

Impact oriented research for development: A case from Crossing Boundaries Project

by

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1. Introduction

The Crossing Boundaries (CB) project aims to contribute to the paradigm shift in water resources management in South Asia, summarised in the concept of IWRM (Integrated Water Resources Management), by means of a partnership-based programme for capacity building of water professionals on IWRM and gender & water through higher education, innovation and social learning focussed research ('research with an impact'), knowledge base development and networking.

SaciWATERS, the South Asian Consortium for Interdisciplinary Water Resources Studies, based in Hyderabad, India and the Irrigation and Water Engineering group at Wageningen University, implemented the project with six South Asian partner institutions namely;

- *Bangladesh Centre for Advanced Studies (BCAS), Dhaka, Bangladesh*
- *Institute of Water and Flood Management (IWFM), Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh*
- *Centre for Water Resources (CWR), Anna University, Chennai, Tamil Nadu, India*
- *Tata Institutions of Social Sciences, Mumbai, India*
- *Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka and*
- *Nepal Engineering College of Pokhara University, Kathmandu, Nepal.*

The activities of the project take place at two levels, the national and the South Asian. The university Partner Institutions (PIs) implement the national level activities. The regional South Asia level activities are coordinated and implemented by SaciWATERS. For implementation of the project the CB Project Office was established in Hyderabad, India, in the SaciWATERS office. Wageningen University provides support and backstopping activities at both the South Asian and national levels, and selected substantive inputs. Wageningen University is the budget holder of the project and the DGIS of the Government of Netherlands is the contract partner.

The Partner Institutions Meeting (PIM), which comprises of two representatives of each PIs, CB staff and Task Manager of the CB Project, is held annually to review the progress of the CB Project and to prepare the activity plan and estimates for the coming year. This meeting is followed by the Project Advisory Committee (PAC) which will review the progress and approve the activity plan prepared at the PIM with necessary modifications.

2. Project activities

The project has three major components, namely education, research and dissemination and networking. The education component consists of postgraduate fellowships, curriculum revision, staff training and staff/student exchange.

The project provides support to conduct impact oriented research by providing 20 PhD research fellowships, research staff and facilities to conduct research. In addition, the project facilitates annual research workshops and bi annual international conferences

The activities of third component of Knowledge base development, networking and outreach include the development of reader series in different aspects of IWRM and promoting women water professionals through networking.

The activities to be carried out by the project and the progress made during first two years of operation are given in Annex 1.

This paper highlights the strategy followed during the development of the research programme under the crossing boundaries Project and discusses the implementation plans to achieve the objectives as specified in the section 3 below.

3. Formulation of research proposals

While new research and innovation in the different water resources disciplines is important, the notion of 'integration' remains elusive, particularly that between natural/technical science perspectives and social science perspectives. Innovative research is – therefore – needed to enhance the IWRM knowledge base. Such knowledge is best developed in the concrete context of real water resources management problems, and efforts at intervention, transformation or reform towards IWRM.

The CB Project provides support to each south Asian partner institution to carry out this innovative research programme by providing resources to enrol 4 research coordinators, 15 PhD and 160 masters students during the project period. Inputs from the CB Staff, funds for research activities and stakeholder meetings will also be provided by the CB Project.

3.1. Preliminary discussion at Partner Institution Meeting (PIM)

The process to be followed for the formulation of research proposal for each PIs was discussed at the first Partner Institution Meeting (PIM) held in Hyderabad from 13th to 14th July 2006. The consensus of members was to select a geographically delineated area (or river basin) to conduct the research programme for the Partner Institutions (PIs) rather than spread the resources available for scattered and individual research. To have an impact, the research theme should address current problems in water resource management in their own countries.

3.2. Brainstorming

The formulation process of the research programme for PIs started with the appointment of Research Programme Manager (PRM) at each PI. They are permanent academic staff members of the PI and expected to coordinate the

research programme. Staff training activities which bring academic staff together was used to generate ideas for research. Three brainstorming sessions were conducted on 20th August, 20th September and 13th October 2006 in Bangladesh, Sri Lanka and Hyderabad respectively to transform the ideas in to a research programme through discussions and feedback from academic staff from PIs.

It was agreed to send the draft research proposals from PI to Saciwaters by November 2007. The proposals received were technically oriented and lacked interdisciplinarity and some of the parameters defined by the CB Project as summarized in section 3.3. Therefore a training programme on research proposal preparation was proposed.

3.3. Training workshop on impact oriented research

The staff of Partner Institutions met in Katmandu, Nepal from 21st to 22nd February to re-formulate their research proposals based on the parameters set out by the CB Project. Dr Peter Mollinga, the Task Manager of the CB Project made a presentation on “what are the main starting points” in formulating the CB research theme in each PIs to make sure that it would address a “problem” and also produce “an impact” at the conclusion of the project. How it is to be done through “participatory” methods through an “interdisciplinary” approach were also discussed (The presentation made at the training workshop can be downloaded from CB Website). The morning session on 21st February was allocated for the presentation and discussion.

Proposals were re-formulated based on the feedback from the CB Task Manager and CB Staff. The representatives from Partner Institutions agreed to discuss the formulated research themes with their colleagues and hold stakeholder meetings before making their final presentation on 23rd March 2007 soon after the conclusion of first South Asia Water Research Conference on “Water Access and Conflicts: Implications for Governance” organized by the project at CWR in Chennai, India from 21-22 March 2007.

The three presentations each from BCAS/BUET, CWR and PGIA were made in Chennai, India, in front of group of invitees to generate intensive discussion and get their feed back. The PIs agreed to finalize the proposals after incorporating the suggestions made at the meeting. This Chennai meeting was the last in the series of meetings conducted by the CB project to develop the CB research programme at each PIs.

4. Research proposals of Partner Institutions

The final research proposals presented gave the broad thematic area under which the PhD and Master’s research studies will be conducted. Thus, each proposal has identified a broad thematic area, which is divided into five sub themes, to be addressed by 5 PhD Students, with several issues. The summary of the research proposals of the three partner institutions are given below under section 4.1, while the full proposals are available at the CB website.

4.1 Summary of research programme of IWFM, BUET

The research programme of IWFM under the Crossing Boundaries (CB) project focuses on a geographical location in the agro-ecological zones, AEZ-12 (Low Ganges river floodplain) and AEZ-14 (the Gopalganj-Khulna Beels), covering the districts of

Narail, Gopalganj and Faridpur in Bangladesh. The research programme will be carried out in collaboration with on-going projects of Bangladesh Water Development Board (BWDB) and Local Government Engineering Department (LGED) with the expectation that the research findings would be useful for the on-going projects, and provide fruitful contributions to enhancing sustainable water management in the selected region.

The overall landscape feature of the study area is quite complex due to the presence of many wetlands, which are important habitats for a wide variety of wildlife, fish fauna and aquatic flora, and important locations of seasonal fishing activities. Agricultural land covers major part of the study region, and agriculture is the dominant occupation of the rural population. The study region is among the highest poverty-stricken parts of the country. The majority of farmers are landless people and marginal farmers who live below the extreme poverty line and the majority of small holders fall below the moderate poverty line.

There are several water management issues in the study area that merit attention. One important issue is the weak performance of water management infrastructures. One of the main reasons of the weak performance is the lack of stakeholder participation in water management, thus not meeting diverse stakeholder needs, in particular the poor. Construction of roads without giving attention to floodplain functions has worsened the situation. Major parts of the study area are under tidal influence from the Bay of Bengal, and damage to dry season crops at the later part of the dry season due to saline water inundation during the spring tide is an issue. Lack of perennial surface water sources due to upstream withdrawal from the Ganges is a major reason for the scarcity of irrigation water in the dry season. Agricultural water supply is thus heavily dependent on groundwater supply. Agriculture in the study region plays a dominant role, yet its productivity is lagging behind the national average. Anthropogenic activities, e.g. water abstractions, and flood control and agricultural encroachment have led to shrinking of wetlands, and hence have had adverse impacts on ecological environment of wetlands. Construction of flood control schemes has caused obstruction in fish migration route between rivers and beels and wetlands, thus causing adverse effects to capture fisheries, the means of livelihood activities of a major portion of the poor people. River bank erosion in regional rivers is a concern; erosion has resulted in loss of agricultural land and homestead and displacement of people.

Considering the above water management issues, a central theme for the research programme has been defined as *"Sustainable Management of Land, Water and Ecological Resources"*. A total of twelve possible areas of research under the central theme have been suggested. The research areas focus on land unit delineation for participatory water management, participatory decision making in water management, mainstreaming gender in decision making, participatory operation and maintenance of infrastructures, systems simulation and indicator-based model development for prediction of impact of water management decision on development goals, design and siting of multi-functional and eco-friendly infrastructures, rationalization of existing infrastructures, equity considerations in participatory operation of infrastructures for different water needs, equitable water allocation among competing needs, conflict resolution, floodplain land use regulation, and environmental flow protection.

4.2 Summary of research programme of PGIA

Currently, water pollution is one of the main concerns in the water sector of Sri Lanka. Though, the country is blessed with water resources, pollution of surface and sub surface water is a serious environmental concern with the increasing population, rapid urbanisation and intensive agricultural and industrial activities. Careful analysis of this problem reveals the interconnected nature of most of the activities which led to pollute the water resources. Therefore, it is important to identify the causes of the problems and approach it in an interdisciplinary manner so that the problem can be well understood as well as the management interventions can be formulated effectively.

Within this background, the research programme of the CB project is oriented around the thematic area of '*water pollution*'.

The geographical boundary for research is the catchment area of Mahaweli river from Kotmale dam to Randenigala reservoir. This area covers a diverse set of land uses such as built up areas (cities), natural forests, farmlands, paddy fields, tea plantations, Kandyan home gardens etc, and also consists of a very complex topography. The area falls mainly within the Wet Zone of Sri Lanka which receives intensive rains particularly during the wet season where the total annual rainfall reaching well over 2500 mm. All these conditions have contributed to develop a very favourable setting for pollution of Mahaweli water within this reach.

Mapping of the issues related to water pollution in the study area revealed the contributing causes and their connectivity. Hence five themes namely, Solid waste disposal, Health and sanitation in estate and rural communities, Soil erosion and landslides, Institutional and financial aspects in urban and rural water supply systems and Low cost wastewater treatment techniques were identified for the formulation of main research questions by the students. Under each of the five research sub-themes, several research issues and objectives have been identified.

The ultimate goal of the research programme is to improve water quality of the river Mahaweli in order to provide good quality water for domestic, irrigation, hydropower and recreational purposes in a sustainable manner while maintaining the health of water resources and associated ecosystems. The overall research objectives are to

- Introduce technically sound, economically feasible, environmental friendly and socially accepted approaches and techniques to reduce the pollutant loads to the reach of Mahaweli from Kotmale dam to Randenigala reservoir.
- Strengthen the formal and informal institutional mechanisms related to water pollution issue in the study area to improve the effectiveness of their activities considering technical, social, financial and environmental dimensions.

4.3 Summary of research programme of CWR

The Chennai city is the capital of the Tamil Nadu state and one of the four major metropolitan cities of India. Chennai city is located in the northeastern corner of Tamil Nadu state and is a coastal city. The city of Chennai has been growing alarmingly, with the population exponentially increasing in the past few decades. The present population is estimated as 60 lakhs and at 140 lpcd water requirements

works out to 840 mld for drinking and domestic needs alone, besides other uses. Chennai is also experiencing expansion of the metropolitan limits, changes in land use and increasing dependence on sub urban areas for natural resources input, pushing up problems of housing, transport congestion, solid waste disposal, and impacts on water supply and sanitation for people.

Since, urbanization is leading to problems for water resources of the city and its periphery, "*the impact of urbanization on the water resources, its availability and its quality in urban, peri urban areas of Chennai city*" is chosen as the main theme of the study.

The conflicts in water availability, access to water, competition between water demands, sectors, urban and peri urban areas, changes in land use, waste disposal, and impacts of pollution are the direct consequences of unplanned and unregulated urban development (urbanization) and expansion of population in Chennai city. While several of these issues and their combinations are relevant in parts of the city and its suburban areas, the problem of water transfer from peri urban areas, conflicts in access and distribution and the issues in sanitation, public health and livelihood dependence and the booming infrastructure IT industry in part of the city are among the leading peoples' problems that merit attention. The emerging water market in Chennai and the packaged water use are indicative of the shortcomings in the public distribution system.

The decade long spurt in IT sector development and the housing sector not so well regulated in the southern part of the city has led to a chain of problems, the drainage congestion - flooding of an expanding solid waste disposal site – encroaching a vast wetland, the Pallikaranai marsh and polluting it, besides the disappearance of many water bodies.

The losing importance of agriculture as a profession in peri urban areas, water supply for the city, the generation and sighting of water packaging industry, impacts of groundwater exploitation, local access to water and its impact on sanitation and health are important problems at present being faced by peri urban communities. The peri urban water bodies are being polluted, loss of inflow channels and water supply affect their multiple socio-ecological roles in the peri urban context.

The following five issues of research from among the problems/issues listed above have been identified and proposed for study.

- Water market in Chennai: Economic and Social and Gender dimensions
- Impacts of urbanisation on Groundwater, Sanitation and Health issues.
- Flooding in South Chennai: Urbanisation and Drainage implications for sustainable development
- Solid waste dumping and its impacts on groundwater quality
- Impacts of urbanisation on the ecological sustainability of peri urban water bodies

5. Linking research programme to the ongoing projects

One of pre-conditions specified in the CB project document is to conduct the research programme of each PIs in collaboration with an on-going project so that the project and society are directly benefited by research results. In Bangladesh, the research

projects are to be located within “Southwest Area Integrated Water Resources Planning and Management: Bangladesh” project co-funded by the Asian Development Bank and the Government of the Netherlands (BWDB, 2005). Major components of the project will be implemented by Bangladesh Water Development Board (BWDB). Other components will be implemented under the Small Scale Water Resources Development Sector Project (SSWRDSP) of Local Government Engineering Department (LEGD). BWDB is responsible for command areas greater than 1000 ha, while LGED is responsible for command areas smaller than 1000 ha. The activities of LGED also include conversion of rural roads to road-cum-embankment.

In Sri Lanka, the research projects were aligned with the existing projects and networks related to water pollution in the area such as Water and Environmental Sanitation (WES) Program of PLAN Sri Lanka, Greater Kandy water supply and sewerage project funded by Japan International Corporation Assistance (JICA), Water Dansih water supply project, projects operating in Walapane area for resettlement of landslide affected people, solid waste management project of the *Kadugannawa Pradeshiya Sabha* (a local government organization), Asian Institute of Technology and Swedish International Development Assistance Link project, etc. Network on Capacity Building in Integrated Water Resource Management (CapNet Lanka) also work closely with the CB research project since CapNet-Lanka and CB Project are located at the same host institution, i.e. Postgraduate Institute of Agriculture.

The linking of research projects to ongoing projects has materialized mainly because of the project requirements and the facilitation provided by the CB project staff. The academic staff of the PIs also realized the importance of these linkages after having extensive interaction with the CB project through various training programmes and meetings. During visits to partner organizations, CB staff discussed the strategies to link the research programme to existing projects and also participated at many meetings with the stakeholders. Arranged meeting with the relevant institutions and individuals and inviting them for stakeholder meetings, contacts of the academic staff with the officials of the project implementation agencies, enthusiasm and the need for implementing Agencies to address important research issues have helped to develop the linkages between CB research programme and the ongoing projects.

6. Research coordinators

Under the CB Project a Research Coordinator was appointed for each of the partner institutes with the main responsibility of providing guidance to the Ph.D. fellows. It was unanimously decided by the CB staff and the partner institutes that the ideal Research Coordinator should have a Ph.D in relevant engineering discipline with background in social science or a Ph.D in social science with working experience in water sector.

The TOR of the Research Coordinator are as follows:

- Provide day-to-day guidance to the PhD fellows, in collaboration with the academic supervisors of the PhD fellows
- Ensure integration between Ph.D and M.Sc theses
- Organise and facilitate the process of stakeholder involvement in the research programme.
- Organise and facilitate interaction of the research activities with the policy & practice domain: assure ‘impact’ of the research

- Liaise with government agencies with direct stake in the research programme
- Conduct own research in the programme and publish
- Do administrative and financial day-to-day coordination of the research component
- Liaise and interact with counterparts in other PIs and CB Office.

All the four RCs have been appointed and at present spearheading the research programme at each PIs along with the RPM and academic staff. Three of the RCs have social sciences/economics back ground whilst one has a civil engineering degree with postgraduate qualification in interdisciplinary research. The PIs have opted for candidates with social sciences/economics background since technical expertise area available in-house and needed an input in social sciences/economics to facilitate the research programme.

7. Implementation of the research programme at PIs

The implementation of the Research Programme commenced from April 2007 with initiatives made to appoint Research Coordinators (RC), Research Advisory Committees (RAC) and enroll PhD students at each Partner Institutions. BUET and PGIA had a good head start with the appointment of RC, RAC and PhD students while CWR enrolled completed all the above tasks at the end of 2007. NEC has only developed the draft proposals since they were included in the project only during the latter part of 2007. While progress of the research programme at each PIs is at various stages, the process followed during implementation is explained with examples taken from the PGIA, the PI in Sri Lanka, to illustrate the interventions made to steer the research programme according to the parameters specified by the CB project. Accordingly, the research programme should;

- address a current problem in water management,
- employ an interdisciplinary approach,
- conduct through participatory approach, and
- lead to an impact.

The following sections describe the attempts made by the PGIA, as an example, to comply with the conditions spelled out by the CB Project.

7.1 Selected theme as a major water management problem

The possible research areas were discussed at the PGIA as soon as the project approval was communicated in November 2005. It was decided at that time to conduct the research in a selected river basin (Mahaweli) so that a holistic IWRM approach could be adopted to address the issues identified in a river basin scale. These issues in Mahaweli basin were fine tuned further during 3 brainstorming meetings in 2007. However, the problems listed by the PGIA was prioritized and present proposal to address water pollution in a selected river reach was adopted during the training workshop on research proposal preparation in Kathmandu, Nepal on 21-22nd February 2007. Resources provided by the CB Project, time period available for research and the intention of having an "impact" at the end of project period were the reason for not spreading the resources thinly over a wide range of issues. Later this selection was proved right as events unfolded after three months of finalizing the proposal as shown in the box 1.

Box 1: Water Pollution in Gampola

Headline news items on a Sri Lankan daily (Lankadeepa) on 26th May 2007 reported that Gampola city located 8 km upstream of PGIA, University Peradeniya had a protest rally on 25th May 2007 (This city is located inside the project area). According to the article, all the shops in the city were closed and the banners displayed by the people who went through the city streets carried slogans against the National Water Supply and Drainage Board (NWSDB).

The problem was that water supplied to the city contaminated with Hepatitis bacteria (as a result to human excreta). Epidemiologists reported that 13 out of 14 samples collected from the headwater sources were contaminated with human excreta as reported in the news paper. This was mainly due to the lack of adequate sanitary facilities to the community. The Medical Superintendent of Gampola Hospital has reported that number of patients coming to the hospital varies from 50-100 per day. Patients have been sent to peripheral hospital such as Peradeniya, Nawalapitiya, Ulapane and Kuruduwatta and private hospitals too.

The findings from several investigations were used to facilitate public information campaign in June 2007, where a media tour with involvement of 18 media units (both print and visual) was conducted with support from three NGOs (Sri Lanka Water Partnership, *NetWater* and Centre for Environmental Justice) to increase national awareness on the need for an integrated remedial action plan. The resultant media coverage increased public awareness and brought the issue to the notice of political decision makers. As a direct result of the campaign and growing public outcome the NWSDB was called to a special presentation before the President of Sri Lanka, who gave a directive that a catchment conservation plan bringing together all stakeholder agencies be formulated for Gampola and Paradeka, which has to be replicated in other parts of the country to avoid repetition of similar incidents.

7.2 Interdisciplinary approach

From the inception inputs were provided by the CB project to shape the existing technical oriented curriculum towards interdisciplinary programme. These changes has to be supported by a research programme to make this transformation effective. Therefore, formulating an interdisciplinary research programme has been constantly insisted upon and the themes and sub-themes were so designed to capture the interdisciplinary aspects. This is followed by the appointments of PhD candidates of different backgrounds and attempt to work cohesively in designing the detail research methodology as discussed below.

a) Development of sub-themes

As given in the detailed research proposals, the ultimate goal of the research programme at the PGIA under the CB Project is to improve water quality of the river Mahaweli in order to provide good quality water for domestic, irrigation, hydropower and recreational purposes in a sustainable manner while maintaining the health of water resources and associated ecosystems.

The overall objectives of research programme are to:

- Introduce technically sound, economically feasible, environmental friendly and socially accepted approaches and techniques to reduce the pollutant loads to the reach of Mahaweli from Kotmale dam to Randenigala reservoir.
- Strengthen the formal and informal institutional mechanisms related to water pollution issue in the study area to improve the effectiveness of their activities considering technical, social, financial and environmental dimensions.

The water pollution issue is interconnected and hence need to identify the network of issues to be researched. Therefore, mapping of the issues related to the problems reveals the contributing causes and their connectivity as described in Figure 1. Accordingly, the five sub themes were identified for the formulation of main research questions as follows:

- Solid waste disposal
- Health and sanitation in estate and rural communities
- Soil erosion and landslides
- Low cost wastewater treatment techniques
- Institutional and financial sustainability of urban and rural water supply and sewerage systems.

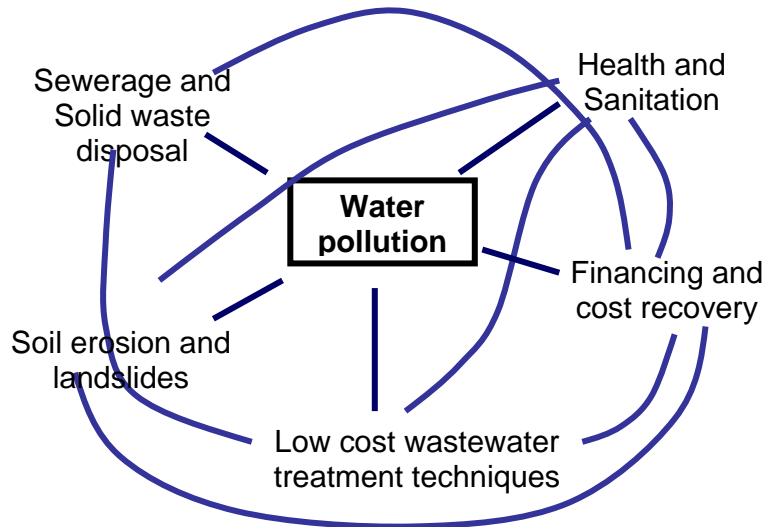


Figure 1: Mapping of issues related to water pollution in Mahaweli

The draft research proposals of each of PhD students have been prepared with detail methodology. However, this needs to be finalized along with the formal appointment of academic supervisors. The main objective which reflects the nature of study is given in Table 1 along with the educational background (both undergraduate and postgraduate) of the students. It is anticipated that students with this diverse background would help to capture the interdisciplinary aspects of the research, as already experienced during the interactions observed during presentations by individual students.

The summary objectives with respect to the five sub-themes are summarized as shown in Table 1.

Table 1. Sub-themes and the objectives of research proposals at the PGIA

Five sub-themes and the background of 5 PhD students	Objectives
Solid waste disposal (Humanities ¹ , Sociology ²)	To develop an effective process to reduce solid waste disposal to river Mahaweli through community participation by intervening to address underlying socio-cultural, economic, political and gender-related factors.
Health and sanitation in estate and rural communities (Agriculture ¹ , IWRM ²)	To develop of a sustainable sanitation programme for Pusella Oya catchment of the Mahaweli river by a demand-oriented approach
Soil erosion and landslides (Agriculture ¹ , Soil Science ²)	To develop management strategies to minimize soil erosion and landslides in Kurundu Oya catchment of the Mahaweli river.
Low cost techniques for waste water treatment (Civil Engineering ¹ , GIS ²)	To develop catchment-based low cost waste water treatment systems
Sustainability of urban and rural water supply and sanitation services (Agriculture ¹ , Economics ²)	To develop alternatives to improve cost recovery of water supply and sanitation services through various policy instruments to ensure sustainability of institutions which provides water supply and sanitation services in municipality, peri-urban and rural areas.

¹/ Undergraduate degree

²/ Postgraduate degree

b) Implementation Strategy

The research programme has been designed for the M.Sc., M.Phil and Ph.D. students (Total number of 45 (24 M.Sc., 16 M.Phil. and 5 Ph.D.) of the Integrated Water Resources Management (IWRM) postgraduate degree programme of the Postgraduate Institute of Agriculture (PGIA), University of Peradeniya, Sri Lanka. The sub-themes is mostly concentrated on the research areas of five Ph.D. students. Sub components of the main research can be undertaken by the M.Phil and M.Sc. students.

Five PhD Students with different disciplinary background was awarded the fellowships under the CB Project at the PGIA to lead the five themes selected as shown in Table 1. The first batch of SAWA fellows, who were admitted to the IWRM programme in 2006 and undergone the field research methodology training in Mumbai, India for two weeks are working along the PhD students. For example, information on extended cost-benefit analysis is needed to estimate tariff structure for the proposed sewerage project for the 5th study. One of the M.phil student is studying this aspect in a selected community to estimate the pollutant load and valuate its environmental cost. The PhD respective PhD student, in addition to the academic supervisor guide this M.Phil student during the research project.

The continuous dialogue between the IWRM staff, CB Research Coordinator and PhD, MPhil and Msc and students helps to formulate the research programme in such a way to address all the aspects in a holistic, interdisciplinary manner. The members of RAC are invited at regular intervals to attend student's presentations so that their advice also can be incorporated to the research programme as it develops.

The synchronization of individual research themes are very much needed for better outcomes. For example, findings of the 2nd study on sustainable sanitation programme for Pusella Oya catchment of the Mahaweli river by a demand-oriented approach is required for the 5th study to develop alternatives to improve cost recovery of water supply and sanitation services through various policy instruments to ensure sustainability of institutions which provides water supply and sanitation services in peri-urban and rural areas.

7.3. Participatory approach

Participatory approach has been used from the inception of the CB research programme at each partner institutions unlike conventional individual technical research that the selected PIs of CB project is used to. All three partner institutes, i.e. BUET, CWR and PGIA held their first stakeholder meetings between February end (after the first Research workshop in Katmandu held on 20-21 February) and March 2007. The feedback received from these stakeholder meetings have been incorporated in the final research proposals.

PGIA had two stakeholder meeting on 5th and 13th March 2007 before finalizing the research proposals, where representatives from various organizations and bodies participated. A total of 38 participants, representing the local and national organizations which have a stake in the research problems identified, were present in the second meeting. A total of 9 members out of this list were selected as members of the Research Advisory Committee (RAC) as shown in Table 2.

The methodology of almost all individual proposals include the use of technological tools such as physical and numerical modeling approaches, GIS and remote sensing, design and development of novel technology, instrumentation etc. However, all sub-themes will also use various Participatory Rural Appraisal (PRA) tools along with social and gender analysis tools. Special attention will be paid to variables such as key stakeholders, social and gender relations, institutional linkages, etc. In addition, the researchers will work closely with the existing projects and networks related to water pollution in the area such as field based NGOs, foreign funded projects, major water supply and sanitation service providers of the central and local government, private sector and civil society organizations.

7.4 Impact of the research programme

All the PIs have identified the expected outcomes of their research programmes at the end of project period. The specific outcomes expected from the research programme at the PGIA are given below.

- Mapping out the problem of water pollution, hydrological system, hydrological and ecosystem changes due to soil erosion, landslides, waste water disposal and poor sanitation in Mahaweli from Kotmale to Randenigala.

- Simple, low cost, technically sound, socially accepted environmentally friendly techniques for wastewater purification and handling of solid waste.
- New land use and resettlement proposals considering social and livelihood aspects with special consideration on gender issues.
- Improved health and sanitation in rural and estate communities.
- Improved institutional arrangement to reduce water pollution of Mahaweli in the study area
- Acceptable cost recovery mechanisms and policy instruments to sustain water supply and sanitation services
- Advocacy programmes for sustainable management of water resources

The Research Advisory Committee (RAC), which has been appointed at all PIs, is expected to play a major role during the implementation of research programmes. This PAC comprised of researchers, policy makers, practitioners, professionals, academics, NGOs etc so that they would be able to provide:

- access to networks and organisations in the research area.
- expertise that is complementary to the expertise available in the PIs.
- links with policy and practice, which can help to assure 'impact'
- links with stakeholders groups/organisation

This committee does not have any legal binding with the institution and, therefore do not have any involvement in academic matters of the PIs. The RAC acts as a sounding board and platform for discussion in addition to provide advice. Formal decision-making is located within the PI which convenes the RAC at regular intervals. The members of RAC are invited for various activities organized by the CB Project in each PI, such as regional workshops, symposiums etc.

PGIA has set up the RAC comprising of nine members coming from various backgrounds – professionals, practitioners, NGOs, business, academics, government departments, as shown in Table 2. The first RAC meeting was held on May 25, 2007. The major outcomes of the meeting were to have;

- a clear understanding to the role of the RAC in the research programme
- clarification of type of support the members would provide
- RAC meetings once in three months, and
- agreement to permit research students to meet any of the members any time they needed.

The list of RAC members, their affiliations and the support that they could provide to implement the research programme at the PGIA is indicated in Table 2. In addition to providing the guidance, the members of PAC has been very helpful in providing access to institutional resources including the supply of information. They could also facilitate the process of transferring research information to practice and policy.

Table 2. Members of Project Advisory Committee (PAC) and their area of influence

	Designation & Affiliation of the PAC member	Area of influence
1.	Director, Head Works Operation & Maintenance, Mahawelli Authority of Sri Lanka (MASL)	In-charge of all the headwork reservoirs of Mahaweli river and has a mandate to protect its water resources.
2.	Executive Director, Environment and Forest Conservation of MASL	Has a mandate to implement catchments management activities to assure regular supply of good quality water to Mahaweli specially through the prevention of Soil erosion and land slide
3.	Consultant Community Physician, Provincial Directorate of Health Services	In charge of Health and sanitation services to the population in Central Province
4.	Deputy Chairman, Central Provincial Council	Member of provincial council elected by people. Also the president of the environmental committee. Helps to provides access to local bodies, people and the government
5.	National Advisor, Water & Environmental Sanitation Program, PLAN Sri Lanka	National NGO with many field based programmes funded by foreign donors.
6.	Associate research professor, Institute of Fundamental Studies	Scientist with long years of experience in water quality research
7.	Asst. General Manager, National Water Supply & Drainage Board, Central Province	Mandated to provide water supply and sewerage services as the main service provider. All the forieng funded projects in the sector are implemented through this organization
8.	Scientists, National Building Research Organisation	Government organization mandated to conduct research on landside hazards and implement regulation on construction and settlements in land slide prone areas.
9.	Businessman, Kadugannawa Town	Interested volunteer to support environmental conservation activities. Has a strong link to local organizations and people

8. Concluding remarks

The first set of activities employed during the initial implementation period of the project was to shape the technically oriented water resources management curriculum of three partner institutions towards an interdisciplinary programme through introduction of three new courses, namely Field Research Methodology, IWRM and Gender and Water. The strategy to be followed and the consent towards change were achieved through intensive discussions with the senior academics of the PIs. In some discussions, the experiences of introducing the IWRM programme at the

PGIA by reorienting the soil and water engineering postgraduate programme was discussed. Constraints and the difficulties faced and the shortcomings even after five years of commencements rather than success stories has to a certain extent helped to convince senior academics of PIs to venture into an interdisciplinary programme proposed under the CB Project. The implementation process to incorporate three new courses commenced with the holding of three staff trainings during the second half of the year 2006, as shown in Annex 1 to train academic staff and formulate the course capsules. Most of the academic staff has never been exposed to disciplinary areas covered in the staff trainings. These training activities have sensitized them to think beyond technical solutions in addressing water resources management issues. The input from the CB project to train academic staff of PIs is to be continued throughout the project period. The next staff training on Participatory Field Research is scheduled in April 2008 in Katmandu, Nepal.

The academic staff, especially the younger group, has very little exposure to societal issues since they have been participating in technical courses, conducting research along the same disciplinary areas and attended workshops and symposiums limited to their identical professional group. Continuous exposure to training programmes on societal issues and events which addresses water resources management problems in interdisciplinary manner has to a certain extent reoriented these technically qualified academic staff to change their mind set and modify the teaching materials of the traditional engineering courses that they teach. A proper evaluation at a later date should be able to capture this transformation in the teaching programme of the Partner organizations

The project also has taken initiatives to help formulate the research programme gradually along with the curriculum change process with clear interventions at various stages. The academic staff of PIs was trained on Field Research Methodology in Netherlands and Spain by the staff of Irrigation and Water Engineering Group of the Wageningen University in June 2006. This training programme was followed by a staff training in field research methodology in Bangladesh to adopt the +training materials of the Wageningen course to South Asian context in August 2006. One day at the end of each staff training activity was allocated to discuss the research programme among the academic staff of PIs in August, September and October 2006. The change of teaching programme and the formulation of research programme went hand in hand in formulating the research proposals within allocated budget to obtain the maximum benefits. An additional training workshop to formulate the research programme was held in Katmandu after realizing that more training input is required to formulate the research programme along the parameters spelled out by the CB Project.

The second group, i.e. SAWA fellows, was also supported by the project to acquire required knowledge and skills required to conduct research through new introduced courses. In addition, they were trained at Tata Institute of Technology and SOPECOOM in Mumbai, India for two weeks in September 2007. They were given theoretical understanding in water and equity issues and field training in participatory research. This opportunity also provided them to interact with their colleagues from other PIs in different countries in the region and learn from each other. The PhD students will be provided with training at TISS in Mumbai in April 2008. The RPMs and RCs were also summoned for the above training.

This problem based, interdisciplinary research conducted through stake holder participation to have an impact was new to all the PIs. The traditional practice is to

guide the student by the respective supervisor for a specific research project with clear objectives. In this case, academic staff along with the students addresses a common theme in different angles to address a major water management problem identified by the PI. Regular meeting of the academic staff, students and members of the PAC is required to make sure that all the individual research projects are interlinked while ensuring that repetitions are avoided. In addition, five independent thesis which does not address the issue holistically also may not provide the anticipated impact at the end. Therefore, closer interaction of all parties in the project is required to guide the academic and research process. Since this is a new experience in the selected universities in South Asian region, how to proceed with the research programme has to be steered through a learning process with regular course correction by interaction, monitoring and intervention.

Annex 1. The Progress made up to December 2007 against the activities listed in the Crossing Boundaries Project Document (Pages 36-38)

Activity identified in the project document	Output
Specific Objective 1: Education	
1.1 Provide 160 fellowships for mainly (135/84%) female students for obtaining a degree in an integrated water resources Masters programme; shorter term 3-week and 1-week programmes: 435 participants	A total of 64 fellowships were offered. i.e. 26 SAWA fellows in 2006 and 38 in 2007. Out of this 56 are female and 8 are male students
1.2 Introduce or strengthen three course modules in partners' institutions programme on a) IWRM, b) gender and water in South Asia, c) interdisciplinary field research methodology.	CWR introduced a new ME programme in IWRM in March 2006 in which all three new courses have been included. BUET: IWRM is already in the ME programme in Water Resources Management. Field research methodology and Gender and Water courses were approved in May 2007 PGIA: Existing River basin planning and management course was modified to include content to be covered under IWRM course. New curriculum of Research Methodology, Gender and Water and River Basin Planning and Management are being offered in the current semester.
1.3 Conduct 10 (5 years x 2) two-week staff training programmes for staff of partner institutions on selected topics, with input of South Asian and other international expertise.	16 staff trained on Field Research Methodology Training in Dhaka, Bangladesh, 12-20 August 2006. 13 staff trained on IWRM, Kandy, Sri Lanka, 9-19th September 2006 11 staff trained on Gender and Water, Hyderabad, India, 9-19 th October 2006 8 staff trained on Water an Equity, Pune, India, 3-12 October 2007
1.4 Exchange of staff and students among partner institutions.	None
1.5 Hold 15 (3 per year in three different locations) 5-day sub-regional workshops for women Masters and Diploma candidates, for networking/exchange, discussion and training.	Training workshop was held from 1-13 th September 2007 at Tata Institute of Technology, Mumbai, India. A total of 23 SAWA fellows, 2 Research Coordinators and 3 Research Programme Managers from BUET, CWR and PGIA participated.

Specific Objective 2: Research	
2.1 Conduct one 6-7 week training on field research methodology.	10 staff trained on Field Research Methodology in The Netherlands and Spain from 1 st June to 1 st July 2006
2.2 Conduct innovation and social learning oriented research in selected development intervention projects with stakeholder involvement	<p>Brainstorm sessions were conducted during the final day of staff training programmes. First was on 19th August 2006 in Dhaka, the second was on 19th September 2006 in Kandy and the third was on 19th October 2006 in Hyderabad.</p> <p>Research Programme Managers have been nominated for each partner institution</p> <p>Training workshop on Research Proposal Preparation was held for PI staff on 21 and 22nd February in Kathmandu, Nepal.</p> <p>Stakeholder meetings were conducted at BUET, CWR and PGIA</p> <p>Final research proposals of PIs were presented in Chennai on 23rd March 2006</p> <p>Final research proposals were completed by BUET, CWR and PGIA. Draft proposal is ready at NEC</p> <p>Research Coordinators were appointed by BUET, CWR, PGIA and NEC</p> <p>Research Advisory Committees have been formed at BUET, CWR and PGIA</p> <p>All 15 PhD Students (5 at BUET and 5 at CWR and 5 at PGIA) were enrolled</p>
2.3 Hold 5 (one per year) research workshops for 20 South Asian researchers working on IWRM topics, and stimulate joint and comparative publication. Competitive admission and organised around themes.	<p>The first one on "Water access and conflicts in South Asia: Implications for governance" was held in Chennai, India on 21st and 22nd March 2007</p> <p>The second on "Water supply, sanitation and wastewater management in South Asia" was held from 24-26th September 2007 in Kandy, Sri Lanka.</p> <p>The third on "Innovative modelling for IWRM" will be held from 24-26th May 2008 at BUET, Dhaka, Bangladesh. The announcements is available at the CB website</p>
2.4 Hold two International conferences on water resources policy in South Asia, one in year 3 of the project, one in year 5 of the project.	First conference is scheduled to be held in December 2008
Specific Objective 3: Knowledge base development, networking and outreach	

<p>3.1 Produce a series of seven readers on water resources management issues in South Asia (7 funded under this project, already 3 funded under earlier grant, total 10).</p>	<p>First in the series “Integrated Water Management” was launched on 4th November 2006.</p> <p>Second and thirds on Droughts in Asia an Floods in Asia respectively are in the process of preparing for publication</p> <p>Workshop for the fourth in the Series “Gender and Water” was held from 9-13th October in Hyderabad.</p> <p>Workshop for the fifth reader on “Civil Society in Water Governance in South Asia” was held from 10-12th October 2007 in Pune, India</p>
<p>3.2 Strengthen library and Internet resources of partner institutions.</p>	<p>Part of the items procured by Partner Institutions</p>
<p>3.3 Strengthen Women and Water Professionals networks in the South Asia region and establish linkages with other South Asian and international gender & water networks.</p>	<p>Contract was signed with a resource person to for one year period from 15th July 2006 to implement this component</p> <p>Renewed contacts with the network of women water professionals in South Asia</p> <p>Established contacts in Bhutan</p> <p>Film titled “Hole in the Bucket” was produced in Chennai, India</p> <p>Contract is signed to conduct situation analysis study in Sri Lanka</p> <p>Side event by the CB Project at SaciWATERS was held at the Stockholm Water Week held from 12-18th August 2007</p>
<p>3.4 Collaboration withCAPNET-South Asia and IWMI-Tata policy Research Programme</p>	<p>No action taken</p>
<p>Project Office and other organization/management</p>	
<p>4.1 Establish a Project Office to coordinate the project and implement the South Asia-level activities.</p>	<p>Project Office established. Project Director, Senior Fellow, Education/Research, Office Manager, Finance Officer and support staff appointed. Equipment procured. Finance Officer was trained and Computer Software Package (FACT) was installed for financial management.</p> <p>Three Research Associated were appointed on short-term basis to help in the development of Reader series</p> <p>Two new institutions, Tata Institute of Social Sciences, Mumbai, India and Nepal Engineering College, Kathmandu, Nepal have been included as Partners in the Project</p>
<p>4.2 Partner institution meetings (one per</p>	<p>The first meeting was held on 13th and 14th July</p>

year preceding PAC meetings)	<p>2006 in Hyderabad, India</p> <p>The second was held on 14th and 15th June 2007 in Dhaka, Bangladesh</p>
4.3 Project Advisory Committee meetings (one per year)	<p>The first meeting was held on 4th and 5th November 2006 in Hyderabad, India</p> <p>The second meeting was held on 16th and 17th June 2007 in Dhaka, Bangladesh</p>
4.4 Backstopping by IWE/WUR	<p>Input from Dr Peter Mollinga during his visits to the SaciWATERS/Partner Institutions on 6th January, 21st May, 14th July and 3rd November 2006, 18 February, 21 March 2007, and 10th June 2007</p> <p>The input from Wageningen was made on;</p> <p>Staff Training in Field Research Methodology, 1st June-1st July 2006, The Netherlands and Spain: Mr Bert Bruins</p> <p>Staff Training from 12-20th August 2006: Mr Bert Bruins</p> <p>Staff Training in IWRM, 9-19th September 2006, Kandy, Sri Lanka: Prof. Linden Vincent</p> <p>Workshop on Gender and Water, 9-13th October, Hyderabad, India: Dr Margreet Zwartveen</p> <p>Staff Training in Gender and Water, 14-19th October 2006, Hyderabad, India: Dr Margreet Zwartveen</p>