

Launching Workshop to develop a Training Manual on the Impact of Climate Variability in South Asia



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Summary

SCaN in association with the Institute for Resource Analysis and Policy (IRAP) India and Cap-Net UNDP organised the launching workshop for the preparation of a training manual on 'Climate Variability and Impacts on Water, Energy and Food Security in South Asia' which was held in Hyderabad, India on the 18th and 19th of February 2014.

The objectives of the workshop were to create a South Asia level platform for informed debate on the ways to reduce the vulnerability of the region's water, energy and food systems to the impacts of climate variability and synthesising multi level information into a training manual.

The workshop comprised a task group of 10 participants, 6 of whom were experts from different disciplines of the field of water and who were high level professionals. There were 5 representatives from IRAP, 3 from SaciWATERS and 2 international participants representing South Asia region of Nepal and Sri Lanka.

The content of the workshop explored the existing literature, principles, concepts, philosophies and issues relating to Climate Variability globally, but focussed its debate and discussions on Climate Variability in the South Asian region especially the gaps in information available in the literature. The three main areas of debate were

1. How climate variability impacts on water resources and the manner in which they affect the water, energy and food systems in the region;
2. Their impact on the socio-economic systems, particularly the poor and the vulnerable sections (vis-à-vis water security, food and nutritional security, livelihood security and health); and
3. The adaptive water management approaches in the larger framework of integrated water resources management that would mitigate these impacts.

The gaps identified and discussion generated in the workshop was condensed into an informal task list. The experts who attended the workshop would carry out location studies in their respective countries to fill these gaps, and write papers. These papers will feed into the development of modules. The training manual is expected to be used in one of the forthcoming training programmes, to be organized by IRAP-SaciWATERS in collaboration with WALAMTARI, Hyderabad.

A compendium of already synthesised material will be submitted to Cap-Net.

1. Introduction

1.1 Context

Scientific studies show significant impacts of a potential change in climate on the natural resources and consequently on the lives and livelihoods of people, through changes in water, energy and food systems. Such impacts will be more on people in the developing countries, which are in semi-arid and arid tropics, due to their high dependence on the natural resource base and lower resilience to environmental shocks. The poor are more vulnerable to such changes. Climate change will have different implications for different parts of South Asia due to the variations in topography and bio-geographic features, and spatial and temporal variability in hydrology and climate. Extreme variations in climate from year to year cause unprecedented changes in almost all major ecosystems with the type, nature and degree of impacts varying across different regions.

The question is—how does climate variability impacts on water insecurity? Population growth, long term economic growth and rising per capita income, fast urbanization and high growth in the manufacturing sector are resulting in exponential growth in water demand for competitive use sectors and more so in the naturally water-scarce arid and semi- arid regions of South Asia. This, compounded by indiscriminate dump of municipal and trade effluents from fast growing cities into freshwater bodies and return flows from intensively irrigated crop land, is causing enormous stress on freshwater resources. The mounting water resource related problems in the region are manifested by groundwater depletion, quality deterioration and widening gap between water demand and supplies, environmental water stress in major rivers, growing inequity in access to water, and increasing competition and conflicts over water use.

Extreme variations in climate add fresh challenges to already aggravated water management problems in South Asia. It can impact on hydrological systems of the country's river basins by affecting runoff, groundwater recharge and moisture in the soil profile, with significant implications for net water availability in them. It can affect the demand for water in many competitive use sectors, especially in agriculture by changing crop water requirements. Given the inextricable link between water and energy, climate variability can impact on energy systems also. The overall impact can be on freshwater availability for basic survival needs, and food and energy security. The way water resource systems are designed need attention to this impending catastrophe. Along with this, the socio-economic systems affecting the demand for water and energy also need to be changed through institutional and policy instruments.

1.2 Relevance of the Workshop

A full-fledged training manual needs to be developed from the available scientific and empirical research (both published and grey literature) on topics related to climate change and variability, the impact of climate variability on water resources, energy and food systems and their socio-economic and health consequences in South Asia, and adaptive water management approaches within the larger framework of integrated water resources management.

Cap-net had developed a large body of scientific literature, which are relevant for the present theme. They are:

- 1] Integrated water resources management as a tool for adaptation to climate change;
- 2] Integrated urban flood management;
- 3] Groundwater in Integrated Water Resources Management;
- 4] Conflict resolution and negotiation skills for IWRM;
- 5] Economics in sustainable water management;
- 6] IWRM for river basin organizations
- 7] Hydro-climatic disasters in water resources management.

Besides this, the training materials developed by other international organizations cover water demand management. They together help enhance the theoretical understanding of the drivers of climate change and its impact on water use sectors, natural disasters associated with climate extremes, and the options for climate risk mitigation, and adaptation.

But, theoretical/conceptual framework to analyze how climate variability impacts on energy and food systems is extremely limited. In terms of empirical evidence on the actual impact of climate variability on water-climate-food systems, and the socio-economic systems in terms (impacts of droughts and floods on the communities), not much is available for South Asia region. They need to be newly generated.

The technological alternatives discussed for mitigation and adaptation (land use planning, water supply rationing, increasing multi-annual storage of reservoirs) in the Cap-net modules are more suited to developed countries, where not only the level of awareness of environmental problems and impacts is high within societies and ruling class, but also the economic conditions of the people, is generally sound. Their implement-ability, particularly the economic viability and social acceptability for the South Asian context, need to be investigated.

The economic and financial instruments and institutional alternatives for water resources management available from Cap-Net modules/manuals (flood warning systems, water pricing, volumetric water rights, quota, groundwater tax, groundwater permits and pollution tax) and work ideally in western societies, which are developed in terms of knowledge, information, human resource capacities and financial conditions, and are well endowed with powerful laws and regulatory frameworks. Amongst these, the options that are most viable for South Asian conditions need to be identified, through a rigorous review of available scientific research on the related topics.

The materials developed for the recent training programme on climate variability and water insecurity, and the synthesis of the discussions during the training programme would also be used. Gap filling research would also be undertaken wherever needed to address specific knowledge gaps.

1.3 Organizers

1. **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
2. **Cap- Net UNDP** is an international network for capacity building in sustainable water management. It is made up of a partnership of autonomous international, regional and national institutions and networks committed to capacity building in the water sector. Networks have proven to be effective at promoting the understanding of integrated water resources management and play a key role in supporting the development of IWRM and the achievement of the MDG's. www.cap-net.org
3. **IRAP (Institute for Resource Analysis and Policy)** is a non- profit research organisation whose goal is to promote sustainable systems for management of natural resources and their related services, particularly land and water resources, for improved food security, livelihoods and environment. The organisation undertakes inter-disciplinary and multi-disciplinary research and consultancy projects. www.irapindia.org

1.4 Sponsors

1. **Cap- Net UNDP** is an international network for capacity building in sustainable water management. It is made up of a partnership of autonomous international, regional and national institutions and networks committed to capacity building in the water sector. Networks have proven to be effective at promoting the understanding of integrated water resources management and play a key role in supporting the development of IWRM and the achievement of the MDG's. www.cap-net.org

2. Workshops objectives, participants profile and expected outcomes

2.1 Objectives

The overall objective of developing the training manual is to create a South Asia level platform for informed debate on the ways to reduce the vulnerability of the region's water, energy and food systems to the impacts of climate variability. The ultimate aim will be to build the capacities of key stakeholders of the region for evolving adaptive water management within the overall framework of IWRM. The specific objectives are to have an informed debate on the following three areas:

4. How climate variability impacts on water resources and the manner in which they affect the water, energy and food systems in the region;
5. Their impact on the socio-economic systems, particularly the poor and the vulnerable sections (vis-à-vis water security, food and nutritional security, livelihood security and health); and
6. The adaptive water management approaches in the larger framework of integrated water resources management that would mitigate these impacts.

2.2 Participants profile

Experts working on climate impacts on water-food-energy systems and adaptation issues in four other South Asian countries, viz., Nepal, Sri Lanka, Bangladesh and Pakistan in addition to India who have been involved in the exercise right from the beginning were invited. However, only representatives from Nepal and Sri Lanka were able to participate in the Workshop proceedings. Each member will be working on one or two modules, independently or in a small group of 2-3 persons, depending on the scope of the module and the disciplines they cover. The experts, who are assigned the task of preparing the modules, would decide on their exact content and the methods to be employed for developing them.

A total of 10 participants attended the Workshop. 5 were representatives from IRAP, 3 from SaciWATERs, a representative from Nepal and a representative from Sri Lanka all of whom are working in the fields of water and its associated disciplines. A detailed overview of each of the participants is given in Annexure I.

2.3. Outcomes expected

The outcomes expected from the workshop are the production of 7 training modules

- A] Development of a conceptual framework to analyze the impact of climate change and variability on water, food and energy systems in the South Asian context
- B] Present state of the art knowledge on climate variability in South Asia for the range of climate variables, and the impact of climate variability on hydrology and

water resources in the country, using empirical analysis of macro and micro level data

- C] Illustrate the impact of climate variability on water supplies, energy systems and food production in South Asia, with empirical analysis of micro and macro level data
- D] Analysis of the socio-economic and health consequences of extreme hydrological events, particularly droughts and floods
- E] Analysis of the impacts of climate variability on women, poor and other vulnerable sections of the community
- F] Technological strategies for adaptive water management which are capable of internalizing the negative implications of climate variability on water supplies and demand for water in the key water-demanding sectors of the economy, under different physical, socio-economic, institutional and policy environments
- G] Institutional interventions and economic instruments for adaptive water management for water, food and energy security in South Asia

3. Programme Details

3.1 Content of the Workshop Sessions

The workshop was held for a total of two days, the 18th and 19th of February. Each session consisted of presentations from respective participants followed by a discussion on the information, gaps and approaches presented or that needed to be touched upon. At the end of the workshop a task list was created and work (case studies) apportioned to each participant.

Day 1

1. Welcome and Introduction Session

In the inaugural session, Dr. Neena welcomed all the participants and asked each participant to make their introductions to the group. She introduced SCaN and Cap-Net UNDP as well as IRAP. She then explained the rationale behind the workshop and what the expected outcomes were. She ended by enumerating her hopes for what this training manual will contribute and the value it will add to current material and available information on the topic of climate variability.

2. Need for Training Manual- Coverage envisaged and Cap-Net initiatives

Dr. Dinesh talked about changing trends and why climate variability was a bigger issue than climate change. He explained the proposal, highlighted the need for the development of the training manual and how the manual would address a large gap in the current literature. Dr. Kumar enumerated the objectives that the development of the manual aimed to cover. He then spoke about Cap-Net, its mission and the initiatives in IWRM that it promoted and spear headed and how the training manual would go hand in hand with IWRM and Cap-Net envisage goals.

3. State of the art knowledge on Climate Variability and impacts on water resources: overview

In this session, Dr. Kumar delved into current research on the topic highlighting gaps and how the manual proposed to fill these gaps in the literature. The session brought participants up to speed on information available globally and regionally on Climate Variability. While this session was a lecture based delivery of information, it was also highly interactive, with participants querying Dr. Kumar throughout.

4. Analysing the impact of climate variability and change on water, energy and food systems

The technical and physical aspects of climate parameters were presented along with an overview of the impact of climate variability in this session, by V. Niranjan. Information was supplemented by data represented graphically. Dr. Pant then presented on the existing institutional frameworks of Nepal and what he believed were the advantages and disadvantages of such a framework. He talked about the successes and failures of initiatives like the NAPA /LAPA, WRS and NWP in Nepal as well as what his current field of research was.

5. Development of framework for analysing the impact of climate variability on water, energy and food systems in different South Asian countries

In this session a prototype of a physical framework to analyse the impact of climate variability on the food, energy and water nexus was presented by Dr. Kumar. The framework and its individual linkages were explained and how each impacts the other. The framework is an innovation by IRAP which was created by synthesising information from the available literature. Dr. Pant talked about the different methodologies/typologies that could be used to assess the socio-economic impacts of Climate variability. While this was not done along the lines of the physical framework, it gave participants an overview of the methods used in the past to assess Climate change from a socio-economic perspective.

6. Assessing the impact of climate variability and change on water, energy and food systems in South Asia

The last session of the day comprised of two presentations on the impact of climate variability from an agricultural perspective. In this session the food and agricultural system was introduced by on a global and regional platform and how an extreme climatic event can impact on a country's food security. Mr. Bassi, presented the impediments that developing countries with large, poor populations, would have to face with impending climate change and increased frequencies of extreme events. Dr. Pathma then presented information about Sri Lanka with regards to their agricultural system, adaptation history and current research in the region. The session generate a lot of debate and discussion.

Day 2

1. Socio-economic and health impacts of Climate Variability with reference to Droughts and Floods in South Asia

Dr Sivamohan commenced the first session of the second day with a discussion on the socio- economic impacts of climate variability and how the vulnerability or resistance of a population or a community could be key in climate adaptation. Rithika Fernandes introduced the health impacts of ENSO events and how different sectors (social, economic, ecological and physical) could interact and result in disease outbreaks.

2. Impacts of Droughts and Floods on women, poor and vulnerable sections of the communications in South Asia

Dr. Neena presented her case study on communities in the North East that have to deal with the compounding factors of not just climate change but also modernisation due to large hydro power projects and how this is regulating their social structure. Dr. Sivamohan then presented an overview of the main impacts of extreme climatic events on women, poor and vulnerable sections of communities and some of the fallacies that grey literature might promote.

3. Adaptive water management and Technological options

The innovation present in the market on technologies that can assist with the adaption to climate variability in the context of droughts was presented by Nitin Bassi. The session delved into drought proofing as a means to ground water management in Arid

and Semi- arid South Asia. Unfortunately due a constraint in time, other presentations were unable to be made.

4. Institutional alternatives: Economic, Fiscal and Social for Adaptive Management

Once again, due to a time constraint only one presentation was made during this session by Arjun Surendra. Arjun talked about social safety net programs, in the context of the MGNREGA study that is currently being underway by SaciWATERS in association with ICRISAT. He listed downfalls and successes of the program and how implementation in different states was different which impacted the effectiveness of the programs.

5. Discussion on field studies: selection of locations and methodology

The last session of the workshop was a discussion on the field study cases that would be apportioned out to participants of the workshop that would fit into the already completed compendium that was prepared by IRAP. As the primary body of information in the compendium was more from India, contributions from Nepal, Bangladesh and Sri Lanka were sourced from the international participants.

6. Closing remarks

Dr Neena Rao ended the day and the workshop proceedings by thanking everyone for their participation and for taking the trouble despite the initial delays to make the workshop a success. She said that she looked forward to a fruitful association, with all present, through the development of the training manual.

4. Ways forward

The main output of the Workshop will be a training manual on Climate Variability and its impact on water, food and energy systems in South Asia, comprising 7 modules. The experts who attended the workshop would carry out location studies in their respective countries to fill these gaps, and write papers. These papers will feed into the development of modules.

The training manual will contain the following:

- A] Development of a conceptual framework to analyze the impact of climate change and variability on water, food and energy systems in the South Asian context
- B] Present state of the art knowledge on climate variability in South Asia for the range of climate variables, and the impact of climate variability on hydrology and water resources in the country, using empirical analysis of macro and micro level data
- C] Illustrate the impact of climate variability on water supplies, energy systems and food production in South Asia, with empirical analysis of micro and macro level data
- D] Analysis of the socio-economic and health consequences of extreme hydrological events, particularly droughts and floods
- E] Analysis of the impacts of climate variability on women, poor and other vulnerable sections of the community
- F] Technological strategies for adaptive water management which are capable of internalizing the negative implications of climate variability on water supplies and demand for water in the key water-demanding sectors of the economy, under different physical, socio-economic, institutional and policy environments
- G] Institutional interventions and economic instruments for adaptive water management for water, food and energy security in South Asia

The manual will equip the water sector and climate science professionals with the tools to deepen their understanding of issues related to climate variability and change and the manner in which they can affect water availability and demand in different regions in South Asia that is characterized by spatial variability in climate. It would also provide tools to analyze the impact of climate variability and change on water resource availability, access to water, demand for water, water-related livelihoods and human health. It would also familiarize them with adaptive water management approaches in the context of climate variability and change, particularly the specific technical, economic and policy instruments to deal with the stresses induced by the same on water resources, socio-economic and environmental systems, and institutional capacity building needs.

The manual would also discuss the analytical framework and tools for distinguishing: 1] global/regional changes in climate from localized changes in climate variables; 2] short-term changes/variability in climate from long term changes in climate; 3] changes in basin hydrology caused by local externalities such as land use changes from climate induced impacts on hydrology. This would be done using real life examples, backed by empirical data. It would also provide key resource base on water, energy and food security in key river basins of South Asia.

The training manual is expected to be used in one of the forthcoming training programmes a Training of Trainers, to be organized by IRAP-SaciWATERS in collaboration with WALAMTARI, Hyderabad (Water and Land Management Training and Research Institute) on climate variability and water, energy and food security in South Asia region. The training seeks participation from mid-career professionals from India, Afghanistan, Nepal, Sri Lanka, Bhutan, and Pakistan.

Already a compendium of completed research with a few case studies has been prepared which will be submitted to Cap-Net shortly.

Annexure I

Programme Schedule

Launching Workshop for Preparation of a Training Manual on

Climate Variability and Impacts on Water, Energy and Food Security in South Asia

February 18th and 19th, 2014

Daspalla Hotel, Hyderabad, India

Date	Activity	Remarks
17 th February 2014	Arrival of international and national participants	Accommodation at Daspalla Hotel, Hyderabad, India
18th February 2014		
9:30- 10:00 am	Welcome and Introduction	Dr. Neena Rao
10:00- 10:30	Need for the Training Manual- coverage envisaged and CapNet initiatives	Dr. Dinesh Kumar
10.30- 11:45	Analysing the impact of climate variability and change on water, energy and food systems: the need for developing a manual for training	Dr. Dinesh Kumar
11.45- 12:00	<i>Tea break</i>	
12:00- 13:15	State of art knowledge on climate variability and impacts on water	<i>Chair:</i> Dr. Neena Rao

	resources: over view <i>Presenters:</i> V. Niranjan -15 mins Dr. Druba Pant -15 mins Discussion: 45 mins	
13:15- 14:00	<i>Lunch</i>	
14:00- 15:30	Development of framework for analyzing the impact of climate variability on water, energy and food systems in different South Asian countries <i>Presenters</i> Dr M. Dinesh Kumar (physical typologies /methods) -15 mins Dr. Druba Pant (socio-economic typologies/methods) -15mins <i>Discussions</i> : 45 minutes	<i>Chair:</i> Dr. Pathmarajah
15:30-15:45	<i>Tea Break</i>	
15:45- 17:15	Assessing the impact of climate variability and change on water, energy and food systems in South Asia <i>Presenters</i> Nitin Bassi- 15 minutes Dr. Pathamrajah -15 minutes <i>Discussions:</i> 45 minutes	<i>Chair :</i> Dr. Neena Rao
17:15- 18:00	Round up session for the day	
19th February 2014		
9:30- 11:00	Socio-economic and health impacts of Climate Variability with reference to Droughts and Floods in South Asia <i>Presenters</i> Dr. Sivamohan-15 mins	<i>Chair :</i> Dr. M. Dinesh Kumar

	Miss Rithika Fernandes-15 mins <i>Discussions: 45 minutes</i>	
11:00- 11:15	<i>Tea Break</i>	
11:15- 13:00	Impacts of droughts and Floods on women, poor and vulnerable sections of the community in South Asia <i>Presenters</i> Dr. Sivamohan-15 mins Dr. Neena Rao -15 mins <i>Discussions: 45 minutes</i>	<u>Chair:</u> Dr. Pathmarajah
13:00- 14:00	<i>Lunch</i>	
14:00- 15:30	Adaptive water management and Technological options <i>Presenters</i> Nitin Bassi-15 mins Dr. Pathmarajah- 15 mins <i>Discussions</i> 45 minutes	<u>Chair:</u> Dr. Druba Pant
15.30- 15:45	<i>Tea Break</i>	
15:45- 17:15	Institutional alternatives-economic fiscal and social for adaptive Management <i>Presenters</i> Dr. M. Dinesh Kumar-15 mins Mr. Arjun Surendra-15mins	<u>Chair:</u> Dr. M.V.K. Sivamohan
17:15-17:45	Discussion on field studies: selection of locations and methodology	
17:45- 18:00	Closing remarks	Dr. Neena Rao
20th February 2014	Departure	

Annexure II

Detailed profile of participants

Dr Neena Rao is the Director - Projects and Partnerships at SaciWATERS. She is a Board Member of the Cap-Net, UNDP Global Network for Training and Capacity Building in IWRM. She is also the Project Leader and International Coordinator of the IDRC-SAWA Fellowships programme. She has varied and diverse national and international experience in academia, research, training and implementation in the development field. She has multidisciplinary training -spanning Economics, History, Natural Resource Management Policies and Environmental Governance. Having worked with diverse groups ranging from American Indians (Indigenous people of Americas), African Americans, and Latin Americans in the US to the indigenous peoples of Nagaland, Andamans , interiors of AP and MP in India she is also very alive to diversity (geographical and cultural) concerns and sensitivities while designing and implementing developmental projects. She is especially interested in and incorporates Systems Thinking approach in her research, training, design & implementation of various projects in the development field. Her book, "Forest Ecology of India: Colonial Maharashtra" has been published by Foundation Books Cambridge, University Press, India. She has also published several papers in Journals and Books of national and international repute. Her recent publication has been a chapter: Muslims of Hyderabad: land locked in the walled city / in a book, Ed by Laurent Grayer & Christophe Jaffrelot, Muslims of Indian Cities : Trajectories of Marginalization, Ed: by Harper Collins, India & Hurst Publishers

Dr. M. Dinesh Kumar did his B-Tech in Civil Engineering in 1988, M. E. in Civil (Water Resources Management) in 1991 and Ph. D in Water Management in 2006. He has nearly 22 years of professional experience in the field of water resources, in undertaking research, action research, consulting and training in technical, economic, institutional and policy issues related to water management with several prestigious national and international organizations. Since August 2008, he is Executive Director of the Hyderabad based Institute for Resource Analysis and Policy, which he founded. He has nearly 135 research publications to his credit, including three books. He is the author of three books. His most recent book is titled "Managing Water in River Basins: Hydrology, Economics and Institutions", by Oxford University Press, New Delhi. He is also the lead editor of the recently published book titled Water Management, Food Security and Sustainable Agriculture in Developing Economies, by Routledge/Earthscan. He has published extensively in many international peer reviewed journals, such as Water Policy, Energy Policy, Water International, Journal of Hydrology, Water Resources Management, Resources, Energy and Development (REaD) Journal. He is member of several professional associations, including International Society for Ecological Economics (INSEE), International Association for Study of Commons (IASC), Asia Pacific Association of Hydrology and Water Resources (APHW) and International Water Resources Association (IWRA). He is one of the founding members of the Society for Integrated Land and Water Management (SOFILWM), a non-profit organization based in Gujarat working on sustainable groundwater management in arid and semi-arid regions of India, and is at present its Member Secretary. Currently, he is also Associate Editor of *Water Policy* journal.

Nitin Bassi works as Senior Researcher with IRAP and is based in Delhi. He holds and M. Phil in natural resources management from Indian Institute of Forest Management (IIFM), Bhopal and is a Ph.D. research scholar with the University of Delhi. He has over 7 years of experience undertaking research in the field of water resource management.

His areas of expertise include institutional and policy analysis in irrigation and water supply management, agricultural water management and wetland management. Before joining IRAP, he worked with the International Water Management Institute on the issues of farmer participation in irrigation management and groundwater governance in Asia. He has several publications, both national and international to his credit.

Dr. M. V. K. Sivamohan is Principal consultant to IRAP, Hyderabad. He has over 40 years of research, consultancy and training experience. Formerly a senior member of the faculty and area chairman (agriculture and rural development) at the Administrative Staff College of India, Hyderabad, Dr. Sivamohan holds a Ph.D. in the social sciences. He has worked with several international organisations, such as the Irrigation Research Group, Cornell University (USA), the Natural Resource Institute (UK) and the International Water Management Institute (India). He has several publications in both national and international journals and four edited volumes to his credit. His specialisation is in natural resources management and public administration.

Dr. S. Pathmarajah did his B.Sc in Agriculture in 1982, M.Phil (Soil and Water Engineering) in 1991 and D. Tech Sc. in Irrigation Engineering and Management in 1996. He has been a senior lecturer in the Faculty of Agriculture at the University of Peradeniya, Sri Lanka since 1996 where he teaches both undergraduate and post graduate courses. He has been working in the field of agriculture, water and irrigation for over 30 years. He has a number of publications in various journals and has recently has a book published that he co-authored on 'Hydro Geochemical Characterisation of Jaffna's Aquifer Systems in Sri Lanka' and has another currently in press.

Dr. Dhruva Pant works as freelance consultant/researcher (Development Sociologist) in Nepal, in the field of Natural Resource Management with a focus on policy and institutional aspect of project design, monitoring and evaluation studies. His recent collaborations include Water allocation and Institutional set up for river basin management for Water Energy Commission Secretariat (WECS) of Government of Nepal, River basin planning for WWF-Nepal and Benefit sharing in Hydropower Project in Nepal and India for SAWI Project of World Bank administered by ICIMOD. Dr. Pant was the previous head of the International Water Management Institute (IWMI), Nepal.

V. Niranjan works as a research officer at IRAP Hyderabad. He holds an M. Tech in environmental management from Jawaharlal Nehru Technological University, Hyderabad.

K. Siva Rama Kishan has a master's degree in anthropology from the University of Hyderabad and is currently working as a research officer at IRAP.

Mr Arjun Surendra has a Masters Degree in Environmental Science from Rutgers, The State University of New Jersey. He also has a Masters Degree in Inorganic Chemistry and a Bachelor's degree in Life Sciences. He works as a Research Associate at SaciWATERS. As part of his graduate work, he has been a part of a Material Use, Science and Engineering (MUSES) project funded by the National Science Foundation entitled: "Self

Sufficient Urban Buildings". As part of this project he was involved in post occupancy evaluation studies in two buildings in the North-Eastern United States, additionally he was involved in developing analytical techniques for analysis of compounds from Pharmaceutical and Personal Care Products (PPCP) in domestic wastewater. During his graduate work, he was a recipient of the "Excellence Fellowship" from Rutgers University's Graduate School - New Brunswick. Prior to joining SaciWATERS he has been involved in diverse projects ranging from water accounting to being a Research Associate for a project studying the mechanism of political interest representation across Brazil, India and China. In addition he has been involved with education and outreach.

Miss. Rithika Fernandes is a Research Associate at SaciWATERS. Rithika has a Master's degree in Conservation Biology and a Post graduate Diploma in Research Methodology specialising in Natural Resource Methodology from James Cook University, Townsville Australia. Working in management in Australia for the last two years, Rithika brings to the team her enthusiasm, international and multidisciplinary experience. At SaciWATERS she works closely with Dr. Neena Rao on the SCaN platform producing and editing scientific reports and reviews as well as coordinating the various events hosted by SCaN-SaciWATERS. She has a publication on the way that sheds light on the top down effects of Dingo populations, in Australia, on Macropod density and behaviour.