WATER FIGURES

TURNING RESEARCH INTO DEVELOPMENT

QUARTERLY NEWSLETTER OF THE
INTERNATIONAL WATER MANAGEMENT INSTITUTE

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ISSUE 4 2006

ANNOUNCEMENTS

International Conference : Linkages between Energy and Water Management for Agriculture in Developing Countries

ICRISAT Campus, Hyderabad, India

29-30 January 2007

This conference is a first step towards gathering a group of stakeholders and researchers involved with energy and agricultural water issues to exchange information and experience, promote collaboration, and formulate joint research to address emerging problems.

IWMI
International Water Management Institute
www.iwmi.org

EDITORIAL

WATER FIGURES ISSUE 4, 2006

DEBATING IMPACT

IWMI's focus on applied scientific research for development means that for many projects attribution of our work's impact has been a difficult task. How do we tell whether our work is making a difference in the lives of people who could benefit from it? Where can we say that our research has had an edge? How can the sources and communicators of our research best work together to influence policy?

'What's our Impact?' was the theme of IWMI's Annual Research Meeting and Knowledge Fair (ARM & KF) held this quarter. Much of the meeting was devoted to looking at different approaches to planning for impact. The sessions focussed not just on the role of research for development but extended to include all research support teams and divisions to explore ways in which systems and processes could be improved and tightened so that operations enable research projects to be managed better.

Debating Impact was the session that kicked off ARM & KF 2006. The debate argued two different approaches to measuring impact. Team Red debated for 'Cutting Edge Research', a stand that supports the evaluation of IWMI's work based on publications in high quality journals and research disseminated by extension staff who are specialists in the field. Impact assessment studies are the most scientific way in which to capture impact, they maintained. Team Green took the position of 'Research with an Edge' arguing that impact is possible mainly by involving partners working on the ground and that researchers in development also have a responsibility to ensure that key research findings get across to the right people. Impact, they asserted, could be examined using 'new' monitoring and evaluation methods such as Outcome Mapping.

The most interesting outcome of the exercise came out during the audience voting. IWMI staff, both researchers and research support, changed their positions several times during the 3-round match. Finally, however, agreement was reached and peace was made: improving the management of water and land resources for food, livelihoods and nature is our mission—this means research for development. Maintaining the quality of research while staying engaged in the development process is what's really important to us.

Samyuktha Varma
Editor

The choice of WATER FIGURES as the name of our quarterly newsletter arises from its ability to communicate more than one meaning: "Water figures in the scheme of things…"; "WATER FIGURES as a reference to the science of water management"; "WATER FIGURES as a visual representation of the spaces the resource occupies and the shapes it takes".

EVENTS

HYDERABAD SUSTAINABLE DEVELOPMENT CONFERENCE
Hyderabad, India, **13 - 14 January 2007**
www.geocities.com/ecoseminar2003_association/susdev.html

DELHI SUSTAINABLE DEVELOPMENT SUMMIT 2007 (DSDS 2007)
Delhi, India, **22 - 24 January 2007**
www.teriin.org/dsds

GLOBAL FORUM: BUILDING SCIENCE, TECHNOLOGY, AND INNOVATION CAPACITY FOR SUSTAINABLE GROWTH AND POVERTY REDUCTION
Washington, D.C., USA, **13 -15 February 2007**
http://web.worldbank.org/WBSITE/E XTERNAL/TOPICS/EXTSTIGLOFOR/ /0,,menuPK:3156763~pagePK:64168427~piPK:64168435~theSitePK:3156699,00.html

PRODUCTION CREDITS

EDITOR Samyuktha Varma
samyuktha.varma@cgiar.org

LAYOUT Sumith Fernando
s.fernando@cgiar.org

COVER PHOTO Alexandra Clemett

IWMI
Headquarters
127 Sunil Mawatha, Pelawatte
Battaramulla, Sri Lanka

MAILING ADDRESS:
P.O. Box 2075, Colombo, Sri Lanka
Telephone: +94-11-2787404, 2784080
Fax: +94-11-2786854

EMAIL: iwmi@cgiar.org

Spatial Data and Knowledge Gateways at IWMI

www.iwmidsp.org/iwmi/info/main.asp

Global Public Goods for you to access from anywhere in the World

In order to facilitate and support high quality water and land research for development, IWMI has established state-of-the-art spatial data and knowledge gateways that act as truly outstanding global public good (GPG). Water Figures introduces these spatial knowledge gateways that offer an opportunity to access high quality science data and products in standard formats.

1.0 IWMIDSP: gateway to spatial data on River basins, Nations, Regions, and the World
Web portal: http://www.iwmidsp.org
IWMI's data storehouse pathway (IWMIDSP) is now a well recognized spatial data and knowledge gateway that is globally accesible (http://www.iwmidsp.org), with over 3.5 terabytes of value added remote sensing and GIS data and products. It is conceived as a goldmine for river basin datasets where IWMI has a relative competitive edge to create a state-of-the-art data and knowledge storehouse of excellence. The IWMIDSP link has been regularly visited, every month, by over 2000 visitors from about 80 countries. Over 50 web portals provide link to IWMIDSP. The site has also been profiled by the World Health Organization, UN Human Settlement Program (UN HABITAT), and UN Economic Commission for Africa (UNECA).

2.0 GIAM: global irrigated area maps
Web portal: http://www.iwmigiam.org
Through pioneering work, a global irrigated area map (GIAM) has been produced by IWMI for the nominal year of 1999 using multiple sensor, time-series satellite sensor data and secondary data. A 28-class dis-aggregated (GMIA28) map and an aggregated 8-class (GIAM8) map of irrigated areas of the world was produced. The GIAM approach helps determine irrigated areas of the World for different seasons using the cropping calendar of each class. The GIAM web portal provides, country-by-country irrigated area statistics and instant web maps of the individual countries. The GIAM project has developed a series of innovative methods and protocols to map irrigated areas at 10 kilometer, 500 meter and 30 meter spatial resolution. These innovations include spectral matching techniques (SMTs), application of hyperspectral methods for multispectral time-series data, generation of ideal spectra, protocols for class identification and labeling, and calculation of irrigated areas through sub-pixel decomposition techniques. The GIAM work has produced several residual products such as the Global Map of Rainfed Croplands (GMRCA).

3.0 DMS: drought monitoring system for southwest Asia
Web portal: dms.iwmi.org
The IWMI drought monitoring systems (DMS) is a simple and direct remote sensing based approach for assesing and monitoring drought at pixel level and at various administrative unit level. The DMS is based on high quality, well processed, freely available public domain remote sensing data from reliable sources such as NASA and USGS. Data used include advanced very high resolution radiometer (AVHRR) sensor data from National Oceanic and Atmospheric Sciences (NOAA's) satellite series and moderate resolution imaging spectrometer (MODIS) sensor data from the Terra\Aqua satellite sensor. Drought is monitored using NDVI as the base index. The 3 drought indices are: (a) NDVI deviation from its long-term mean (DEVNDVI), (b) vegetation condition index (VCI), and (c) temperature condition index (TCI).

4.0 KBS-Lanka: Knowledge base system for Sri Lanka
Web portal: http://kbslanka.iwmi.org
The overarching goal of this web portal will be to establish a comprehensive national Knowledge Base System for Sri Lanka (KBS-Lanka) that encompasses disaster preparedness and rapid response for droughts and other natural disasters, and also enables natural resource assessment and monitoring on a near-real-time basis using remote sensing and other spatial techniques. The KBS-Lanka project has three components: (a) Baseline conditions (BC-Lanka); (b) crop monitoring and water productivity patterns (CMS-Lanka), and (c) Drought Monitoring System (DMS-Lanka). Currently, in the first phase, KBS-Lanka is developed for IWMI's Ruhuna Benchmark Basins (comprising Walawa, Kirindi and Menik basins) as proof of concept and during phase II will be developed to cover the whole island as links and partnerships develop with the Government, the main client. Phase I will include a substantial research component in developing the methodology while phase II will focus on building up the systems and the database.

5.0 TSDC: Tsuanmi satellite sensor data catalogue
Web portal: http://tsdc.iwmi.org
The tragedy of the Tsunami brought coordinated and concerted effort of numerous satellite sensor data providers from around the world under one umbrella in making data available and accessible for free for Tsunami related work. The data was made available on a near-real time basis for the entire Tsunami affected area. This in itself brought the great challenge of organizing and disseminating the well catalogued data that is made easily accessible to the global community. All Tsunami response vector data and maps for Sri Lanka are available at http://www.iwmidsp.org/iwmi/info/tsunami.asp. The TSSDC is the continuation of this effort to support the global community in terms of satellite remote sensing before and after the Tsunami to help decision makers in relief and rehabilitation.

For questions and information on the spatial data and knowledge gateways, please contact Prasad S. Thenkabail (p.thenkabail@cgiar.org).

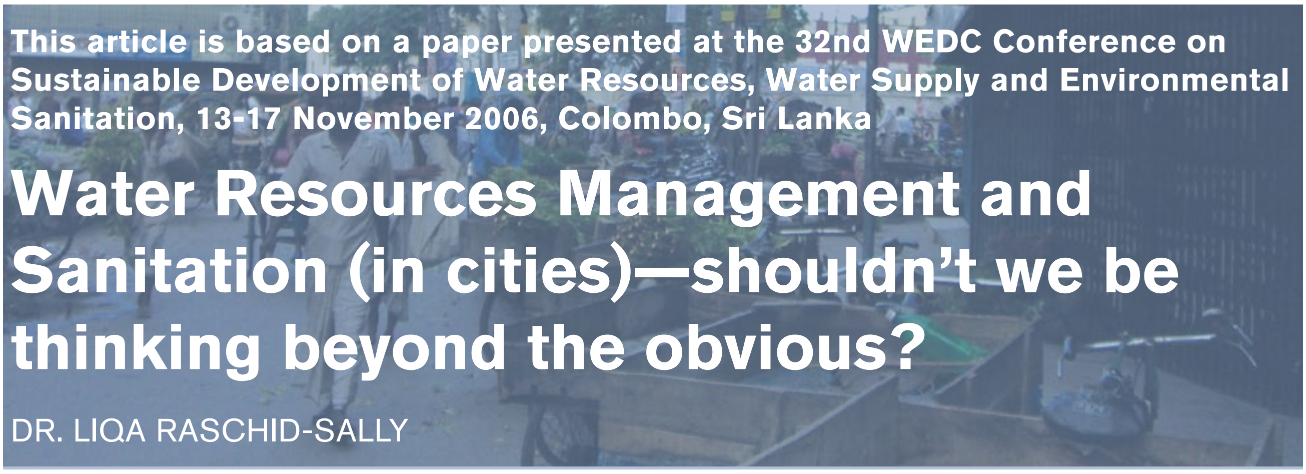

Photo Credit Alexandra Clemett

This article is based on a paper presented at the 32nd WEDC Conference on Sustainable Development of Water Resources, Water Supply and Environmental Sanitation, 13-17 November 2006, Colombo, Sri Lanka

Water Resources Management and Sanitation (in cities)—shouldn't we be thinking beyond the obvious?

DR. LIQA RASCHID-SALLY

People by the millions move to cities in order to improve their lives, find better jobs and have access to goods and services that are not available in rural areas. As they attract more people, cities assemble and provide the goods and amenities that these people need and want. Foremost among these is food.

A city of 10 million people may need to import at least 6000 tonnes of food per day. It is a huge task to feed a city of several million people, or even of several hundred thousand, who require many tonnes of food each day. This requires much coordination among producers, transporters, market managers and retailers in stores, on the street and in open-air markets in buying and selling the food, but also with waste treatment departments for disposal. City officials and private operators must act together to achieve that coordination and provide food to cities adequately.

If you look at the amount of water people use daily:

- 50 liters of water per capita for drinking, cooking, washing, bathing and other domestic uses. Water for people is "blue water".
- But growing a kilo of cereal grains uses between 500 and 2,000 liters.
- A healthy, balanced diet requires 2,000 to 5,000 liters per person per day, depending on how much meat is included.
- Growing food requires an average of 70 times as much water as domestic use.

If you do a back of the envelope calculation this translates into a domestic use of 1 mill m^3/day (at100l/c/d), but the amount of water being channeled into cities via food consumed is 30 mill m^3/day (at 5000m^3/tonne of food produced). Which brings us to the cities–sanitation-irrigation nexus. It is not a debate about cities vs. irrigation water needs only but also about pollution of irrigation sources.

Agriculture gets the lion's share of all water resources (70% at the world level-FAO statistics, 1999) but much more in developing countries. Globally, cities use under 5% of available water resources, but this demand can impact on agricultural water use in specific locations. In China there has been a substantial shift in balance of water use to non-agricultural uses (cities and industry) in parts of the Yangtse and Yellow river basins putting pressure on farmers. For example, in the Kaifeng city prefecture, presently 16% of the Yellow river diversion is use to meet municipal and industrial demand, as against only 4% in the sixties forcing agriculture to resort to groundwater (Molle et Berkoff, 2005) Increasing amounts of the Chao Phraya river flow in the Bangkok Metropolitan Area has been allocated to the city, to the detriment of irrigation flows in the dry season (Molle et al. 2001). A sixteen-fold increase in demand by the city ha been seen over the last 22 years.

Though overall in terms of volumes the flow to cities is still very small, the return flows from cities are still capable of polluting large reserves of water downstream of cities impacting on the quality of water. Besides impacting on domestic use and the environment downstream of cities it is starting to have a major impact on irrigation water quality (Raschid and Jayakody, under review). The irony is that unlike with domestic water which is treated prior to use, it is impossible to treat the large volumes of irrigation water.

Paradigms from the city water resources and sanitation sector

Water and Sanitation for slums: The World Population Report notes that 37% of the urban residents in Africa live in informal settlements. For Asia, the figure is 18% and for Latin America and the Caribbeans, 9%. In spite of the numbers, these populations often remain 'marginal' and unaccounted for because a census would give them recognition and make the city accountable through the provision of services. The poor buy water at nearly 10 times the price paid by the rich (analysis of UN-Habitat statistics). The interesting fact is that pricing for water demand management that is being much discussed is actually happening amongst the poorest! And, in the pursuit of sanitation targets, have we ever thought about whether the poor informal dweller would want to invest in a toilet if he does not even own the land on which he lives? And when one speaks of improving hygiene and hand washing how can one expect individuals and communities to do this if there is no water available?

When we speak of private sector involvement and privatization in LDC cities, one should not only think of models where large utilities manage the water and sewerage system. This is only one side of the coin. There is a large informal sector of private service providers who have set themselves up to respond to a felt need. As an example, 70–100% of sanitation service providers (emptying of septic tanks) are in the private sector in both Africa and Asia.

The hidden uses of domestic water:
A recent study that we are doing in Accra, Ghana, is attempting to quantify the extents to which urban domestic water supply is being used by diverse groups of people to generate livelihood activities, many of which are not

registered as commercial connections but provide a host of livelihood activities to the users.

Wading to work—urban flooding resulting from poor design and under-dimensioning
Flooding was a phenomenon one associated with living close to rivers and marshy low-lying areas (mostly in rural contexts) which flooded out periodically during heavy rainfall and just as naturally subsided. In present times, flooding has become a city phenomenon. Many cities in tropical Asia experience flooding on a regular basis because they have insufficient drainage capacity for the built areas.

Out of the box ideas—thinking beyond the obvious

Non-conventional water sources for cities:
In managing city water resources the past thinking that a 'single source makes sense' is fast changing. The three thousand year old city of Beijing once used its plentiful rivers for drinking water and other uses. The city's economy is booming but a crisis is looming in the form of shortage of water to meet even Beijing's current need. By 2010, the expected shortfall will be 1.8 billion cubic meters. Study of the current water resource situation shows that the obvious methods alone are not sufficient. The city of Beijing is turning towards a combined application of wastewater reclamation (3 million cubic meters a DAY are available with a further mobilization of 1 MCM/day expected) and rainwater harvesting.

Since only 5% or less of water carried in potable mains is used for essential potable needs inside the house, 95% of the water supplied returns as waste. With a little imagination, a city catchment can be viewed as a vast source of water albeit polluted but nevertheless valuable particularly in water stressed situations.

Applying an integrated basin context:
I use the two terms integrated and basin together, purposely. Integrated is to include all the different sources, sinks and potential uses. The term basin, because when you apply the basin perspective you can analyze a whole set of different scenarios involving both water and wastewater as they naturally interact (if not separated) and it allows you to simulate alternative plans and their consequences.

Water demands for rapid industrial development and population growth in many developing countries put increasing pressure on the remaining fresh water resources. In a closed basin context, this causes a shift of water out of irrigated agriculture. The negative impacts of re-allocation emerge most in dry periods in regions where large industries and urban agglomerations share the same water source as the irrigation scheme, although any impact depends on the capacity of the water source. Subsequent increases in the wastewater volume generated by urban agglomerations provide a significant source of water for irrigation, as can be observed with the case of Hyderabad (Rooijen et al., 2005).

Applying ECOSAN (Ecological Sanitation) principles:
As the debate heats up about whether or not to go with ecosan, my own position is simple. Applying ECOSAN is unavoidable – it is a good combination of water savings and nutrient recycling. *Household storage for demand management and catering to hidden uses*
Experience shows that it is very unlikely that the water distribution systems in many less developed cities will function optimally in the next 10 years. So how does one respond to water demand? Have we ever thought to encourage household storage as a means of demand management—this is now happening even in major cities so why not accept and improve? There are issues to be resolved like storage conditions and safety, but people are asking for the information and ready to use it—we the professionals don't always provide it. This also leads us into the area of encouraging professionals to adopt a people-centered approach.

Utilizing modern techniques and analytical approaches
Mapping is a tool which is being widely used as a first step in a planning process. Remote sensing tools combined with GIS are used for mapping water pollution. It is important to be open to new tools and technologies—they may sometimes appear expensive at first analysis, but it soon becomes clear that once the initial investment is over, the ease of analysis allows for rapid progress in collating reliable data. A good database is essential for most planning activities. In the case of flood control planning, new techniques of combining GIS with hydrodynamic modeling are making a breakthrough as a cost efficient system for planning and managing of drainage systems in Asia.

To conclude, given the constraints within which we as professionals operate, it is imperative that we start thinking differently about problems and how to respond to them. Seek the simple, wherever possible (I don't mean by that, that we never build another complex dam to provide more water to people) but we also need some interim solutions immediately—these are what many NGOs have tried to provide but I think it is time that professionals in the public and private sectors handling water problems also did that in a structured manner.

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Dr. Liqa Raschid-Sally is a Wastewater Specialist at the IWMI West Africa office in Ghana. l.raschid@cgiar.org

Solutions to wastewater management

ALEXANDRA CLEMETT

One of the consequences of rapid urbanization in developing countries is the growing competition for freshwater. Population expansion in cities has increased the demand for water for drinking and household needs, with other sectors of the economy feeling the pressure of scarce water resources. This has associated implications for the production and management of wastewater. Solutions for wastewater treatment usually involve large areas of land, huge sums of money and a certain level of technical management, some or all of which may be absent in the local government.

Past research by IWMI and partners has shown that this wastewater has however become an important source for urban and peri-urban farmers because it is both cheap (often free) and reliable throughout the year, thus addressing the problem of increasing water scarcity as the demands of the city grow. The quality of the water can however vary and can include grey water, sanitary waste and industrial waste, all of which can have potential health impacts for farmers and consumers, and downstream environmental impacts. The issues of water provision of urban and peri-urban agriculture, and of wastewater management are therefore intrinsically linked in many cities. The reality is that local authorities need to recognise this association and begin to plan wastewater strategies accordingly, taking into account the livelihoods benefits that can be derived by farming families and the possibility of inexpensive wastewater disposal. Not just that, the need for management to protect the health of farmers, their families, and consumers. Consequently the solution lies in more innovative planning in sanitation and wastewater management for agricultural end-use. Linking sanitation approaches to better wastewater agriculture practices will call for closer co-operation among a variety of stakeholders and more particularly town planning, sanitation, health and agriculture authorities, poor farmers and urban dwellers.

One approach being piloted in Rajshahi in Bangladesh and Kurunegala in Sri Lanka under the European Union, Asia Pro Eco II Programme funded Wastewater Agriculture and Sanitation for Poverty Alleviation in Asia (WASPA Asia) Project, is that of full stakeholder involvement through learning alliances. Both cities have areas with inadequate sanitation facilities, open sewers and areas where wastewater is used untreated to irrigate agricultural land. These cities were selected because they are representative of hundreds of similar cities across Asia and therefore provide an opportunity to test solutions that could be applicable to many other cities in the region.

WASPA Asia, which is being implemented by IWMI, the International Water and Sanitation Centre (IRC), NGO Forum for Drinking Water Supply and Sanitation (NGOF), COSI Foundation (COSI) and the Stockholm Environment Institute (SEI), involves a wide range of stakeholders in developing and testing solutions for sanitation and decentralized wastewater management, and for mitigation of health risks from wastewater use in agriculture. This project is important because it recognizes the link between sanitation and wastewater in agriculture, and that holistic solutions are required in both sectors. It also tries to address the problem that in many countries around the world wastewater use in

Photo Credit Alexandra Clemett

irrigation, and even the existence of urban and peri-urban agriculture, is not officially recognized. Consequently no single agency takes responsibility for these issues and it is necessary to bring together all the relevant agencies and stakeholders into a single platform to effectively address the risks associated with wastewater agriculture and to enhance the benefits.

The approach of the project is therefore to establish stakeholder coalitions at town and national level, called **Learning Alliances** that will bring together the main stakeholders including community members, government agencies, NGOs, community based organizations, scientists and practitioners. Initially the stakeholders are brought together in clusters to discuss related issues that are of relevance to them. Through this process they are gradually made aware, through discussion and learning activities, of the perceptions and needs of other groups. They are asked to analyze the problems from both their perspective and that of other stakeholders and to identify the root causes of the problems. This is the first stage and leads on to a more positive stage of visioning the ideal situation or ways of dealing with the solutions. Gradually through this process the various stakeholders at each level are brought together into a single Learning Alliance to develop a single vision and the approach needed to achieve it. The project team will support the process, providing seed money and small-scale interventions. However. the link between the different Learning Alliance levels; from local to national, should provide opportunities for implementation of the plans developed by the local stakeholders that are more sustainable and replicable.

A key factor in the Learning Alliance approach is that whilst the lessons are learned at the local level and a localized plan is developed, the existence of national and potentially international platforms ensures that lessons are translated to other cities and other countries.

Alexandra Clemett is a researcher with IWMI specialising in livelihoods, water quality and wastewater. a.clemett@cgiar.org
For more information visit the project website: www.iwmi.cgiar.org/WASPA.

Outcome Mapping: A Tool for Knowledge Sharing and Monitoring and Evaluation

NADIA MANNING

IWMI headquarters in Sri Lanka recently played host to a training workshop on Outcome Mapping. The workshop was organized by the Knowledge Sharing in Research Pilot Project (KSRPP) with the aim of building capacity on an approach for Knowledge Sharing and a tool for Monitoring and Evaluation (M & E). The KSRPP aimed, on the one hand, to equip itself and its pilot projects with a new and innovative tool for monitoring and evaluation that strikes a balance between accountability and learning, while introducing new mechanisms for projects to share knowledge between researchers and boundary partners. The workshop comprised a diverse and dynamic group including members of the KSRPP core team, knowledge sharing focal points from 8 of the 10 projects within the KSRPP, communications and capacity building staff of the Challenge Program on Water and Food (CPWF), staff working on the IWMI-WorldFish-CIFOR Impact Assessment Initiative, the institute's Program Office, IWMI and WorldFish researchers as well as staff from IUCN, a partner to one of the Knowledge Sharing projects.

Photo Credit Sharmi Jayawardena

First introduced by the Canadian-based International Development Research Centre (IDRC) in 2000, Outcome Mapping (OM) is increasingly used by projects, programs and organisations in Latin America, Africa and Asia, as an integrated system of planning, monitoring and evaluation. It is a tool to help address particular issues in design that other, more traditional methods, do not consider. In practice Outcome Mapping involves twelve steps within three main stages. In the intentional design stage the project explores and defines its vision, mission, boundary partners, outcome challenges, progress markers, strategy maps and organisational practices. This leads into a stage of outcome and performance monitoring which involves steps towards monitoring priorities as well as systematic recording of project progress through outcome, strategy and performance journals. The third stage, evaluation planning, supports projects in setting up an evaluation plan to guide its evaluation process. Using participatory approaches through the twelve steps, Outcome Mapping helps create an open organisational culture within project teams and provides tools and vocabulary for understanding the complexity of the social change that the project aims to produce. It measures this social change by bringing the stakeholders into the M & E process, fostering social as well as organisational learning, and strengthening partnerships and alliances—all of which are aims shared by the KSRPP.

According to Kaia Ambrose, the workshop facilitator and an Outcome Mapping practitioner "Outcome Mapping is intended to be a guide to the journey we take with our partners, focusing on the intention, what happens, and the rning and collaboration with boundary partners—defined as those groups which projects can realistically hope to influence changes in behaviour. Through the twelve steps and an open framework that allows other tools and approaches to be imported, Outcome Mapping encourages projects to engage with their own internal members and the boundary partners it is directly involved with to design, plan, monitor and evaluate the project.

In addition to the Outcome Mapping training sessions, the workshop was also used other knowledge sharing approaches. The World Café approach was used to explore key questions on monitoring and evaluation. The café setting helped facilitate a comfortable environment for all participants to share experiences and ideas and address the challenges they have had with monitoring and evaluation on projects.

A key lesson that emerged from the workshop was that both Outcome Mapping and Knowledge Sharing could be mutually beneficial and supportive to each other. While OM could benefit from the use of Knowledge Sharing approaches and tools to facilitate and support a participatory process, Knowledge Sharing in turn could be enhanced by engaging a monitoring and evaluation process that focuses on interaction with partners, dialogue and learning. When asked why these two usually distinct approaches were being merged, Sanjini de Silva, project leader of the KSRPP and co-facilitator of the OM training responded, "In order to improve the effectiveness of the work we do, we need to think differently and engage in more innovative approaches. All projects are looking for ways to better monitor and evaluate their work and results and the KSRPP is trying to encourage greater knowledge sharing in research. But both monitoring and evaluation and knowledge sharing approaches have an overall aim to improve the impact of our work. If we can achieve this aim through both avenues with the help of one approach, then this is all the better."

Nadia Manning is a communications coordinator working on the Knowledge Sharing in Research Pilot Project. She also works on research projects focused on livelihoods and water poverty.

For more information about the Knowledge Sharing in Research Pilot Project and a report of this OM workshop, visit the KSRPP website hosted at http://www.iwmi.org.

For more information about IDRC and OM, visit http://www.idrc.ca/evaluation

Recent Publications

For on-line access to IWMI Research Reports and Working Papers, see **www.iwmi.org/pubs**

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