

## Drought Resilient Water Management

*Chair:* Raúl Glotzbach (International Water Association)

*Rapporteur:* Courtney Brown (Queensland Urban Utilities)

Monday, 10th October 2016 at 15:30-17:00

### Workshop overview

Drought is an important issue for integrated water resources management and planning as well as environmental protection. Climatic variability in time and space may cause periods with low rainfall and runoff insufficient to sustain the normal requirements for water for basic human needs as well as agricultural and industrial production, all while maintaining environmental needs.

Drought differs from many other natural disasters in its slowness of onset and its commonly lengthy duration and possible spatial difference between the deficiency of precipitation itself and the occurrence of drought. Although it is a natural hazard, drought may be aggravated by climate change in many regions.

Defining a drought condition relates to identifying the beginning, length and degree of severity. One of the issues with defining a drought event is that at the beginning of a drought, the duration and severity of the drought will be unknown. Satellite based data is increasingly used for calculation of drought indices for evaluation of the drought impact. Combination of seasonal forecast and climatic based drought indices are used for forecasting how the drought condition is evolving.

Decision Support Systems for drought planning and management can provide decision makers with an effective and systematic means of assessing drought conditions and the future outlook, developing mitigation actions and programs that reduce in advance the effects of drought, and developing response options to minimise economic stress, environmental losses, and social hardship during drought.

The workshop aims to address how current planning practices and tools are being used to ensure drought resilient solutions and how these can be improved. Through examples of how current planning practices and tools are used for water planning with presentations by Paul Belz (Executive Leader Planning, Queensland Urban Utilities), Dr. Sutat Weesakul (Deputy Director, Hydro and Agro Informatics) and David Dreverman (Executive Director of River Management, Murray-Darling Basin Authority), techniques and methods for short- and long-term water planning were demonstrated. This helps us build on our understanding of how to include drought resilient into current planning methods, requirements for data, tools, knowledge, and so forth. The workshop engaged with the audience through roundtable discussion (see Annex 3 for roundtable questions and written key points) facilitated by the speakers/presenters. The discussion provided useful insight to how drought is monitored and how planning is done at the basin and local level.

### Workshop objectives

- Support decision making process by providing structure and functionality through technical tool. Baseline assessment, strategic plan, reassess / monitoring
- Exchange practical examples
- Information to prepare for climate change
- Discussion to include drought resilient mgmt
- Insight into future tools and practices

## Project overview and drought management

The 'Flood and Drought Management Tools' (FDMT) project is funded by the Global Environment Facility (GEF) International Waters (IW) and implemented by the United Nations Environment Programme (UNEP), with the International Water Association (IWA) and DHI as the executing agencies. The project brings a useful approach to water resource management, bringing together basin organisations and local level organisations, e.g. water utilities, to ensure water security across scales. The project is developing a methodology, using tools within a decision support system, to allow the integration of information on floods and droughts into planning. The project is being implemented from 2014 - 2018, and 3 pilot basins (Volta, Lake Victoria and Chao Phraya) have been identified for development and testing of the methodology.

The project understands that flood and drought events can be managed to increase resilience of basins and their communities from these naturally occurring extremes. By using a methodology and tools, basin organisations and local level organisation can arm themselves with the needed information to manage and plan for the impacts and sustainable manage the water resources within the basin.

This methodology and tools are globally accessible to address transboundary basin management (basins that stretch across at least one political border nationally or internationally) and to support short- and long-term planning scales.

There is great emphasis on the global to local application of the methodology and tools. However, as the tools are not tailored to specific local conditions and should be seen as a first approach or screening to identify and evaluate the key issues at basin or local level.

Various tools are being developed since the inception of the FDMT project, focusing on indicator selection, data and information for analysis, and dissemination and reporting. How this translates to drought management, some specific outcomes are using selected satellite based data sources (e.g. vegetation cover (Normalized Difference Vegetation Index), soil moisture (Soil Water Index), precipitation (Tropical Rainfall Measuring Mission), which basin organisations, water utility, and other users can make drought assessment for the catchment/basin evaluating the impact of the drought. The indices can be presented as spatial maps or weighted time series for specified areas. The impact can be calculated by linking to models, for example, linking to a simplified water balance tool for a first evaluation of the catchment water balance or to a crop model to calculate crop yield under current or forecasted conditions. Lastly dissemination functionality will be developed for automated drought impact and status reporting.

For more information on the FDMT project, visit the project website: <http://fdmt.iwlearn.org/en>. To find out more about the support for drought management download the [Drought Management in a Changing Climate](#) information sheet or download the [Drought Management](#) presentation by Raúl Glotzbach.

## Case studies

### [South East QLD Drought Resilient Water Management](#) Paul Belz (QUU)

Extreme events such as drought and floods will happen. They have always been there but are now more prominent and more severe. The question is how to manage this changing environment, how do we ensure that we are more resilient, that our systems are more resilient.

In 1995, Queensland, Australia experienced a prolonged drought period, the Millennium Drought, lasting up until 2007. It was only until 2002/2003 that a formal drought response approach was implemented. The approach pushed for:

- The use best science to predict the future and influence institutional reform
- Educating rather than compliance to encourage reductions in water demand and manage water consumption behaviours
- Improved communication with the community
- Identifying alternate sustainable water supplies and implementing proactive resilient solutions and infrastructure
  - Stormwater recycling and harvesting
  - Interconnected South East Water Grid
  - Gold Coast Desalination Plant
  - Western Corridor Recycled Water Scheme

When identifying the right approach for becoming more resilient to extreme climatic conditions, it is important to choose our approach wisely as solutions have a customer and economic legacy.

## Q/A

*What level of risk do you plan for?*

Based on the service objectives and on the interval/duration of the drought level. Additional supply measures are often put in place and tools used to understand and mitigate the risk.

*What action is taken at 70% drought readiness level?*

Recommissioning water recycling scheme or voluntary measures in our communities are taken in preparation for drought.

*At what point in time do you notify communities of the realistic level of drought?*

There is an open communication with communities. For plans to be successful in responding to drought, we need to allow voluntary participation from community.

In South East Queensland (SEQ), we are good at taking messages up and making it a permanent change in water consumption habits.

## Drought in Thailand

Dr. Sutat Weesakul (HAII)

Drought in Thailand has been a naturally occurring event. In 2015, severe drought hit Thailand, in particular the upper-middle region of the country, where rice crop irrigation competes for water supply, along with water supply for communities. As the population trend is expected to grow from 67.31 million in Q2 of 2016 to around 67.5 million in 2020, water demand is expected to increase.

Data (hydroinformatics i.e. weather data and water data) has been used to establish drought monitoring systems to plan for impacts of drought. Such information is also provided to communities through:

- Mobile phones
- Broadcasted water situation news to serve local administration and communities
- Water Management Operation Centres at the provincial level
- CWRM networks in Thailand made up of 60 leading communities, 19 River basins, 603 villages, 10 live museums

Community action has been at the forefront of water resilience reform. Using the information provided, communities are able to do water budgeting. Children are heavily involved in community actions, largely due to technological kickback from older residents.

Consequently, Thailand experienced an increase in water storage from 2.31 million m<sup>3</sup> to 34 million m<sup>3</sup> between 2012 and 2015. About 98% of community survived the drought period due to the collective education and accepted responsibility of communities affected by the drought.

## Q/A

*What are the gaps in drought management practices?*

It is hard to change the behaviour of government agencies as they are very technology averse and are not willing to adapt.

Research and gathering of information needs to be more comprehensive from end to end.

## Managing Drought in the River Murray, Australia

David Dreverman (MDBA)

The Murray-Darling Basin has a history of high variable water supply with very extreme flood and drought trends. During the millennium drought, water storages were close to empty. The Prime Minister's involvement urged the need for some action to be taken. Consequently, a multi-jurisdictional taskforce was established to identify necessary changes to water management.

Water sharing arrangements were adjusted between states, additional reserves established during periods of low inflow, policy changes made to allow individual power manage individual risks and water trading to the highest value use enabled a way through the crisis.

The experience of the millennium drought provided a number of lessons from which to draw from and move forward in planning for future drought events:

- Inflows can be much lower than previously experienced therefore, cannot rely on historic record as guide to what might happen in the future
- Unprecedented drought threatened the supply of critical human water needs
- Impacts on communities and environment increased exponentially as the drought deepened
- Private carryover allows irrigators to manage their own risk
- Effective water market resulted in 1/3rd of water use relying on temporary trades
- Policies must be adaptable
- Environment was disproportionally impacted; environmental needs should have a high level of importance
- Communication with community and irrigators need to be clear
- Build capacity of communities to understand drought
- Wellbeing of communities and individuals severely affected, many businesses that did not survive the drought, created market challenges i.e. commodity prices and reduction gluts
- Water allocation reporting taking place twice monthly to address:
  - Storage levels,
  - Water Transit,
  - Conservative estimates of future inflows,
  - Estimated losses,
  - Water already used

## Q/A

### *How important or effective is the “task force” in implementing change?*

Agreement from sovereign governments to change water sharing agreements. This has resulted in good cooperation from states through the task force.

## Round table discussion

### *Drought monitoring*

While droughts are naturally occurring, they are becoming more frequent, more severe and less predictable, threatening our water security. Although little can be done in the short-term to prevent a drought, actions can still be taken to reduce the vulnerability to a drought; this includes the development of monitoring mechanisms and the use of early warning systems. For different stakeholders, monitoring priorities are different and how drought impacts are monitored also vary. In Brazil, dam levels are monitored, in Thailand, local community monitor surface water gauges, while in Australia utilities mainly record real-time hydrometric data.

There are an array of monitoring approaches, the conjunctive use of these methods is fundamental in better understanding the impacts and better defining planning and management priorities to properly address the impacts of drought.

### *Planning*

Planning can be reactive and/or proactive. For drought events it is not enough to be reactive. Planning needs to include all pre-defined measures with appropriate tools and stakeholder participation to manage both the short- and long-term impacts and so minimise the adverse impacts on the economy, society and environment.

Each organisation has its own priorities and as such their specific action plans related to drought events vary. These include the establishment of committees for monitoring on use of water, establishing water sharing agreements, devising contingency plans or drought management plans, as well as identifying alternative water sources. Despite the varying priorities, a well-defined and informed planning approach enables those responsible to focus their efforts in the right areas.

### *Basin and local level planning*

The experience in the Flood and Drought Management Tools project working at the basin level with basin authorities and local level with water utilities is that planning approaches are not necessarily coordinated. With varying priorities across the scales, this is understandable as the level of complexity involved in water resources management increases.

However, for the sustainable management of water resources within basins, it is necessary to have coordinated and harmonised management plans. There is a collective consensus of this. For connected river systems, there needs to be a join approach with common objectives and goals amongst the relevant stakeholders. In Thailand, the approach is more bottom-up, where planning is driven by communities (at the local level), where as in Australia, planning needs to be well coordinated, and using a top-down approach. It starts at the basin level and feeds down to individual water resource plans, then to individual enterprises within the boundaries of these water resource plans.

## Key recommendations

From the presentation, the following actions can be successful in building resilience in response to drought management:

- Community engagement and action is powerful for any resilience building.
- Technological support can be integral in building drought resilience no matter the scale of the issue or the state of the country (developing or developed).
- Having governmental input is integral when implementing policies to respond to drought.
- Accessibility of information pertaining to water and weather information can give the power back to the communities and local businesses to manage and build their own resilience.

## Quotes from speakers/presenters

"The local and state water management agencies in South East Queensland have done a great job in filling the gaps and taking action in the absence of flood and drought policies." *Paul Belz (QUU)*

"This is a successful project [based not on] planning or infrastructure solutions, [but on] good community practice instead." *Dr. Sutat Weekasul (HAI)*

"One day (not sure when) it will rain and storages will recover." *David Dreverman (MDBA)*

## Annex 1 Workshop agenda

Time	Item	Who
15:30-15:40	Overview – setting the scene <ul style="list-style-type: none"> <li>DSS for drought planning and management</li> </ul>	(DHI)/IWA Raul Glotzbach
15:40-15:55	Case study – Australia <ul style="list-style-type: none"> <li>Impacts of drought</li> <li>How is drought monitored and addressed?</li> <li>How are planning practices or tools used for water planning?</li> </ul>	Executive Leader Planning Queensland Urban Utilities, Australia Paul Belz
15:55-16:10	Case study – Thailand <ul style="list-style-type: none"> <li>Dry season water management in the Chao Phraya basin, Thailand</li> </ul>	Deputy Director Hydro and Agro Informatics Institute, Thailand Dr. Sutat Weesakul
16:10-16:25	Case study – Australia <ul style="list-style-type: none"> <li>How is drought addressed in Australia?</li> <li>How are planning practices or tools used for water planning?</li> </ul>	Executive Director of River Management Murray-Darling Basin Authority Australia, David Dreverman
16:25-16:55	Round table discussion <ul style="list-style-type: none"> <li>Drought monitoring and basin and local level planning</li> </ul>	Facilitators:  <i>QUU, Queensland, Australia</i> <i>Paul Belz</i>  <i>(HAI, Thailand</i> <i>Dr. Sutat Weesakul)</i>  <i>MDBA, Australia</i> <i>David Dreverman</i>
16:55-17:00	Wrap-up and closing remarks	



## Annex 2 Speaker Bios

### *Paul Belz*

#### *Executive Leader Planning, Queensland Urban Utilities, Australia*

Paul Belz is responsible for service strategies, infrastructure planning, capital inauguration, development assessment, and environmental strategy across Queensland Urban Utilities' geographic area. Queensland Urban Utilities is the fourth largest water company in Australia.

Paul has more than 25 years' experience in the water and sewerage industry across a wide spectrum of disciplines. His main areas of expertise are in planning, asset management, and operations.

Paul was a key member of the formation team of Queensland Urban Utilities.

As well as overseeing major future planning and investment programs, Paul oversees initiatives to improve liveability, environment climate resilience and economic outcomes for the Queensland Urban Utilities' service area.

### *Dr. Sutat Weesakul*

#### *Deputy Director, Hydro and Agro Informatics Institute, Thailand*

Current Deputy Director of Hydro and Agro Informatics Institute (HAII), Ministry of Science and Technology, Thailand, Dr. Sutat Weesakul graduated with a doctoral degree in Engineering (Hydraulic/Coastal) from The Asian Institute of Technology (AIT), Thailand. With over 35-year experience in teaching and researches, he is an expert in hydraulic and coastal engineering and has been involved in many international projects in collaboration with the private sector and government agencies to enhance water resources management in Thailand.

### *David Dreverman*

#### *Executive Director of River Management, Murray-Darling Basin Authority, Australia*

David Dreverman is the Executive Director, River Management, Murray-Darling Basin Authority. David joined the Murray-Darling Basin Commission in 2000 as Manager, Assets, and was appointed General Manager, River Murray Water of the Commission in 2003.

Prior to joining the Murray-Darling Basin Commission, David worked as a consultant in the engineering industry; with SMEC, Hydro Electric Commission, Tasmania and Australian Power and Water. David has been involved with large dam and hydro power projects, both in Australia and overseas for more than forty years.



## Annex 3 Roundtable discussion questions (and notes)

### A. Drought

*How are you monitoring drought impacts? (List indicators or information used)*

Group 1	Group 2
<ul style="list-style-type: none"> <li>Monitoring bores or changing strategies</li> <li>Dam levels (for example in Brazil)</li> <li>Impact on irrigators                             <ul style="list-style-type: none"> <li>Commercial impacts</li> </ul> </li> <li>Self-monitoring</li> <li>Level of trading</li> <li>Revenue impacts</li> </ul>	<ul style="list-style-type: none"> <li>Thailand                             <ul style="list-style-type: none"> <li>Local community monitoring of surface water gauges</li> </ul> </li> <li>Australia                             <ul style="list-style-type: none"> <li>BoM – national system post 2007</li> <li>Utilities mainly record real time hydrometric data which they are required to promote BoM</li> </ul> </li> </ul>

### B. Planning

*Does your organisation have specific action plans related to drought events? If yes then mention examples of actions.*

Group 1	Group 2
<ul style="list-style-type: none"> <li>Water sharing rule / announced entitlements</li> <li>Management area                             <ul style="list-style-type: none"> <li>Community</li> </ul> </li> <li>Drought management plans</li> <li>Drought triggers / mitigation measures</li> <li>Alternate water sources</li> </ul>	<ul style="list-style-type: none"> <li>Thailand                             <ul style="list-style-type: none"> <li>Basin River Committee oversights voluntary restriction in use</li> </ul> </li> <li>Australia                             <ul style="list-style-type: none"> <li>Level of service objectives</li> <li>Water sharing agreements</li> <li>Contingency plans implemented</li> <li>Demand side management</li> <li>Compliance to ensure water allocation are not over-used</li> <li>Close monitoring of use, at local scale</li> </ul> </li> </ul>

### C. Basin and local level planning

*How should basin level planning and local level planning be aligned given that there are differing priorities at the different scales?*

Group 1	Group 2
<ul style="list-style-type: none"> <li>Where connected river system                             <ul style="list-style-type: none"> <li>Need joint approach</li> <li>Common objectives / goals</li> </ul> </li> <li>Queensland                             <ul style="list-style-type: none"> <li>Water resource plans</li> <li>Resource operation plans</li> <li>Three/Four levels of government</li> </ul> </li> <li>Right management approaches</li> <li>Collaboration at the catchment level by all bodies                             <ul style="list-style-type: none"> <li>Basin strategies                                     <ul style="list-style-type: none"> <li>Salinity management</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Thailand                             <ul style="list-style-type: none"> <li>Basin scale is integrated</li> <li>Bottom up planning – starts at local level then aggregated</li> </ul> </li> <li>Australia                             <ul style="list-style-type: none"> <li>Yes needs to be well coordinated. Top-down – starts a whole of basin feeds into individual water resource plans, then to individual enterprises within the boundaries of the water resource plans</li> </ul> </li> </ul>