Academia contribution to water resources management (WRM): tools and lessons

Session report, 16 January 2015

Session Structure

The session was convened by Colin Green, from the University of Middlesex, who begun providing an overview presentation on the challenges and contributions the academia can make to support the realization of the post-2015 development goals around water resources management (WRM). The session continued with a panel discussion with experts working on different aspects related to WRM on-the-ground, including: Dabo Guan (University of Each Anglia), Elena López-Gunn (University of Leeds), Luis Garrote (Technical University of Madrid) and Ruth Matthews (Water Footprint Network). The panellists made reference brief introduction to some of the WRM tools they've used and also to the innovative/valuable aspects as well as the existing barriers to overcome when implementing scientific tools related to governance, capacity development and technology surrounding WRM.

1. Implementation challenges surrounding Water Resources Management

Addressing water scarcity is fundamentally a problem of improving the management of water for food

Growing food requires enormous quantities of water and this is why agriculture is the sector with the largest consumptive use of water. Attending the increasing demand of food represents a major challenge from a water management perspective as many countries are facing a truly water scarcity problem. Fortunately, there are different solutions to address water management in agriculture, including efficiency improvements or even virtual water trade ie. importing water embedded in food production from third countries.

In the long run, efficiency gains ie. doing more with less will require innovation, and this implies pushing the technological frontier closer to the theoretical limits. In the short term, however, the problem is how to move closer to the technological frontier. Fortunately, the gap between what is technologically achievable and is commonly achieved is very substantial in many areas, which implies that there is still large margin of increasing water use efficiency (in agriculture but also other sectors) in many countries. Bridging this gap is not just a question of technological innovation but also about gaining understanding on what are the barriers to making the more efficient use of water in individual cases, and developing tailored incentives to overcome these barriers.

More efforts are required to address variability in the availability of water resources

Averages of water availability are of little use when managing water resources. What really matters for effectively addressing water management is coping with ‘variability’ ie. intra-yearly availability but also inter-annually. Droughts and floods are the two extremes of a variability gradient rather than distinct problems. In areas of very high variability, floods are the water resource while drought periods account for the total absence of it. From a management perspective, the critical feature when managing floods is largely the peak, whereas with droughts it

is primary the duration what matters. Storage is a key feature for managing both extremes and overall variability i.e. the greater the variability of water availability in a country, the greater the requirements for storage, but other non-hard path solutions also need to be considered eg. drought and flood plans, flexible allocation schemes, water markets, etc.

We need to raising and servicing the capital sums necessary to finance water management approaches

Since water management is so capital intensive, we have to get the most from every penny invested. We need to increase capital availability but do so in a way that enables capital to be raised at the lowest possible cost. Getting the most from every penny means that we have to make every penny or cent do the work of two or three; we have to look for approaches/solutions that involve synergies between problems, and specifically to avoid addressing one problem in a way which makes another problem worse. Alternative options to reduce the costs of capital also include maintaining and promoting the role green infrastructures as well as promoting incentives like payment for ecosystem services. Regions like Latin America have abundant examples on where these type of green investments are promoted to secure water services and contribute to reduce the costs of capital.
Other important challenges that were highlighted include the need to find the appropriate methods/tools for reducing the risk of losing the capital and increase the effectiveness of mobilising such capital.

It is time for a paradigm shift, from supply driven approaches towards better demand management

The increasing mismatch between supply and demand and the growing environmental degradation experienced across the world requires re-thinking the way we are managing water resources. Whereas historically water management focused upon modifying the environment to match anthropogenic needs, the prevailing paradigm now is that we need to shift this view and start focusing on changing people's behaviour and demands to live with the environmental constraints. But changing behaviour is rather challenging and the incentive provided has to be sufficient and appropriate to overcome the barriers to change. Thus, the necessary starting point is to understand the barriers individuals face in making a change. Once that is understood, the relative appropriateness of the different forms of incentives can be examined. Water pricing can be an effective tool to induce this behavioural change. However, water pricing has been so far very ineffective in inducing this change. The reasons might be diverse but often the cost of water in proportion to total input costs is too low to be given management attention, disincentivizing an efficient use of water.

2. Addressing the challenges: Developing and using tools

There are different tools, guidelines and other resources developed and used by the academia that may be useful to address implementation challenges and help ensure the provision of basic services

Cases discussed

Capacity Development: 'Flood Footprint Accountings' by Dabo Guan, University of Each Anglia

We present a new and transformative disaster accounting framework – flood footprint accountings. Flood footprint is a measure of the exclusive total economic impact that is directly and indirectly caused by a flood event to the flooding region and wider economic systems. Flooding in one location can impact the whole EU or world economy, since the effects of the disaster are transferred through the whole supply chain. For investment in flood risk management options, it is critical to identify the 'blind-spots' in critical infrastructure and vulnerable sectors along with the economic supply chains and social networks. This in turn allows for sufficient adaptation to the damage that is transferred from the current event to future events. Adaption to flood risk is not limited to the area suffering the direct damage. It also extends to entire socioeconomic networks and this must be considered in order to minimize the magnitude and probability of cascading damage to the regions not flooded. We are developing this new tool under EU FP7 project – BASE, UK EPSRC funded projects of Sesame and Blue Green Cities.

Governance: 'The Audimod Tool' by Elena López Gunn, Leeds University

We present the results of a study undertaken on behalf of FAO and then further developed for a Spanish river basin agency to look at whether irrigation modernization projects are effective measures as part of the implementation of catchment plans to help improve the status of water bodies. The tool developed is called *AudiMod* and was tested for two specific sites.

Technology: 'Drought Management Plans' by Luis Garrote, Technical University of Madrid

The case study deals with the preparation and implementation of drought management plans. It is based on the MEDROPLAN project, carried out between 2007 and 2010. The objective of the project was to provide Mediterranean countries with a framework. The project produced a set of Drought Management Guidelines for effective and systematic approach to prevent and/or minimize the impacts of drought on people, which were published in 2010 in six languages. The Guidelines outline both long term and short term measures that are to be used to prevent and mitigate the effects of drought. The Guidelines provide an integrated approach to face droughts from a risk management perspective and therefore minimizing the impacts of droughts in the population and resources. The integrated drought planning concept addresses the planning framework and four specific components: the organizational, methodological, operational and public review components.

Technology: 'Building Capacity in the Apparel Sector on Reducing and Managing he Water Footprint' by Ruth Mathews, Water Footprint Network

Improving environmental performance in the apparel supply chain is critical for the long-term viability of the sector as well as the sustainability of ecosystems and communities. Water is a key natural resource for the apparel sector: the production of cotton and other fibres is dependent upon water resources but also impacts water quality through the use of fertilizers, pesticides and tillage practices; washing, dyeing, finishing (WDF) of fabrics and other textiles uses water and releases effluents that contain residual chemicals used in the processes. The Water Footprint Network has a strategic partnership with the clothing retailer C&A calculating the water footprint of its supply chain, assessing its sustainability and formulating responses to improve its sustainability. In the project: 'Building Capacity in the Apparel Sector on Reducing and Managing the Water Footprint'

data was collected from 702 cotton farms from 3 states in India using three agricultural practices: conventional, REEL and organic. The green, blue and grey water footprint was calculated and analysed against the practice types to identify where significant water footprint savings can be realized. A guidance document on agricultural practices relative to the water footprint and training materials for farmers are developed for dissemination.

3. Lessons learnt from implementing the tools

During the panel discussion, participants from the Academia community shared their experience in utilizing available tools and what lessons can be drawn to improve water resources management. The discussion spin around a set of main questions:

1. Financing: water management is capital intensive so how can we reduce the capital requirements? What are the technological options?

2. Cooperation/Governance: What are the lessons as to the incentives required to promote cooperation? The best techniques to use and the skills required? Are there preconditions for effective cooperation? How can cooperation be sustained?

3. Agriculture/technology: How do we shift crop production towards the technological frontier whilst building sustainable rural livelihoods?

4. Stakeholders' roles: What are the views of academia about the roles of other stakeholders (governments, business, civil society, and media)?

Elena López-Gunn provided valuable insights on the lessons learnt from a governance perspective resulting from the implementation of the Audimod tool and her previous experience working in WRM. As she pointed out, the adoption of more efficient technologies in the agricultural sector within the Douro basin succeeded in saving water because the right institutions where in place and working effectively. The existence of water rights changed to encourage farmers to save water, but equally important efforts were placed in building trust and reciprocity among stakeholders engaged, as well as in facilitating good communication and information. As oppose to other nearby regions where similar technological solutions have been adopted, in the Douro basin the institutional setting has largely determined the success of the program ie. *there was a clear procedure on water allocation, how to operate it, clear goals and guidelines were clear.* Overall, from Elena's experience working in WRM, an important government lesson that can be extrapolated to other regions when dealing with WRM, and particularly with water scarcity, can be achieved by working in close collaboration with key stakeholders ie. farmers. As she pointed out "*Choose the largest irrigation largest schemes, work with farmers and other relevant stakeholders, built trust and good communication and you might get many of your problems solved*"

Luis Garrote provided some insights on the financial, government and technological lessons learnt from his experience working with developing drought plans. From a technological perspective, the challenges are not so big as there are many tools available to predict and measure droughts. Today, Spain has enough information and knowledge built to know at which point it is necessary to act in the light of a drought, and the list of actions (based on their effectiveness and financial requirements) that can be set in place. Actions involve both, financially expensive solutions (eg. infrastructure), as well as less expensive ones (eg. stakeholders agreement and engagement). However, these soft-path solutions are often harder, as it require putting people together, built a common understanding of what the problem is, and more importantly agreeing on a common list of priorities on how water is going to be allocated during droughts. Building these bridges for cooperation is much harder but also more effective than simply enforcing a law or implementing a

technology. Some important lessons that can be drawn from the Spanish experience in developing drought management plans are: 1) effective plans can only be achieved when stakeholders are willing to cooperate: 2) Cooperation largely relies on building trust among stakeholders and also on the technological tools and data used to define the status and actions required; 3) There is no single protocol built up a drought plan. The overall success of the plan will rely much more on the process of negotiation and agreement among all involved stakeholders, than in the strictly implementation of a set of rules or guidelines.

Dabo Guan and **Ruth Matthews** focused their interventions on the role technology and capacity building can play in WRM. Dabo outlined the need to invest in developing more comprehensive tools to assess the full cost associated with extreme events like floods. Tools like the flood footprint can help in evaluating the full costs (direct and indirect) associated to floods as well as helping in targeting the most vulnerable sectors and regions. Ruth Matthews highlighted that knowledge transfer of relative simple technologies (eg. water footprint) and building local capacities have been critical to understand and what type agricultural practices and technologies can contribute to save water and decrease water pollution in India, one of the largest cotton production countries of the world currently facing many water management challenges.

5. Conclusions

The main conclusions of this session can be summarized in:

Technology can play a significant role in providing evidence-based on what are the barriers and options to improve WRM. However, these tools alone won't solve the problem. Trust needs to be built on their capacity and reliability among all those stakeholders involved in the water challenge.

Appropriate institutional setting is crucial to address WRM challenges. The same tools and solutions implemented in different institutional contexts have provided very different outputs, ranging from success to failure.

Pricing water does not necessarily result in efficient use. The reasons behind the failure to change behaviour at the moment is not clear. In urban and industrial uses, water service costs are too low a proportion of total input costs to be given management attention and hence companies typically use more water than would maximize their profitability.

Session Photos

Overview presentation by Colin Green.