overview of IWRM' with four coordinators from the PIs being 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 South Asian countries.
- The presentations made by students during the review workshop were seen as a useful tool for knowledge sharing learning from each other's work.

4.4 Objective 4

- The SAWA fellows were trained in interdisciplinary and climate change concepts through various subjects such as Interdisciplinary field research methodology, climate change and water resources and climate change, adaptation and livelihoods that have been offered in the universities. Although they have received training, the application of these concepts is limited to the course.
- A limited number of theses have showed 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 of. The next phase proposes to incorporate greater involvement of gender experts in teaching the courses and a 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. List of these publications is presented in Annexure 8.
- The contributions made by SAWA fellows in the journal have been very few. Therefore in order to encourage young water professionals specially the SAWA fellows to publish in the journal, a special issue has been planned for the first quarter of 2017 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:
    - Water Justice, Gender and Disability. Volume 5 Issue 4. Guest Editor: Dr. Floriane Clement, Ms. Sylvie Cordier, Dr. Alan Nicol.
    - Urbanization and periurbanization: Challenges for water Governance in south Asia. Volume 5, Issue 3. Guest Editor: Dr. Vishal Narain
    - Special issue on 'Ramaswamy R. Iyer'. Volume 5, Issue 2.

5. Synthesis of Research Results and Development Outcomes

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

Synthesis for objective 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	• Aid in designing and conducting research
	Course Curriculum	• Competencies in Qualitative and Quantitative data analysis • Competencies in data collection methods, tools and techniques • Competency in scientific publishing • Competency in adopting an interdisciplinary approach • Competency in oral communication and presentation
Networking and Collaboration		• Establishing of new linkages and collaboration • Collaboration in activities on proposal writing, research dissemination activities, undertaking research projects, Community outreach activities
Employment		• Expectations of employment opportunity from the course and Fellowship • Aspiration on completion of the

	degree

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.

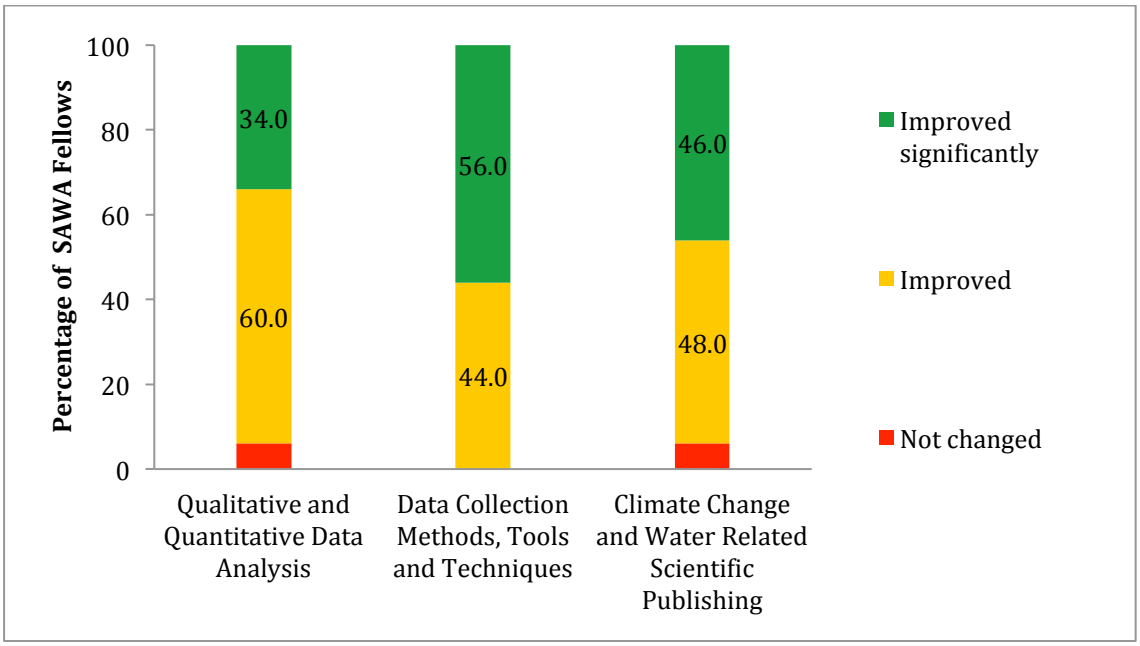


Figure 4: Competencies in research skills before and after joining the IWRM program

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.

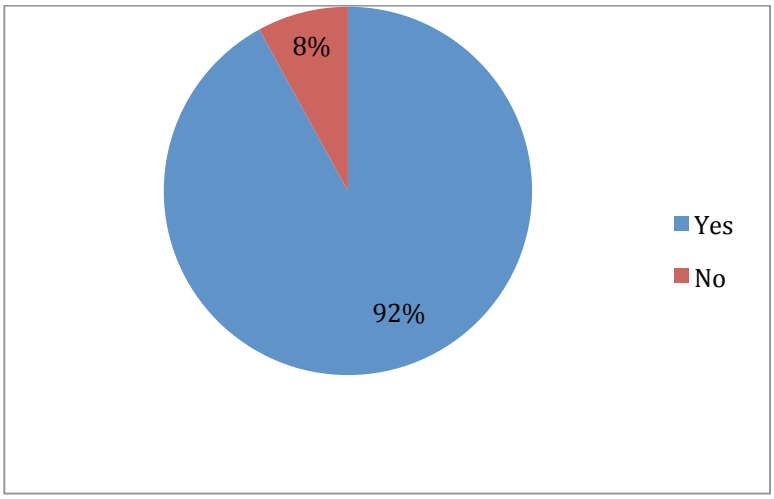


Figure 5: Meeting Grantee's expectations/objectives

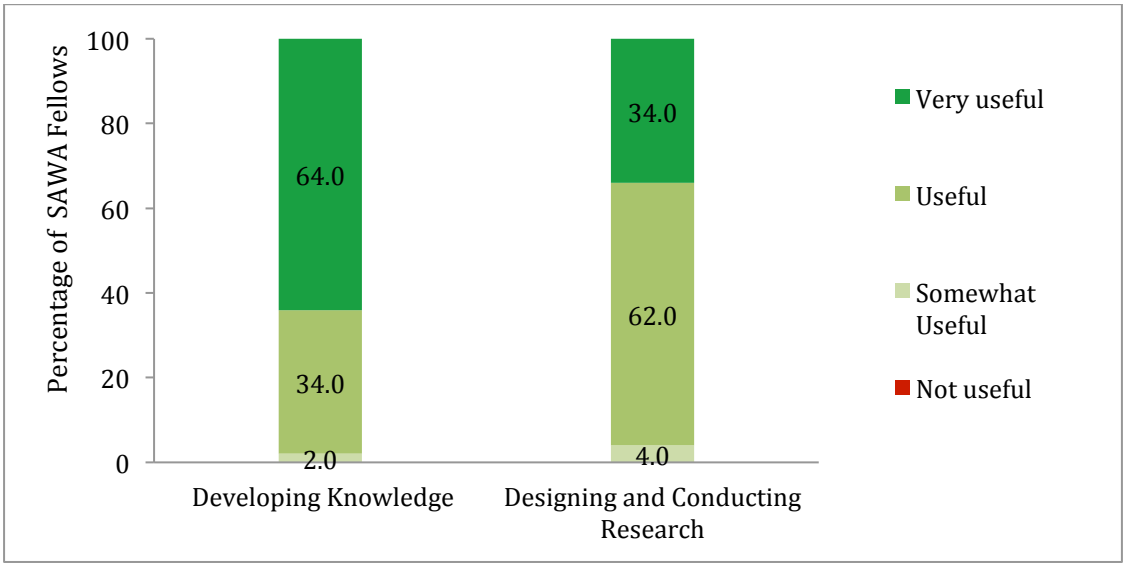


Figure 6: Usefulness of Regional Training Workshop

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**

"In the regional training of South Asian Water (SAWA) Fellows on "Interdisciplinary Research Concepts & Methodologies" held in Kandy, Sri Lanka we had 7 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 multi-cultural knowledge and friendship sharing was the most amazing involvement we have had from the training."

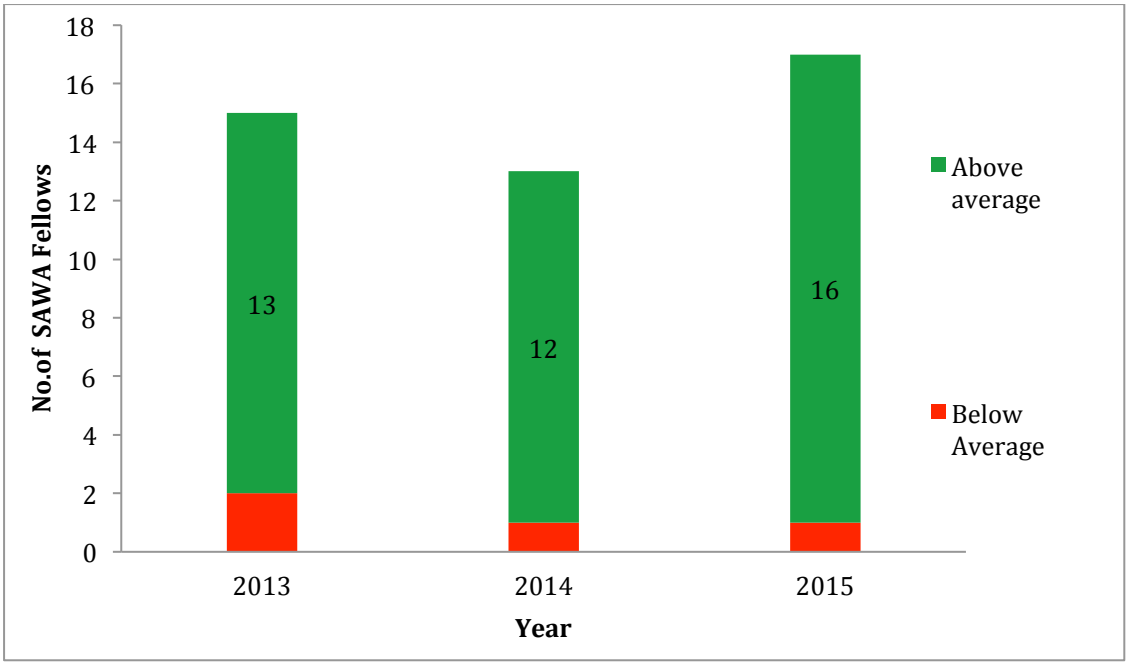
-Md Sadiul Alam Chyon, BUET

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 MSc IWRM.



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

Figure 7: Academic performance of SAWA fellows

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 society 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 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.

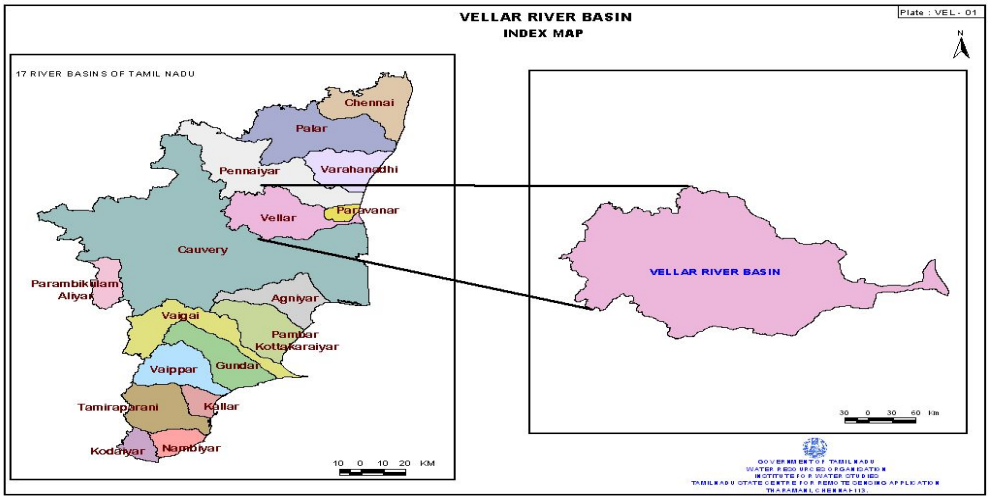
The batch-wise details of the four PIs are given below:

Batch 1

Theme: Food Security and Climate Variability

- **Centre for Water Resources (CWR), Anna University**

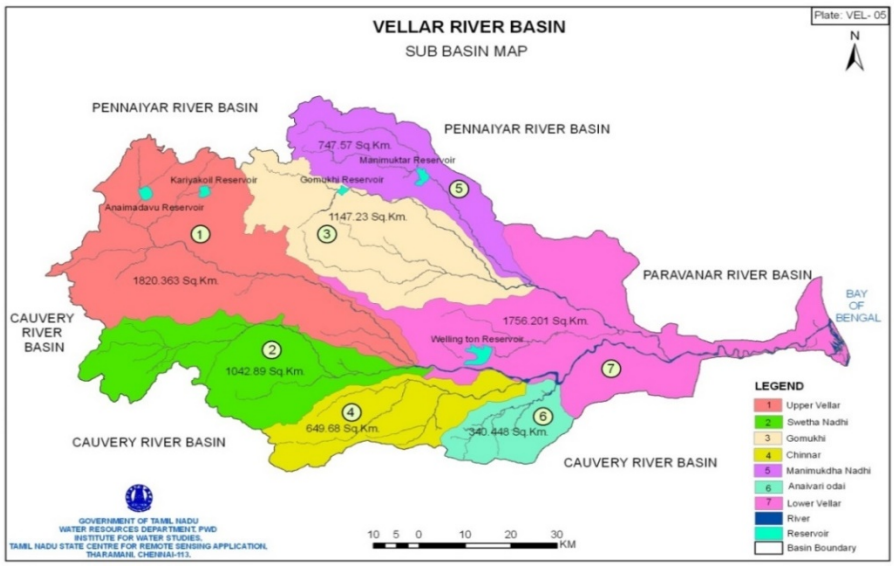
The selected study area was Vellar basin which is located in the Northern part of Tamil Nadu in India, between latitude 11°13' N to 12°00' N and longitude 78°13' E to 79°47' E. The total length of the Vellar River is about 150 km. The total area of the basin is 7,520.87 sq. km. This basin is surrounded by Pennaiyar, Paravanar 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.



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

Figure 8: Location Map of the Study Basin in India

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



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

Figure 9: Sub-basin map of Vellar River Basin

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 chosen objectives. Cropping pattern and crop diversification due to climate variability impacts were found in the Vashistanadhi sub-basin. Additionallly, 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 analyse food security in accordance with agro ecosystems, by comparing irrigated and dry systems, by 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 in the food security of the study area was considered important and 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 Water Users' Associations. 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 in order 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. 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 analyse 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, by and large are 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 coping capabilities of the farmers 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 Veliar, 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 IAMWARM programme had well progressed in terms of economic growth. The villagers get assistance through programmes like animal husbandry programme, training on the technical adoption such as systems 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 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 and if the command area is less than 80 ha, then the system is considered as a minor irrigation system and the two systems are operated by two 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 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, 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. A number of participatory tools including focus group discussions (FGDs), semi structured interviews (SSIs), key informants' interviews (KIIs), timeline analysis, participatory GIS, social and resource mapping were frequently used by the fellows. The fellows made a number of field visits to the study area for gathering of field data. For bio-physical assessment, the fellows made use of simulation models, such as Delft3D and AquaCrop, and image processing softwares, such as ERDAS Imagine. Overall, the approach followed by each fellow was both socio-technical and inter-disciplinary.

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 delays 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, naamely 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 urbanization-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 case study approach, while the rest of the studies used tools like ArcGIS, 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 carried 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 for 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 other to cultivate, fragmentation of lands, lands surrounded by buildings inappropriate for agriculture and 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 in 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 food deficiency period has increased from less than 3 months to almost nearly 7 months in a period of 35 years. 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 characteristics of individuals or households but is a combination of diverse factors that determine adaptive capacities.

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 urbanization

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 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 in the hierarchy. Those vulnerable to climatic variability mostly comprised of socio-economically disadvantaged farmers, women and the households belonging to lower caste groups.

The research conducted on inundation impact on paddy yield was carried out in the middle Bagmati river basin where frequent flood phenomenon 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 flood of various return periods. Loss of paddy yield by the inundation is about 25 percent 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, which was the Vellar basin. In the second year, the water security of the Upper Vellar sub-basin was studied. 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 this is the driest sub basin of the Vellar basin. 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 rehabilitated tank catchment in improving water security to promote economic and ecological water saving mechanisms that increased farm income were studied. The other objectives included assessing 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 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 informal 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 fifteen 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 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 block level. The climate data from 2005 to 2014 was collected from the Institute for Water Studies and used to estimate the evapotranspiration. The crop data 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 the agricultural water security improved significantly due to rehabilitation of tanks due to increased water-availability days and their ground water recharge capability. The study also found that performance of non-system tank was better than 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.

Picture 1: Sluice and water spread area of non-system tank
Picture 2: Typical well under system command area

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.

The research also established a relationship between crop diversification on water use 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 to have watershed improvement in a small village effectively, which can potentially be replicated for similar agro-ecological systems.

- **Post Graduate Institute of Agriculture (PGIA), University of Peradeniya**

The five students of the second group of SAWA fellows attempted to address the water security issues selecting two study sites; Hakwatuna Oya major irrigation system and the watershed area of Hakwatuna Oya, Bayawa minor irrigation system and the riparian ecosystem located downstream of Deduru Oya reservoir located in Deduru Oya river basin in the North Western Province of Sri Lanka. The overall objective of the research programme of the second batch of SAWA fellows is to address the 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 socio-economic 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 Deduru oya basin
- Small scale water interventions for improving livelihoods of rural smallholder farmers in a selected minor tank cascade system in Deduru Oya basin and
- Environmental flow assessment of Deduru Oya reservoir in Deduru Oya Basin to enhance the sustainability of the downstream ecosystems.

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

The results revealed that the farmers in the study areas suffer due to inadequacy of water either due to climatic variability or due to 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 socio-economic factors. In addition, crop diversification is highly dependent on socio-economic variables such as education, gender, social capital, field location etc. In the same irrigation system, 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 head, middle and tail end of the command area. 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.

Picture 1: Collection of water sample in the field using dipping method
Picture 2, 3 & 4: Fauna in the paddy field

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-cooperating attitude among farmers, weak land and water rights, non-implementation of law, encroachments, inadequate institutional arrangements were the reasons behind these conflicts. The ecosystems of downstream of Deduru Oya reservoir do not suffer much due to reservoir construction since there is adequate flow release to compensate the environmental flow requirement. 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[1] fellows from the second batch at IWFM, BUET. All the fellows are continuing their working in the south-west 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

[1] 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

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 inter-relation. The fellows are using PRA tools, such as FGDs and Key Informant Interviews (KIIs), along with formal questionnaire survey for gathering field data and information. They are also using economic valuation tools, multi-criteria decision analysis tools and 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 comprises of water availability, access, water use, capacity and disaster management. The security index was found to be high for agro-ecosystem 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.

Picture 1: Students conducting FGD

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 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 to 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 urbanization 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 homestead. People who lack the utility sources have conserved 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. Drying up of traditional water sources used for many rituals has created chaos among the community members and has led them to change their cultural as well as traditional beliefs although leading to extra stress on the nearby sources. In contrast, urbanization, in some cases seemed to have contributed to rejuvenating few water sources through joint efforts of the municipality and community which has led to protection of few water sources and stone spouts in the area.

Picture 1: Traditional community source left abandanoned
Picture 2: Community water source during the dry season
Picture 3: Community water source during 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

Research findings on water security and conservation in the Upper Bagmati basin, through the water sample tests, concluded that there is an increase in electrical conductivity in the river water from source towards downstream. As the river flows downstream the river gets more polluted. Higher concentrations

of Total Dissolved Solids (TDS) and ammonia indicates organic pollution from domestic sewage, industrial waste and fertilizer run-off. Higher concentration of nutrients were observed as it passed through city areas where many municipal and industrial drains drain in the river. The study from key informant interviews concluded that residents in Bagmati Basin know of the source of their domestic water supply, and 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 focusing on reuse of wastewater was carried out to assess the potential of treated wastewater to be used for agriculture in Harisiddhi VDC 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 also lower compared to the irrigation demand and was not technically feasible for irrigation. There is gendered difference on attitude toward the use of wastewater in agriculture; male farmers prefer use of wastewater from 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 third batch is ongoing, though the review of literature, field work 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, because of time that their sessions begin, are in a nascent stage of developing the proposals.

- **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 to 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 1,165 mm.

The primary research objective is understanding peoples' perception on climate change, effect of climate change on the 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 disaster management plan by assessing the performance of implementing institutions. The extent of climate change impacts is proposed to be computed using 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 study 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 reviewed based on which 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 analysed using probabilistic techniques to measure the impacts, and trend analysis to project the climate change. The effectiveness of 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 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 (major cultivation season) would increase in 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 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, providing support services to community based system centered on farmer organizations. Other multiplicity of agencies play a supportive role, operating independently of each other with very little coordination. There is a need for strong functional coordination mechanism between major institutions. Strengthening of Framers 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 livelihoods of 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 enimies in pdyy 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 third batch of fellows are, at present, developing their research proposal; after a series of consultation with the potential supervisors, few of them have submitted the proposal. The issues they will be dealing in their research are climate change induced migration and adaptation to secure their livelihoods. The other issue is the government and local initiations on building resilient community against climate change impacts. A 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 2016 December.

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 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

- **BUET**

The student's research is largely focusing on risk assessment and 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
- 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
- Salinity problems, crop production and different livelihood adaptation strategies in the south west region of Bangladesh

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- Source of irrigation water

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; these were 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 strengths 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:

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, 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 point 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).

b) ***Highlighting the need for inter-disciplinary 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 having 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 implemention or non-implementation of efficient scientific solutions.

c) ***Learning across batches of SAWA fellows****:* Though the thematic thrust of different batches were different, there were cross learnings across the different batches of SAWA fellows, when seen in totality. 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 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.

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 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 that are associated when women 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 Bangldesh. A related result from Nepal that demonstrates how differently waste water irrigation is viewed by men and women and that the latter have 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 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 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 were 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 their Master's program.

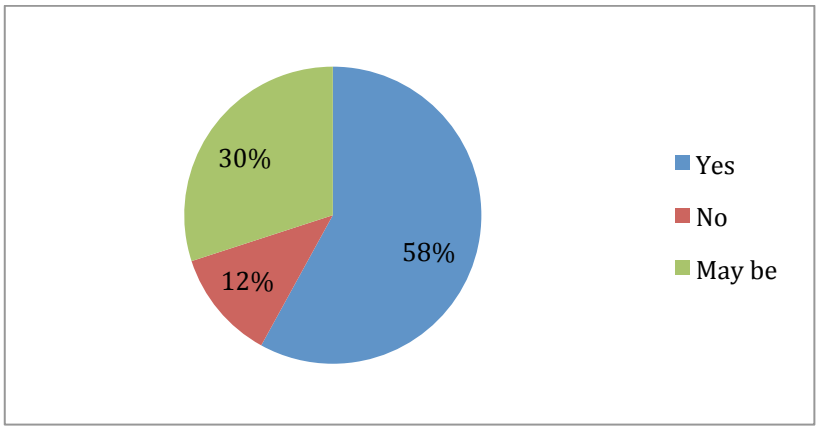


Figure 10: Developing new linkages and collaborations

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

- Linkages with the SAWA fellows from other countries has aided in sharing of knowledge
- Linkages with different sections of the community developed through the field work
- Collaborations with water professionals from different government and non-governmental organizations through training and research activities
- Meeting 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 professional and researchers who are in very higher 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 the completion of their Master's degree.

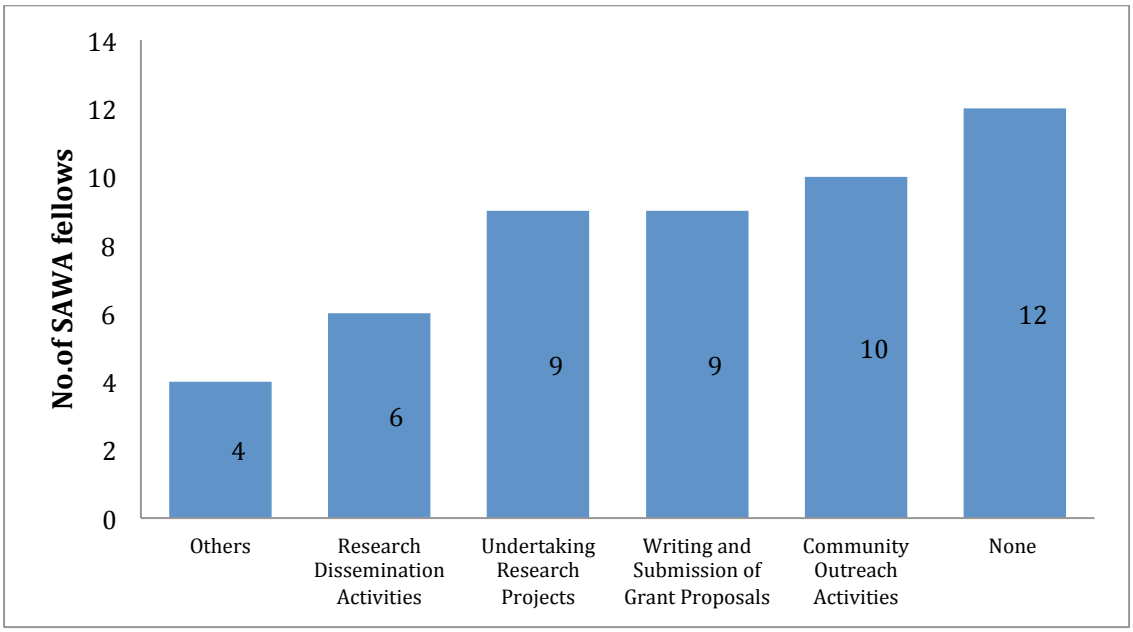


Figure 11: Collaboration in research activities

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

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.

Membership with National/International Networks

Twelve 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 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 expert's views.

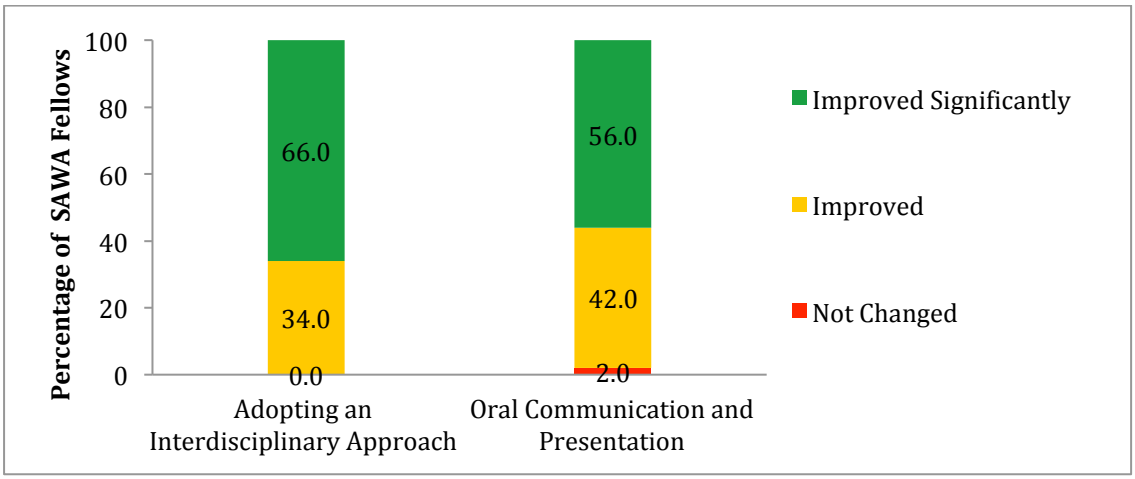
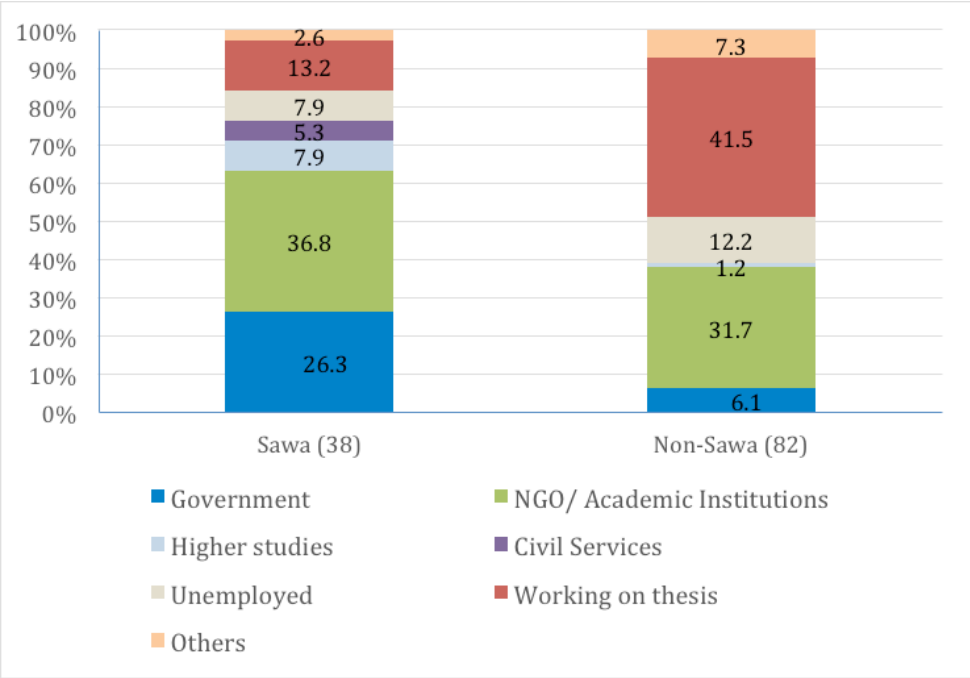


Figure 12: Competency in Research skills

Employability Status

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



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

Figure 13: Employability status of SAWA and non-SAWA fellows

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.

The above chart (Figure 13) though is not a full representation of the status of employment, gives some insights into the percentage of students employed in

various sectors[2]. 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 government sector is significantly high.
2. Number of female SAWA fellows who have found employment are 18.
3. Another major observation is that the number of students still working on thesis is significantly higher for non-SAWA fellows as compared to the SAWA fellows. Data shows that at BUET a total of only 6 students of 2013-2015 batch of MSc 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%[3], which is lower as compared to non-SAWA, which is 12.2%. One reason of 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 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 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

[2] 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] Out of 6 who are unemployed 1 student from CWR is awaiting job confirmation as Management Trainee at Food Corporation of India.

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 as an interdisciplinary flagship journal of SaciWATERs was started in the year 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 the year 2012. From the year 2012, 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 representation in household decision-making processes.

- **Urbanization and peri-urbanization: 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 urbanization 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 has 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 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 democratization 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 three different topics, which are 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 whine: Why 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,NepalinOctober 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, 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 Storm 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

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

Ms. Chathurika Perera, SAWA fellow from the 1st batch worked as an intern at SaciWATERs during the period 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 trans-boundary protocols/treaties/accords to understand the processes shaping the institutional arrangements for managing the Trans-boundary Rivers. Ms. Perera was involved in the review of one such agreement i.e. 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 trans-boundary 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 a NGO calledEnvironment 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 organizations in different capacities and have been able to employ IWRM approaches. This sub-section 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 policy-making 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. 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 broader 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 though 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, and involves dealing with different level 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 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 H2O- P4 (P4 stands for People, Pollution, Profit and Politics)"

- Mr. Robert Dongol, NEC

Dr. N.K. Ambujam is a 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 the year 2006 as a part of the CB project. She was the project coordinator and mentioed that it was a highly satisfying experience. IDRC-SAWA fellowship started in the year 2013 and she remarked that "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 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).

6. Challenges and Lessons Learnt

6.1 Major Challenges

1. Employment of the fellows in water sector has remained a challenge especially at NEC
2. Ensuring satisfactory interdisciplinarity in the 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 theses supervisors are the ones who have been trained in natural sciences.
3. There is a lack of gender lens in student's 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. The contributions made by SAWA fellows in the SAWA journal have been limited as it is a refereed journal and hence, to ensure quality the articles go through review by several experts.

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 from social sciences background in order to provide hand holding support and also to ensure a greater degree of interdisciplinary element in the student's research.
5. The project has definitely created a knowledge base on water, climate change with perspectives from four South Asian countries through research thesis and a number of publications. Consolidation of 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	87-94
2	Report of the Regional Training Workshop in 2013	95-113
3	Report of the Regional Training Workshop in 2014	114-129
4	Report of the Regional Training Workshop in 2015	130-146
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9	List of articles published in SAWA journal	172-174
10	Employment details of SAWA fellows	175-179

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.ijirset.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/journel/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

- **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 Galagedara, 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
- **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/
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- 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

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

SCaN
SaciWATERs - CapNetNetwork

95 SaciWATERs

Summary

As part of the South Asia Water Fellowships (SAWA), a training programme on Integrated Water Resource Management was organized in Kathmandu, Nepal between the 3rd and the 8th of October 2013. The training programme was entitled "*Regional South Asia Water (SAWA) Fellows Training on Integrated Water Resources Management".* The training programme was financially supported by International Development Research Centre (IDRC), Canada and 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 sub continental 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) Initiating and encouraging "regional co---operation" among water professional in thelong run. 6) Promoting 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 content of the workshop explored the issues of interdisciplinary 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, involving a lot of student participation. Participants got the chance to apply classroom learning in the field, with two field trips during the programme, one to Matatirtha village where, participants learned about the community managed water distribution system there. Additionally, a full day field exercise was held in NaubisePhant,

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 in this regards, as leadership skills are essential for becoming complete water professionals.

Overall, the participants were happy with the sessions, the materials, and the group exercises. They were also appreciative of the field visits and the field practicum, as it allowed them to apply classroom learning in the field.

1. Introduction

1.1 Background – The SAWA Fellowships

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 urbanization 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 multi---disciplinary approaches that are sensitive to women, the poor, environment and sustainability.

This project continues a 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.

- 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 andgirls 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 policy making. This project seeks to address this imbalance by awarding 80 percent of the fellowships to women; the rest of the fellowshipswill 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 trans---boundary cooperation in the fellows, which would hopefully lead to larger regional cooperation in future. Such interdisciplinary, regional and trans---boundary 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.

1.2 Relevance of the Training Programme

As mentioned above, in many regions in South Asia, the availability ofwater in both quality and quantity is being affected by climate change and climate variability. Additionally due to increase in population and urbanization, there are changes in consumption and production patterns which have huge impacts on food security, 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 withespectr to utilization 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. This new approach, capacity building in terms of leadership skills will be extremely important in terms of creating complete water professionals.

1.3 Organizers

Nepal Engineering College (***nec***): Nepal Engineering College, was established in 1994 as a non---profit institution under 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

SaciWATERs:the South Asia Consortium for Interdisciplinary Water Resources Studies, is a policy research institute at 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 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

1.4 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

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 as its key partners and implementing members. These networks have proven tobe effective at promoting the understanding of IWRM.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 with at the South Asian level such as gender, equity , climate change, and food security at the South Asian Level
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) 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) Initiating and encouraging " regional co---operation" among water professional in the long run
6) Promoting an interdisciplinary approach to water resource management and research.
7) 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) fellowships, 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 traditional civil engineering background, thus introduction to the above mentioned issues was important to them.

2.3. Outcomes expected

It is expected that the participants would have increased sensitivity to issues of gender and equity in the water resource management context. 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 trans---boundary 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, Bangaldesh University of Engineering and Technology. Dhaka, Bangladesh
- ***Dr N.D.K Dayawansa****:* Senior Lecturer in Agricultural Engineering at the 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 :***Pragya (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 BinodBhatta:*** the Director---Research: Forestry and Natural Resources Management (F/NRM) Specialist at Alliance for Social Mobilization --- Alliance Nepal, Kathmandu, Nepal

- ***Dr Niraj Joshi :*** Associate Professor (Research Coordinator) at Nepal Engineering College--- Center for Postgraduate Studies, Kathmandu, Nepal
- ***Ms Sukanya Patwardhan :***Practice Leader --- Diversity, Ethics, Sustainability, Coaching, at 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 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 class room lecture using power---point, followed by discussion of about 15 minutes. Participants were encouraged to take active part during the discussions. Some sessions were even more interactive, having exercises for each individual.

Group Exercises: Participants were divided into different 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 quite 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, groupswere also assigned some tasks such as giving a recap---of the previous day's events, In order to make the workshop more participatory.

Field Exposure: A half day field visit was organized to provide exposure to participantson water transfer mechanisms operating in Matatirtha village outside Kathmandu. Additionally, a full day of field practicum was also undertaken at Naubise Phant Irrigation system about 45 kilometres east of Kathmandu, where participants carried out focus group discussion, 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 that was administered

3.3 Content of the Training Sessions

The programme was held for a total of six days, between 3 – 8 Octobers. Each day had multiple sessions; details of the sessions are provided in Annexure. Additionally one half day field visit and a full day field practicum were also carried out.

Day 1

1. **Introduction to the Training Programme: Dr Neena Rao and Arjun Surendra**

This session involved giving the participants an overview of the aims, objectives and structure of the training programme, as well as what the expectation from the participants were. The participants were also advised on the precautions to take while in Kathmandu. Ice breaking exercises were then 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 by 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 the differences between inter---disciplinary approaches and multi---disciplinary 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 lack of people's participation in project designs and implementation. It also mentioned how IWRM would address these issues, and how it can be applied in the Bangladesh context.

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

The session discussed the current stated of water resources management in Nepal. It was pointed out that Nepal was a water rich state in terms of availability of water resources, even if calculated on a per capita basis. An overview of the various plans and policies related to water instituted by the government of Nepal was given. The patterns of water use in the Nepal context were mentioned next, after which the presentation moved to the challenges faced in water resource management. The presentation points to Climate change, Water resources degradation, Equity concern, and Political instability being 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 look into historical practices of water management therein. It mentioned the importance of minor irrigation systems such as small tank systems to water security 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 after the issues faced in Sri Lanka in large scale water resource development were discussed.

5. Overview of water resources management in India– Dr B.V. Mudgal

A brief overview of the status of water resources available in India was give, with the help of maps and data. The presentation then delved 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. Additionally, problems such as flood and droughts, ground water management, lack of drinking water resources were elaborated on. Also mentioned were attempts by policy makers

to address these issues, and what existing gaps were. The important aspect of climate change and its impacts in the Indian and Tamil Nadu contexts were discussed. The session concluded on a lighter note, by sharing cartoons appearing in the media illustrating how important the issues of water resource management are.

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 as well as micro level. It provided theoretical understanding of major climate parameters, the 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 the point about climate variability.

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

The session discussed the importance of ground water as a source 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 student group 1.

1) IWRM – Who does the integrating and how? - Mr Dipak Gyawali

The session initially started by providing examples of cases where the IWRM framework has not worked as well as expected. The presentation examined the problems of having a fixed framework in these regards. The presentation 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 by talking about how assumptions about how consensus building was changing, and new realities were emerging as an example, the pluralizing of Nepal's power system was mentioned.

2) Gender Water Rights and Equity – Dr. Aditya Bastola.

This session started at the basic level – 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 to and benefits from water resources in South Asia including Gender Barriers. 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 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.

4. **Student group presentations on Study area and issues faced therein**

This session had four presentations on the respective study areas, carried out by groups of participants from each country. As part of their educational requirements, each student has to carry out original research. Thus, a general overview of the areas under study was given for each country.

Participants from Bangladesh gave an overview of the impacts of climate change on the South---West region of Bangaldesh. They explained how their research topics fit in with the problems facing Bangladesh. Participants from Sri Lanka gave an overview of the DeduruOya 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 fit in with the issues mentioned. Participants from Nepal, gave an overview of theBhagmati river basin and the issues of water quality and water resource management that were seen there. Participants from India, gave an overview about the TheVellar river basin lies in the Northern part of Tamil Nadu state in South India

3) Interdisciplinary research design–Prof. Mashfiqus Salehin

The session provided an introduction to research design--- or how one must "prepare" for research and how the research concept is developed. It wenton to how, in order to get a good idea of how to move forward in research design, it is essential to develop 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 in order to attempt to answer the research questions.

4) Introduction of field study sites – Prof Khem Raj Sharma

As part of the training programme, a field visit and a field practicum were organized. This session gave an overview of both the selected sites. The first site, which would be the location of a half a 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 urbanisation occurring therein and changing modes of water transfer that were happening. The session also covered the implications of unchecked water transfers and initiatives being taken at the VDC level in order to tackle these issues.

The second part of the session covered the NaubisePhant 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 water users association as well as how increased irrigation coverage has led to changes in agriculture and livelihood amongst beneficiaries.

5) **Group work –SPQR presentation.**

In this session the participants were tasked with forming groups and preparing a research proposal 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 in order to attempt 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 utilization and control: supporting sustainable economic and social development whilst addressing the maintenance of environmental quality. 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 how to design an effective questionnaire survey. The session started with an explanation on the difference between qualitative and quantitative data, andhow depending on the research question, either or both 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 differenttypes 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 conduct of interviewers/ enumerators during questionnaire surveys was also given.

3) Introduction to Participatory Research Tools--- Dr BinodBhatta.

The purpose of this session was to introduce the participants totools and methods of participatory research as well as to highlight the importance of using participatory research methods. The session started by describing the differences between the traditional technology led approach 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 how there were multiple forms and levels of participation. The session went on to explain the principles of Rapid/Participatory Rural Appraisal (RRA or PRA) and list the various tools that could be used as 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 important issue of ethics principles involved in such work were discussed. The session ended with a detailed look at how to carry out timeline analysis and focus group discussions.

In class exercise

After this session was completed the participants were split into groups in order to hold a simulated focus group discussion. One group of participants were assigned the role of inhabitants in a village, while one group were assigned the role of facilitators. The facilitators were given some time to organize their thoughts and plan the discussion, in order to elicit information from the "villagers" about the problems of water resources related to their village. After this mock exercise, feedback was given by members of the faculty about approaches and ways of taking the discussion forward, as well as ideas on how to diffuse potentially difficult situations that may arise in the course of a focus group discussion.

4) Field Visit to Matatirtha VDC

Participants were taken to study the water transfer occurring 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 how water was shared with neighbouring water scarce villages. In addition, they gained information about the system of supplying water into urban areas of Kathmandu through water tankers. They also understood that due to lack of adequate public water supply infrastructure was exacerbating the water withdrawals and water transfers from this peri---urban area in order to transfer it into urban Kathmandu.

Day 4

1) **Field Practicum – Naubise Phant Irrigation System**.

Full day field practicum at the Naubise Phant Irrigation system was carried out. The participants had the opportunity to put into practice all that they had learned in the preceding three days. The area is about 45 kilometreseast 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 that were to be answered. 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 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, some of whom had never been involved in participatory research in this manner before, thus this exercise went a long way in building capacity in this regard.

Day 5

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 to engage them constructively and maximize learning in a short time. The Learning objective of this session was to sensitize the participants to 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 - special qualities of a leader through various examples
- The leadership qualities required by a sustainability professional and in particular the participants
- The importance of holistic approach to leadership through the well-being of the individual assessment of one's well-being
- Drawing and action plan as a future leader for water management

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

2) Data analysis and report/presentation preparation

This session was time was 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 next day.

Day 6

1) 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 presented on Gender roles in the study area and their relation to water accessibility.
- Group 2 examined the water distribution inefficiency in the NaubisePhant Irrigation System
- Group 3 studied the Impact of NaubisePhant Irrigation System on Agricultural Productivity
- Group 4 examined the Impact of the NaubisePhant Irrigation System on Livelihoods of the beneficiaries.

After the presentations, each group was given feedback as to improvements and further steps, as 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 5 countries. The session explained water management issues in the GBM basins, in terms of the spatial and temporal inequalities in flow of waterleading 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 about history of regional cooperation between the nations. The session explored different water management interventions, existing as well those proposed in the future and their regional implications. An example given was the proposal to link rivers in India, which was looked at with some concern in Bangladesh. The session described various opportunities and road blocks 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 a final few words 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

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

SaciWATERs

SUMMARY

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

The objective of the programme was to acquaint the participants with the 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; 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, one to Narayanganj- Narshinghdi Irrigation project in the peri urban area of Dhaka. Students conducted FGDs, key person interviews and household survey based on the topic assigned to each group. Overall, the participants were happy with the sessions and the field activity.

INTRODUCTION

BACKGROUND – THE SAWA FELLOWSHIPS

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 urbanization 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 multi-disciplinary 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.
- 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 policy making. This project seeks to address this imbalance by awarding 80 percent 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 trans-boundary cooperation in the fellows, which would hopefully lead to larger regional cooperation in future. Such interdisciplinary, regional and trans-boundary 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

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 multi-disciplinary process, requiring a holistic understanding of the system with a good blend of engineering, agricultural, socio-economic and environmental analyses, a multi-disciplinary course curriculum has been created. The multi-disciplinary 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.

SaciWATERs : the South Asia Consortium for Interdisciplinary Water Resources Studies, is a policy research institute at 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 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

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

WORKSHOPS OBJECTIVES, PARTICIPANTS PROFILE AND EXPECTED OUTCOMES

OBJECTIVES

The main objective of this training programme was to build capacity of the SAWAS 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 second 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. Introduction to the research methodology was important to them.

OUTCOMES EXPECTED

It is expected that at the end of the sessions followed by the field work the fellows will have fundamentals know- how of the qualitative research approach. And will appreciate the importance of inclusion of 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
- **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, Bangaldesh University of Engineering and Technology. Dhaka, Bangladesh
- **Dr Hamidul Haq,** Professor, Institute of Water and Flood Management, Bangaldesh University of Engineering and Technology. Dhaka, Bangladesh
- **Dr Surijit Bala**, Professor, Institute of Water and Flood Management, Bangaldesh University of Engineering and Technology. Dhaka, Bangladesh
- **Dr Shahjahan Mondal**, Assistant Professor, Institute of Water and Flood Management, Bangaldesh University of Engineering and Technology. Dhaka, Bangladesh
- **Dr Mashfiqus Salehin :** Professor, Institute of Water and Flood Management, Bangaldesh 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 lasted for five 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 class room lecture using power-point, followed by discussion of

about 15 minutes. Participants were encouraged to take 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 half day field visit was organized to provide exposure to participants on 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; the programme agenda is provided in Annexure.

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 brief introduction to the training workshop.

Dr Sultan Ahmed: (Former Doctoral SAWA Fellow) was called upon to reflect his views on this SAWAS Fellowship program. He shared his experiences and how SAWAS Fellowship has helped him and other fellows in pursuing studies. Focused on how SAWAS Fellowship gives exposure and helps understand the importance of inter disciplinary approach in water resource management.

Dr Anamika Barua (Executive Director, SaciWATERs): Welcomed all to the workshop. She gave background of the IDRC SAWAS Fellowship. She pointed out that most of the interventions made are for the people to benefit, but most of the times 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. Gender focus within the fellowship is to encourage women to enter this field. She also encouraged the fellows to contribute to the SAWAS Journal.

Dr Khaleda Ekram (Vice Chancellor, BUET): Welcomed all the guests and expressed that she is happy to know of such initiative wherer SaciWATERs has

joined hands with BUET to work on such a project to encourage students to take up work on Water resource management to meet the challenge of 21st century.

Dr Tarekul Islam (Professor and Director – IWFM, BUET): He noted that SAWAS training gives 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 build capacities. Thanked the VC to be able to attend the program

Overview of the training program and programme details of the coming five days was given by Mr Sumit Vij, SaciWaters. In this session all participants had an opportunity to introduce themselves to each other.

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 the considered key to IWRM in Bangladesh due to the recurrent flooding events, but this idea has changed with time.

GENDER IN IWRM (BANGLADESH) – DR SURIJIT BALA

This presentation focused on the emphasis given in the National Water policy on participatory water management and role of women in the management. The focus was on integration of concept of gender equity into the water management policy and practice of irrigation, groundwater management, watershed management etc. 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 give, 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 what existing gaps were detailed. Additionally, problems such as flood and droughts, salinity, fluoride, ground water management, lack of drinking water resources, interstate and trans boundary water conflicts were elaborated on. The important aspect of climate change and its impacts in the Indian and Tamil Nadu contexts were discussed

OVERVIEW OF WATER RESOURCES MANAGEMENT IN NEPAL – MR ROBERT DONGOL

The session discussed the current status of water resources management in Nepal. It was pointed out that Nepal was a water rich state in terms of availability of water resources, even if calculated on a per capita basis. An overview of the various plans and policies related to water instituted by the government of Nepal was given. The presentation pointed to electricity demand 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 one student each 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, 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.

FOUNDATIONS OF RESEARCH AND DESIGNING RESEARCH : DR VISHAL NARAIN AND MR SUMIT VIJ

This session included the fundamentals of research and research design. This presentation gave an overview of research paradigm, essential steps of research design and ethics of research. Within the research paradigm students were given the basic know how of positivism, interpretivism. This also gave students introduction to how to conduct literature review and steps towards writing 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

In this session Dr Vishal Narain further elaborated the concepts of qualitative research. This presentation elaborated on the ethnographic methods. Principles of fieldwork such as methodological pragmatism, naturalization, socialization

and researcher's personality were discussed. Steps in field work were elaborated upon along with the ways to deal with key informants. Need for sampling was introduced.

Students were introduced to the process of analysis of field notes and the steps involved in 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 focused group discussions, transect walk and resource and institutional mapping, were discussed with students participating in one such demonstration activity.

STATISTICAL SAMPLING:

DR M SHAHJAHAN MONDAL

This session was aimed to introduce the basic concepts of sampling and introduce on how 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 questionnaire, importance of relevance of questions to be asked, 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 the data entry, data cleaning and data analysis using different statistical techniques such as central tendency, correlation etc.

INTERDISCIPLINARY RESEARCH TOOLS/METHODS: BIO-PHYSICAL INVESTIGATION/ MEASUREMENTS : DR MASHEFIQUS SALEHIN

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 utilization and control: supporting sustainable economic and social development whilst addressing the maintenance of environmental quality. 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 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.

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 for implementation.A demonstration unit (D/U) under Area-A of 1300 ha was completed in 1984 with grant from Japan through JICA and proved to be extremely benefitted for local people. So, Block–A1 of Phase–I was completed in 1993 with an increase 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 is shown in the next two slides.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 form groups and prepare a research proposal 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 in order to attempt 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 members of the local community, the water users association, and other key informants in discussions and interviews 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 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. 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, 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 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

SUMMARY

As part of the South Asia Water Fellowships (SAWA), a training programme on Interdisciplinary Research Concepts and Methodologies was organized in Kandy, Sri Lanka from 28th October to 3rd 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 second batch of SAWAS 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; 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 Fellowships

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 urbanization 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 multi-disciplinary 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.
- 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 policy making. This project seeks to address this imbalance by awarding 80 percent 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 trans-boundary cooperation in the fellows, which would hopefully lead to larger regional cooperation in future. Such interdisciplinary, regional and trans-boundary 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), is a semi-autonomous institution of the University of Peradeniya, 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 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 organizations 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 Boards of Study' the Board of Study in Agricultural Engineering is one of the most active of the eleven boards of study of the PGIA. In order to develop 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 program 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 at 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 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

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

Cap-net UNDP is an international network for capacity development in sustainable water management. It is made up of a partnership of autonomous international, 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 training programme was to build capacity of the SAWAS 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 third 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 post graduate level courses in IWRM. Most had a conventional civil engineering background and few were with 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 followed by the field work the fellows will have fundamentals know- how of the qualitative research approach. And will appreciate the importance of inclusion of 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, Bangaldesh 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 class room lecture using power-point, followed by discussion of about 15 minutes. Participants were encouraged to take 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, between 28th October to 3rd December, 2015, in Kandy. Each day had multiple sessions; the programme agenda is provided in Annexure.

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 that he is happy to know of such initiative where SaciWATERs has joined hands with the institutions from South Asia to encourage the students to work on water management issues and also said that it's a means of fostering relationship between the four countries.

Dr Anamika Barua (Executive Director , SaciWATERs) : Welcomed all to the workshop. She gave background of the IDRC SAWAS Fellowship. She pointed out that most of the interventions made are for the people to benefit, but most of the times 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. Gender focus within the fellowship is 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 had spoken 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 three folds and so has 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 Masters 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, and challenges and future opportunities.

Overview of IWRM in Bangladesh: Dr Shahjahan Mondal

An overview of 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 up gradation of rain fed agriculture. The session ended with a discussion on policy and institutional reforms which are key to building a water resilient economy.

<u>Day 2</u>

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 5th paradigm. He went on to discuss about 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 is a paradigm shift

as it departs from the sectoral approach, with spatial focus on the river basin, and the importance of integration between sectors and administrative units as 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 students group from each country. 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 privatization 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, principles of fieldwork and steps to be followed in fieldwork.

Steps in field work were elaborated upon along with the ways to deal with key informants. Need for sampling was introduced. The session ended with various ways of assessing qualitative data.

Post graduate thesis development: Dr. Anamika Barua

This session gave an overview of the stages involved in thesis development. The 1st stage is developing a research design, which involves literature review. The presentation focused on how to do a literature review and the difference between good and bad literature review, and also on referencing. The 2nd 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 conclusion, referencing and placing of annexures.

Quantitative Methods using SPSS: Mr 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.

<u>Day 4</u>

Sampling methods, questionnaire design and administration: Dr. Shahjahan Mondal

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

Preparation by the Students for the field work: 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 Organization 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
Ms. R.P.S.P. Chandrasiri	1st	Assessment of water management on sustainability of paddy cultivation under variable rainfall in Bayawa, Kurunegala, Sri Lanka	PGIA
Ms. A.C.S. Perera	1st	Impact of climate variability on water availability and paddy productivity in the "Hakwatuna Oya" irrigation scheme in Sri Lanka	PGIA
Mr. D.M.N. Diyawadana	1st	Impacts of climate change and policy environment on rural smallholder farmers in Hakwatune-oya major irrigation scheme, Kurunegala, Sri Lanka	PGIA
Ms. T. Sellathurai	1st	Impact of rainfall variability on soil organic matter and nitrogen in lowland paddy field: A case study in Bayawa minor irrigation system	PGIA
S. Thusyanthi	1st	Identification and assessment of processes and functions affected by extreme events due to climate variation in paddy field in a tank cascade system	PGIA
Ms. G.W.R.W.M.R.M.W. Kirinde	2nd	Alternative water regimes cum enhanced ecosystem as an adaptation for climate variability in paddy cultivation	PGIA
Ms. N.G.R. Saumyarathna	2nd	Effect of climate variability on water availability, allocation, productivity and conflicts in Hakwatuna Oya watershed in Deduru oya basin	PGIA
Hemanthi Dhammika	2nd	Small scale water interventions for improving livelihood of rural	PGIA

		smallholder farmer in a selected small tank cascade system in Sri Lanka	
K. Kirinde	2nd	Water regimes cum enhanced ecosystem as an adaptation for climate variability in paddy cultivation	PGIA
Pradeep Kumara	2nd	Identification and Assessment of Technical and Socio-economic Aspects in Cultivation Other Field Crops (OFC) in *Bayawa* Minor Irrigation System	PGIA
Ms. W.M.S.M. Wijekoon	3rd	Role of Governance and Institutional Arrangement in Strengthening Resilience to Shocks and Stresses to livelihoods in Minor Irrigation system	PGIA
Lakmini	3rd	Social and livelihood impacts of Deduru Oya dam construction and water diversion	PGIA
Indika	3rd	Investigation of strategies for CC adaptation in terms of Food quality and ecosystem in Paddy cultivation	PGIA
Sudarshani	3rd	Evaluating existing levels of livelihood capitals of the smallholder rural farmers and prioritizing the water interventions within the Bayawa – cascade in Sri Lanka.	PGIA
Rajendran	3rd	Impact of Climate change and irrigation management on irrigation water demand in Hakwatuna Oya irrigation scheme in Sri Lanka	PGIA
Ms. Debanjali Saha	1st	Prospect of rabi crops in south-west coastal area under climate change scenarios	BUET

Md. Gulam Kibria	1st	Storm surge propagation and crop damage assessment in a coastal polder of bangladesh	BUET
Tamanna Kabir	1st	Assessment of biophysical factors for storm surge hazard and their implications for food security	BUET
Taznin Naher	1st	Crop decision making model and impacts of crop selection on the livelihood of farmers in coastal area.	BUET
Sultana Maliha	1st	Changes on land use and soil properties and their impact on rice yield in dacope upazila, khulna	BUET
Aniqua	2nd	Valuation Of Ecosystem Services Of Tidal River Management In Pakhimara Beel: An Ecosystem Based Approach To Ensure Water Security	BUET
Samiul Kader Khan	2nd	A Comparative Study on Assessing Gender Perspectives for Adopting Different Farming Practice in Coastal Upazila of Tala in Satkhira	BUET
Sumayyah Tehsin	2nd	Assessing Agricultural Water Security In Different Agro-Ecosystems Of Southwest Bangladesh Using Analytic Hierarchy Process	BUET
Sadiul Alam	3rd	Multi hazard risk assessment and adaptation strategies	BUET
Sabrina Mehzabin	3rd	Strom surge risk assessment and livelihood Adaptation Strategies	BUET
Umme Hani	3rd	Effect of Livelihood diversification due to Climate change and its impact	BUET

		on displacement and migration	
Ayesha	3rd	Impact of Climate change on coastal reserves of Bangladesh and scope of modification of existing adaptation programs	BUET
Kazi Mita	3rd	Effectiveness of EBA to climate change impacts in study area with a focus on sustainable livelihood	BUET
Swarnali Mahmood	3rd	Impact of Polder on Agricultural Water Management and Livelihood in the South-West Region: A Case Study	BUET
Anitha P	1st	Impact of climate variability on agricultural productivity in Lower Vellar, Anaivari Odai and Chinnar sub basins	CWR
Elakiya Priyaa A	1st	Impact of climate variability on agro-ecosystems and its vulnerability to livelihood	CWR
Malarmathi Divinya A	1st	Impact of climate variability on cropping pattern and crop diversification in Manimukthanadhi sub-basin	CWR
Monisha S	1st	Land cover dynamics and its impact on vulnerability of agro - ecosystems and food security	CWR
Vidhya A	1st	Impact of IAMWARM on food security in Vellar basin	CWR
Sivaranjani Umapathi	2nd	Rainfall variability under changing climate: an impact study of drinking water security at village level	CWR
Priyadarshini	2nd	Impact Of Crop Diversification On Water Use And Water Security At	CWR

		Village Level	
Hemalatha Murugesan	2nd	Role Of Water Users' Associations In Improving Water Security- A Case Study Of Upper-Vellar Sub-Basin	CWR
Durgadevi Gnanaguru	2nd	A Study Of Agriculture And Domesticwater Footprint And Its Impact On Water Security Of Veppanthatai Block Of Vellar Basin	CWR
Arivoli Elangovan	2nd	Role Of Rehabilitated Tanks In Improving Water Security In Gomuhi Sub Basin Of Vellar Basin	CWR
S. Esakkiammal	3rd	Community and Ecosystem based adaptation to climate change impacts towards sustainable livelihood in Vellar river basin	CWR
E. Nivedha	3rd	Adaptation Strategies to Climate change in Vellar Basin	CWR
G. Rajaswedha	3rd	Effect of Climate Change and Climate Variability on livelihoods in Vellar river basin	CWR
Pavithra T S	3rd	Role of Governance in Strengthening Resilience to Water Shocks and Stresses	CWR
Sri balaji	3rd	EFFECTS OF LIVELIHOOD DIVERSIFICATION AND ITS IMPACT ON DISPLACEMENT AND MIGRATION	CWR
Sangita Dandekhya	1st	Understanding the vulnerability of farm household in upper Bagmati basin to climate variability	NEC
	1st		NEC

Pratikshya Neupane		Impacts of Water Induced Disasters on Food Security	
Durga Adhikari	1st	Impacts of Changing Land Cover Dynamics on Vulnerability of Agro-ecosystems and Food Security	NEC
Rajendra Shrestha	1st	Urbanization as a Driver of Landuse and Land cover Change and Its Impacts on Local Food security	NEC
Jyoti Dahal	2nd	Effect of Urbanization and Urban water extraction on water security of Jhaukhel	NEC
Bandana Shrestha	2nd	An Assessment of Water Security Situation in terms of Water Quality in Upper Bagmati Basin, Nepal in Present and Future Climatic Conditions	NEC
Shyam Prasad Pant	2nd	Water Resources Conservation and Management Practices in context to Climate change in Upper Bagmati River Basin	NEC
Archana Chaudhary	2nd	Climate Variability and Trends in Water Induced Disasters in lower Bagmati River Basin	NEC
Manina Baidya	2nd	Potential of Wastewater Reuse for Water Security in Agriculture: A Case of Harisiddhi Wastewater Treatment System	NEC
Sanchita Kaduwal	3rd	Climate change and variability effects on livelihoods in the upper, middle and lower Bagmati river	NEC

		basin	
Sumana Parui	3rd	Assessment of appropriate community based adaptations (CBA) and ecosystem based adaptations to climate change impacts with a focus on sustainable livelihoods	NEC
Kul Man BK	3rd	Role of governance, institutions, and social safety net programmes in strengthening resilience to shocks and stresses to livelihoods	NEC
Neekita Joshi	3rd	Severity of Climate Induced Drought and its Impact on Migration: An Assessment through Mapping in Ramechhap District using GIS and Remote Sensing	
Neha Basnet	3rd	Assessment of the viability of Adaptation measures in response to the impact of climate change. (study of patlekhet 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

IDRC | CRDI

SUMMARY

As part of the South Asia Water Fellowships (SAWA), a review workshop was organised for the first batch of SAWAS Fellows on May 29, 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 first batch of the SAWAS 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 4 students could not join at the review workshop.

ORGANIZERS

SaciWATERs : the South Asia Consortium for Interdisciplinary Water Resources Studies, is a policy research institute at 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 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

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

WORKSHOPS OBJECTIVES, PARTICIPANTS PROFILE AND EXPECTED OUTCOMES

OBJECTIVES

The main objective of this training programme was to bring together the first batch of SAWAS Fellows from Bangladesh, Sri Lanka, Nepal and India to present their masters dissertation work among their peer 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 for them to be able 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 first batch of South Asia Water Studies (SAWAS) fellowships, through a competitive process from each of the four partner institutes. All participants were pursuing post-graduate 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. Priyanie 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, South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERs). Hyderabad, India
- **Ms. Jyoti Nair,** Research Associate, SaciWATERs, Hyderabad, India.

The SAWAS Fellows presented their masters dissertation, each student was allotted 15 minutes for presentation with 10 minutes discussion and comments from the reviewers. Each reviewer was assigned with few papers based on their area of expertise prior to the workshop. Respective reviewer gave specific comments post the student 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 given to them in specific and also benefitted from other students presentation which dealt with similar topic. Dr. Anamika Barua summed up the workshop with a brief presentation on 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 ASIAN WATER FELLOWSHIPS REVIEW WORKSHOP 'WATER SECURITY'

23rd May 2016

SUMMARY

A Review workshop on 'Water Security' was conceptualised under the aegis of 'South Asia Water Fellowships' (SAWA) project and organized by SaciWATERs with support from IDRC and CapNet. The workshop was held on May 23, 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 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 student's research there were sessions on 'Interdisciplinary approach to Water Resource Management' and 'Problem to Proposal'. The workshop targeted 18 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).

ORGANIZERS

SaciWATERs: the South Asia Consortium for Interdisciplinary Water Resources Studies, is a policy research institute at 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 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)

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)

Cap-Net UNDP is an international network for capacity development in sustainable water management. It is made up of a partnership of autonomous international, 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 second batch of South Asia Water Studies (SAWAS) fellowships, 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 Masters' 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, South Asia Consortium for Interdisciplinary Water Resources Studies (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 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 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 PI.

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

- Student's research has been able to capture a wide number of issuses 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 program 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 a 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.

<u>Reflection on SAWA fellows' research by Prof. Nimal:</u>

Extended abstract of the students was 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 project and then the concluding remarks. He categorized 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 to go the field, meet the community use various PRA tools and then trying to incorporate the needs of the society and trying 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 ***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, constraints encountered into their thesis so that the final outcome is also justifiable.

Reflection on SAWAS fellows' research by Prof. Mollinga:

Professor Mollinga talked about the collection as a whole. He looked at it from a question on ***'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. There is a type of research that is very strong in the papers is fieldwork is about data collection.
- Anthropology, Sociology and certain kinds of Economics are not about data as such. It is about investigating and documenting relations, causalities, processes etc.
- On the Social Sciences side there is

> *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*

very little theoretical grounding that'll help you think and an interdisciplinary way while there is sufficient literature review done 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 and multidimensional and they 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 influence each other.
- The second element of the wickedness is kind of political wickedness, that there is not one best solution.

One way to operationalize 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 observation made was what is the capacity of that kind of interdisciplinary conceptual modelling of Research question? Do you feel 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 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 1st semester

Interdisciplinary approach to Water Resources Management: Dr. Anju Gaur

Dr. Gaur laid emphasis on the need of interdisciplinary water professionals in todays' world in organizations like 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 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. ***Urbanization and peri-urbanization: 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***
- Urbanization, 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 Nelliyat***
- 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 Socio-Economic 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 Privatization 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, Bangladesh Kathmandu 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	
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			
	Government Organization	**Academic institution**	**National/ international NGO and others**	**Higher study**
Samiul	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		
G.M.P. Kumara				Ph.D. at Saithama University, Japan
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		
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 on June 7, 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 has also currently passed UPSC examination that is the highest level of qualification in India to get into the Indian Administrative and Police Services. She is awaiting a interview.