FLOOD & DROUGHT MANAGEMENT TOOLS

Technical Training: Chao Phraya Basin Report

27 November – 1 December, 2017

Centre Point Hotel Chidlom

Bangkok, Thailand

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1. Executive summary / รายงานสรุปสำหรับผู้บริหาร

There is a growing sense of urgency around the need to improve resilience within river basins, and for this to become a critical part of water management plans. The increased frequency and unpredictability of floods and droughts is a priority concern across scales from transboundary to local, along with the other multiple drivers that cause depletion and degradation of shared water resources.

The Flood and Drought Management Tools (FDMT) project (http://fdmt.iwlearn.org/) is financed by the Global Environment Facility (GEF) International Waters (IW) and implemented by UNEP, with the International Water Association (IWA) and DHI as executing agencies. The project is developing a computer software-based decision support system (DSS) with tools to support planning from the transboundary basin to water utility level by including better information on floods and droughts. 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 DSS.

Understanding how to use the DSS is an important aspect of the future operational use and sustainability of the FDMT project, therefore, capacity on the use and application of the DSS, as well as giving stakeholders an opportunity to provide feedback on the functionality of the DSS will go a long way to achieving this.

The project is holding a series of technical trainings targeting technical staff and junior to senior level water resource professionals from different organisations. Trainings intends to provide a basis for bringing basin organisations, water utilities and other organisations together around a common planning tool, while being able to test and validate the DSS. Feedback from these workshops is being gathered and will be included in the further development and refinement of the DSS.

The objective of the technical trainings are to:

- Enhance stakeholders understanding of the DSS
- Provide the stakeholders with an opportunity to give feedback on the functionality of the DSS
- Refine the development of the DSS based on stakeholder feedback

The training in the Chao Phraya Basin was divided into 2 separate trainings. A 2 day training from 27-28 November 2017 with representatives from utilities in Thailand, Metropolitan Water Works Authority and the Provisional Waterworks Authority as the key project stakeholders, and utility representatives from the National Water Supply & Drainage Board (NWSDB) in Sri Lanka as potential additional end users. A 3 day training from 29 November to 1 December, 2017 with representatives from basin level organisations including the Hydro and Agro Informatics Institute as the key project stakeholder and representatives from the Department of Disaster Prevention and Mitigation (DDPM), Royal Irrigation Department (RID), Electricity Generating Authority of Thailand (EGAT), Thai Metrological Department (TMD) and Department of Water Resources (DWR) as potential additional end users.

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ปัจจุบันนี้ความจำเป็นเร่งด่วนในการปรับปรุงความยืดหยุ่นภายในลุ่มน้ำมีเพิ่มมากขึ้นและยังเป็นส่วนสำคัญส่วนหนึ่งในการวางแผนบริหารจัดการน้ำ
การเพิ่มขึ้นของความถี่และความไม่แน่นอนของการเกิดน้ำท่วมและภัยแล้งเป็นประเด็นสำคัญที่ต้องพิจารณาทั้งในระดับข้ามพรมแดนและท้องถิ่น รวมถึงปัจจัยที่เกี่ยวข้องอื่น ๆ
ที่ทำให้เกิดการลดลงและการเสื่อมสภาพของแหล่งน้ำที่ใช้ร่วมกัน

โครงการจัดทำเครื่องมือในการบริหารจัดการน้ำท่วมและภัยแล้ง (http://fdmt.iwlearn.org/)
ได้รับเงินทุนจากกองทุนสิ่งแวดล้อมโลก (Global Environment Facility, GEF) ด้านน้ำระหว่างประเทศ
(International Waters, IW)และดำเนินการโดยโครงการสิ่งแวดล้อมแห่งสหประชาชาติ (United Nations Environment Programme, UNEP) โดยมีสมาคมน้ำนานาชาติ (International Water Association, IWA) และ DHI เป็นหน่วยงานปฏิบัติงานสำหรับโครงการ
โครงการนี้ได้พัฒนาโปรแกรมคอมพิวเตอร์สำหรับระบบสนับสนุนการตัดสินใจ (Decision Support System, DSS)

ที่มีเครื่องมือสนับสนุนการวางแผนสำหรับระดับลุ่มน้ำระหว่างประเทศจนถึงระดับการผลิตน้ำประปา รวมถึงข้อมูลน้ำท่วมและภัยแล้ง โครงการนี้มีระยะเวลาดำเนินการระหว่างปีพ.ศ. 2557-2561 ในลุ่มน้ำนำร่องทั้ง 3 แห่ง คือ ลุ่มน้ำโวลต้า (Volta) ทะเลสาบวิคตอเรีย (Lake Victoria) และลุ่มน้ำเจ้าพระยา เพื่อทำการพัฒนาและทดสอบระบบสนับสนุนการตัดสินใจ

การศึกษาทำความเข้าใจวิธีการใช้งานระบบสนับสนุนการตัดสินใจมีความสำคัญสำหรับการใช้งานและดำเนินการในอนาคตและยังส่งผลถึงความยั่งยืนของโครงการจัดทำเครื่องมือในการบริหารจัดการน้ำท่วมและภัยแล้ง ดังนั้นความสามารถในการใช้งานและการประยุกต์ใช้งานระบบสนับสนุนการตัดสินใจ รวมถึงการให้โอกาสแก่ผู้มีส่วนได้ส่วนเสียในการแสดงความคิดเห็นต่อฟังก์ชั่นการทำงานของระบบจึงเป็นขั้นตอนที่ต้องใช้เวลาเพื่อให้ประสบความสำเร็จ

โครงการนี้จะจัดการฝึกอบรมทางเทคนิคอย่างต่อเนื่องเป็นลำดับให้แก่เจ้าหน้าที่ด้านเทคนิคและผู้เชี่ยวชาญด้านแหล่งน้ำทุกระดับอาวุโสจากหน่วยงานต่างๆ การฝึกอบรมมีความมุ่งหมายที่จะให้หน่วยงานลุ่มน้ำต่างๆ หน่วยงานสาธารณูปโภคต่างๆ และหน่วยงานอื่นๆ ใช้เครื่องมือในการวางแผนร่วมกัน ในขณะที่สามารถที่จะทดสอบและตรวจสอบระบบสนับสนุนการตัดสินใจได้ ความคิดเห็นจากผู้เข้าร่วมประชุมจะถูกนำมาพิจารณาในการพัฒนาและปรับปรุงระบบสนับสนุนการตัดสินใจต่อไป

วัตถุประสงค์ของการฝึกอบรมทางเทคนิค ได้แก่

- เพื่อให้ผู้มีส่วนได้ส่วนเสียมีความรู้ความเข้าใจระบบสนับสนุนการตัดสินใจ
- เพื่อให้ผู้เกี่ยวข้องหลักมีโอกาสแสดงความคิดเห็นต่อการฟังก์ชั่นทำงานของระบบสนับสนุนการตัดสินใจ
- เพื่อปรับปรุงการพัฒนาระบบสนับสนุนการตัดสินใจให้ดีขึ้น โดยข้อเสนอแนะจากผู้มีส่วนได้ส่วนเสีย

การฝึกอบรมการใช้เครื่องมือบริหารจัดการน้ำท่วมและภัยแล้งสำหรับผู้ที่เกี่ยวข้องในลุ่มน้ำเจ้าพระยาแบ่งออกเป็น 2 ช่วง คือ (1) การฝึกอบรมสำหรับหน่วยงานสาธารณูปโภคในประเทศไทยได้แก่ การประปานครหลวงและการประปาส่วนภูมิภาค ซึ่งเป็นผู้มีส่วนได้เสียหลักของโครงการ และตัวแทนจาก National Water Supply & Drainage Board (NWSDB) ประเทศศรีลังกา ซึ่งเป็นผู้ที่มีศักยภาพที่จะนำไปใช้เพิ่มเติม โดยจัดการฝึกอบรม 2 วัน ระหว่างวันที่ 27 ถึง 28 พฤศจิกายน 2560 (2) การฝึกอบรมสำหรับองค์กรลุ่มน้ำระยะเวลา 3 วัน ระหว่างวันที่ 29 พฤศจิกายนถึง 1 ธันวาคม 2560 โดยมีตัวแทนจากองค์กรระดับลุ่มน้ำ ได้แก่ สถาบันสารสนเทศทรัพยากรน้ำและการเกษตร (สสนก.) ซึ่งเป็นผู้เกี่ยวข้องหลักของโครงการและผู้แทนจากกรมป้องกันและบรรเทาสาธารณภัย กรมชลประทาน การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย กรมอุตุนิยมวิทยา และกรมทรัพยากรน้ำ ในฐานะผู้ใช้งานเพิ่มเติม

2. Project background

There is a growing sense of urgency around the need to improve resilience within river basins, and for this to become a critical part of water management plans. The increased frequency and unpredictability of floods and droughts is a priority concern across scales from transboundary to local, along with the other multiple drivers that cause depletion and degradation of shared water resources.

The Flood and Drought Management Tools (FDMT) project (http://fdmt.iwlearn.org/) is funded by the Global Environment Facility (GEF) International Waters (IW) and implemented by UNEP, with the International Water Association (IWA) and DHI as the executing agencies. The project is developing online technical applications[1] which can be applied individually or together at the basin or local level to facilitate the inclusion of information about floods, droughts and future scenarios into Integrated Water Resources Management (IWRM) planning, Transboundary Diagnostic Analyses (TDA) and Strategic Action Plans (SAP), and Water Safety Planning (WSP). The project is being implemented from 2014 - 2018, and 3 pilot basins (Volta, Lake Victoria and Chao Phraya) are participating in development and testing.

Understanding how to use the technical applications is an important aspect of the future operational use and sustainability of the FDMT project, therefore, capacity on the use and interpretation of the tool and their outputs, as well as giving stakeholders an opportunity to provide feedback on the functionality of the tools will go a long way to achieving this.

The project has been holding a series of technical trainings targeting technical staff and junior to senior level water resource professionals from key project stakeholder. Trainings intend to provide a basis for bringing the basin organisations and relevant basin level authorities, and water utilities together around a planning tool, while being able to test and validate the technical content of tools. Feedbacks from the trainings are integrated into the development and refinement of the tools.

The objectives of the technical trainings are to:

- Enhance stakeholders understanding of the methodology and tools developed under the FDMT project
- Provide stakeholders with an opportunity to give feedback on the technical content of the tools
- Refine the development of the methodology and tools based on stakeholder feedback

[1] The term tools and technical applications are used interchangeably. Tools in this context are defined as the technical applications being developed by the project and are available at http://www.flooddroughtmonitor.com/home

3. Technical training

3.1 Overview of training

Technical trainings on the use of the tools are scheduled on a yearly basis within each of the pilot basins. The technical training provides capacity building as well as an opportunity for stakeholders to give feedback on the functionality and use of the developed tools to date. The feedback is included in the further development and refinement of technical content of the tools.

The technical training provides a basis for bringing basin and national level organisations, and water utilities around a common planning tool. The training in the Chao Phraya Basin was divided into 2 separate trainings:

- 2 day training from 27-28 November 2017 with representatives from utilities
- 3 day training from 29 November to 1 December, 2017 with representatives from basin level organisations

See Annex 1 for the agenda.

The training sessions reflected the developed functionality to date, using real data from the Chao Phraya Basin. Later trainings will include the functionality of additional tools available in the Flood and Drought portal (http://www.flooddroughtmonitor.com).

Objective

The objective of the technical training was to:

- Enhance stakeholders understanding of the methodology and tools developed under the FDMT project
- Provide stakeholders with an opportunity to give feedback on the technical content of the tools
- Refine the development of the methodology and tools based on stakeholder feedback

Expected outcome of the workshop

The expected outcome of the technical training is for key stakeholders to understand the functionality, how to use the tools, and how the output from the tools could be used in decision making around flood and drought management and planning.

For the project, it was also an opportunity to gather valuable feedback on the functionality and how the developed tools could be used in decision-making.

Target group

The target group of the technical training is the technical staff within the project stakeholders, junior to senior level water resource professionals as recommended by key stakeholders. The 2 day trainings focused on staff from the water utilities in Thailand, Metropolitan Water Works Authority and the Provisional Waterworks Authority as the key project stakeholders, and utility representatives from the National Water Supply & Drainage Board (NWSDB) in Sri Lanka as potential additional end users. The 3 day training with basin level organisations including the Hydro and Agro Informatics Institute as the key project stakeholder and representatives from the Department of Disaster Prevention and Mitigation (DDPM), Royal Irrigation Department (RID), Electricity Generating Authority of Thailand (EGAT), Thai Metrological Department (TMD) and Department of Water Resources (DWR) as potential additional end users (see Annex 2 for full participant list).

3.2 Technical training

From November 27 to 1 December, 2017, the FDMT project held a 2 day technical training at the Centre Point Hotel Chidlom with utilities and a 3 days technical training with basin level organisations. The training gave participants an overview of the latest developments of the methodology and

associated technical applications, and the opportunity try out the applications and provide feedback to be used in finalising the applications.

The following section will provide a brief overview of each day.

3.2.1 Utility training

All material from the training can be accessed here: https://goo.gl/FgBvE7

Day 1. Project overview, DSS platform and QGIS
Monday, 27 November, 2017

The first day started with a welcome address and an overview of the workshop and FDMT project. This was followed by a presentation on general functionality of the Flood and Drought Portal and a presentation on the use of climate data in long term planning before the break.

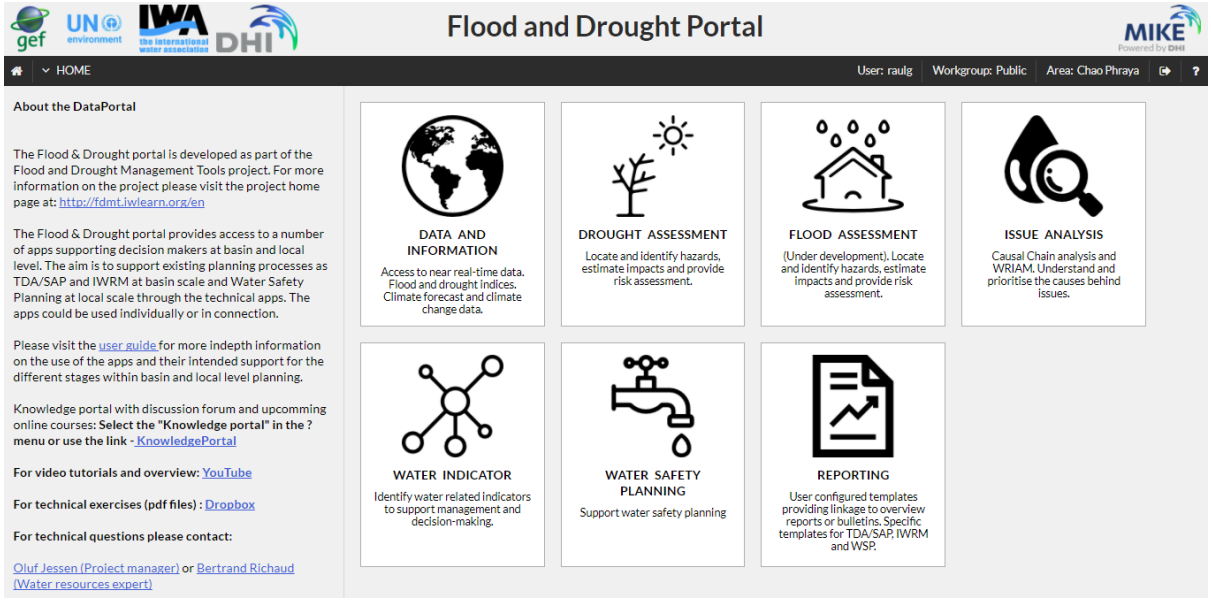

Figure 1. Flood and Drought Portal

The morning session was a useful pathway into the data and information application which provides users with access to near real-time satellite data (freely available). The application provides climate information such as rainfall, temperature, information about flood and drought indices, climate forecast and climate change. The information can be used to inform long-term planning in which climate change impacts can be considered.

The issue analysis application was also presented and explored by participants. The application aims at analysing environmental issues and the causes behind the impacts from the environmental issues. The application is based on the Causal Chain Analysis (CCA) method to identify the immediate, underlying and root causes behind the impact and the Water Resource Issues Assessment Method (WRIAM) is used to evaluate the key issues and prioritise the environmental impacts based on the a rapid assessment.

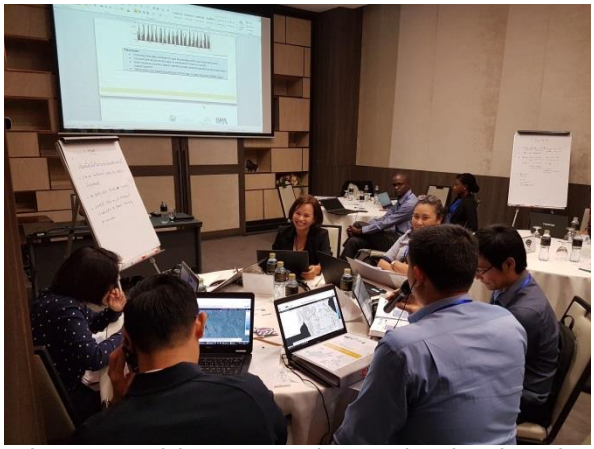

Figure 2. Participant groups interpreting data from the data and information application

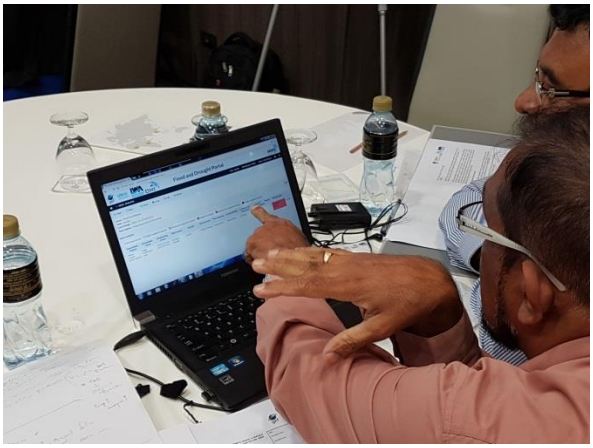

Figure 3. Participants assessing environmental impacts with the issue analysis application

Day 2. WSP and drought management in the DSS
Tuesday, 28 November, 2017

Day 2 focused on how the project is supporting utilities with their development and implementation of water safety plans (WSP). As part of the Flood and Drought Portal, a water safety planning supporting application has been included for development and documentation of the WSP process. The application is the main entry point for water utilities.Through the application, water utilities are prompted to think about climate change impacts on their supply system and for hazard identification in order to ensure their WSP are climate resilient.

The application supports the 11 modules (steps) identified in the WSP manual (http://www.wsportal.org/what-are-water-safety-plans/), each representing a key step in the WSP development and implementation process. Each module contains a brief overview and provides assistant for each key step on the development of the WSP.

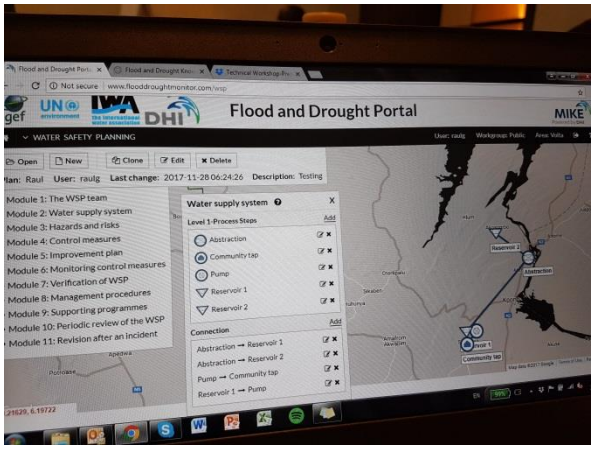

Figure 4. Water Safety Planning supporting application

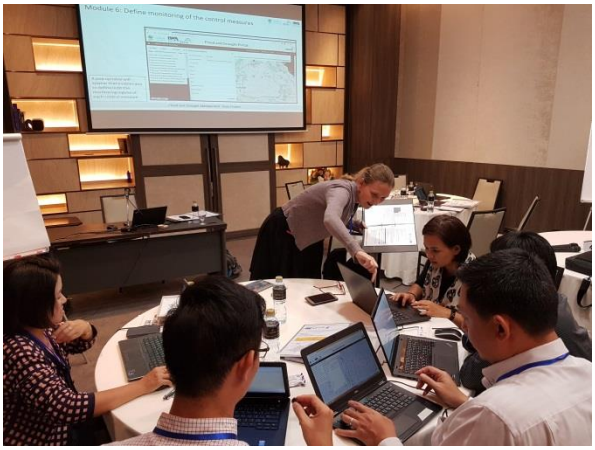

Figure 5. Participants explore the use of the Water Safety Planning supporting application with guidance from project staff

Towards the end of the day, both the water indicator application and reporting application were demonstrated to participants and an opportunity to for participants to test and explore the applications.

The water indicator application is a library of indicators providing information about the indicators, the relevance of the indicator and how it can be used for planning and decision making. Default

frameworks have been developed which users can use as a starting point when developing their own framework for their respective organisations, users are also able to start from scratch.

The reporting application pprovides configured templates that provide linkage to overview reports or bulletins. Reports are critical for easily disseminating technical information in a more accessible way. The applications allow users to generate automated reports (defined by the user) addressing key issues such as drought status, flood status, WSP status, etc.

Figure 6. Closing remarks from participants

3.2.2 Basin training

All material from the training can be accessed here: https://goo.gl/GGf96z

Day 1. Project overview, impacts and causes, indicators and data and information
Wednesday, 29 November, 2017

Day 1 started with a welcome address from the Hydro and Agro Informatics Institutes, followed by an overview of the project. The first day of the training provided an introduction to the drivers or causes of flood and drought events, use of indicators to measure the state of specific causes and overview and knowledge of relevant data.

Participants where introduced to the issue analysis application to identify and prioritize the key environmental impacts from flood and drought events using Chain Causal Analysis and WRIAM approach through group work and discussion to identify and prioritise issues. Participants were then introduced to the water indicator application.

Indicators provide a mean by which data can be combined or interpreted as a basis for making sound decisions or policies. Indicators are a way to compile complex values or data into a simple interpretation of a state and pressure, e.g. drought or flood status. Water indicators can be used for example to understand the current state of water resources, the changes in these resources and whether or not our interventions in a river basin produce the desired effect. Participants in groups worked used the water indicator application identifying relevant indicators for measuring the state of a flood and drought in Thailand.

Understanding the importance of indicators is one thing. Accessing the information or data to calculate indicators is another. Participants were presented the data and information application that provides users with access to near real-time satellite data, providing climate information such as rainfall, temperature, information about flood and drought indices, climate forecast and climate change. Participants were informed of the available data to be used for flood and drought assessment.

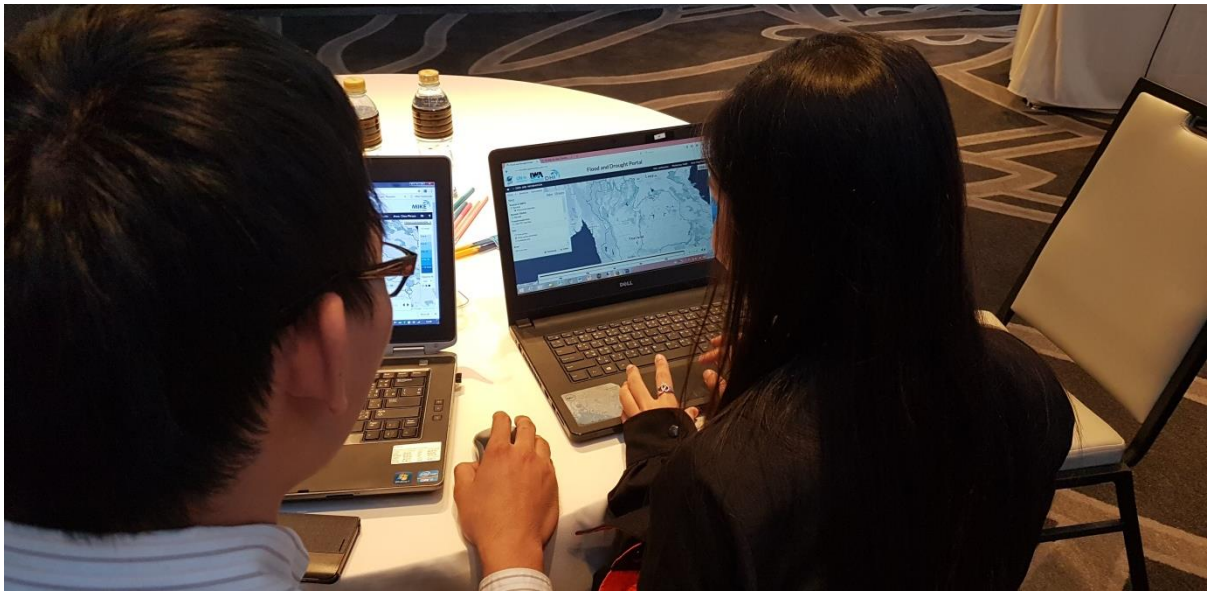

Figure 7. Participants exploring the data and information application

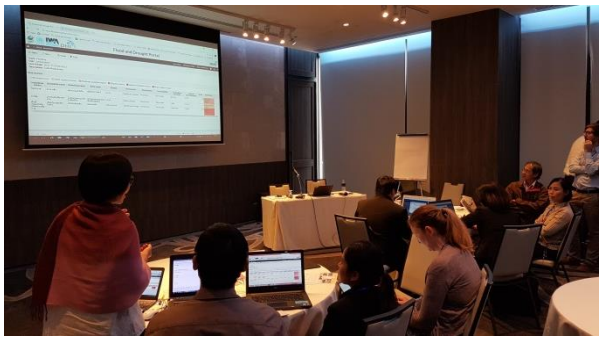

Figure 8. Participants present their issue assessment using the issue analysis application

Figure 9. Participants discuss the water indicator application

Day 2. Data and information, dissemination, drought indicators
Thursday, 30 November, 2017

Day 2 started with a reflection of Day 1 followed by a continuation around the understanding of the data to be used for flood or drought assessment.

This was followed by and explanation and exercises on how to disseminate information from the system to stakeholders and details on drought indicators of relevance needed to assess where drought affected areas exist for Thailand.

Participants continued to work with the data and information application before turning to the reporting application. Reports are critical for easily disseminating technical information in a more accessible way. The session ensured that participants understood how reports or bulletins for dissemination could be generated.

Before the end of the day, participants partook in hands-on exercises on how key indicators could be used for drought assessments using specific examples from Thailand. This involved the use of the drought assessment application also available in the portal. The application allows users to locate and identify hazards, estimate their impacts and provide a risk assessment.

Day 3. Drought indicators, drought early warning, flood assessment
Friday, 1 December, 2017

After a reflection of day 2, the 3rd and final day continued its focus on drought management, focusing on identify current and upcoming drought hazards, how to evaluate the risk as a combination of hazard and vulnerability and to disseminate warnings to relevant stakeholders and organisations. This was a continuation of exercises undertaken on day 2.

The remainder of the day focused on the flood component of the portal and an overview of the planned developments for the coming months (see section 3.3). This included understanding how the medium range forecast could be used in flood management. Overview and status of the applications supporting flood management. The flood assessment is set up in a similar way to that of the drought assessment application.

3.3 Next steps (2018)

There will be a number of activities around the technical application:

- Finalising updates to the WSP supporting application
- Continued development on the basin planning
- Migrating rainfall runoff model form data and information application to the flood assessment application and further development of the flood assessment application
- Further developments to the data and information application on going based on participant feedback
- Integration of various technical applications
- Further development to the reporting applications and integration with other applications

Once the applications are near completion, the focus of the remaining time will be on capacity development and consultation to ensure better uptake of the methodology and technical applications.

Annex 1 – Agenda

Utility level training

Monday, 27 November 2017 – 09:00-17:30 *Overview, Introduction to Flood and Drought Portal (data and information, issue analysis)*	
Time	**Item**
09:00-09:10	Welcome and introduction - IWA
09:10-09:20	Overview of workshop and FDMT project
09:20-09:40	General functionality
09:40-10:00	Long term planning – use of climate data
10:00-10:15	*Break*
10:15-11:00	Data and information application • Climate overview

11:00-12:00	Data and information application
	• Climate hazard
	  ○ Rainfall
	  ○ Temperature

12:00-13:00	*Lunch*
13:00-14:00	Data and information application • Rainfall forecast ○ Seasonal forecast: SPI
14:00-15:00	Data and information application • Climate change
15:00-15:15	*Break*
15:15-16:15	Data and information application • Climate change
16:15-16:30	Discussion (data and information: climate data)
16:30-17:00	Issue analysis
17:00-17:15	Discussion and wrap up

Tuesday, 28 November 2017 – 09:00-17:00 *WSP support, indicators and reporting*	
Time	**Item**
09:00-09:10	Importance of catchment information (climate data) in implementing climate resilient WSPs
09:10-09:40	Presentation – MWA (10 mins) – 5 min Q&A Presentation – PWA (10 mins) – 5 min Q&A
09:40-10:00	WSP support application
10:00-10:30	Module 1, 2
10:30-10:45	*Break*
10:45-12:30	Module 3, 4, 5
12:30-13:30	*Lunch*
13:30-14:45	Module 6, 7, 8
14:45-15:30	Module 9, 10, 11
15:30-16:00	*Break*
16:00-16:30	Water indicator application
16:30-17:00	Reporting application
17:00-17:15	Discussion and wrap up

** all material (presentations, step-by step guides, etc.) can be accessed here: https://goo.gl/FqBvE7*

Basin level training

Wednesday, 29 November 2017 – 09:00-17:00	
Time	**Item**
09:00-09:30	Registration
09:30-09:45	Welcome and presentation of the objective with the technical training
09:45-10:00	Presentation of participants
10:00-10:30	**Status of the ongoing Flood & Drought project** Outcome: Objective and current status of the project.
10:30-13:00	**Flood and Drought – impact and causes** *Identify and prioritize the key environmental impacts from drought and flood using a Chain Causal Analysis and WRIAM approach* • Group work based on the Issue Analysis app. • Discussion on the identified and prioritised causes Outcome: Identification of prioritised impacts and the underlying causes of flood and drought events in Thailand.
13:00-14:00	*Lunch*
14:00-16:00	**Indicators – assessing the state through indicators** *Identify relevant indicators for measuring the state of the causes for flood and drought in Thailand.* • Group work based on the Water Indicator app. • Identification of relevant indicators for the key underlying causes behing flood and drought in Thailand. Outcome: Identification of indicators and the required data for assessing the state of flood and drought in Thailand.
16:00-16:45	**Flood and Drought – data (part 1)** *Overview and understand available near real time data for flood and drought assessment.* • Hands-on exercises – based on the Data and Information app. • Basic introduction to the functionality and the different data types. Outcome: Knowledge and understanding of available data to be used for flood and drought assessment.
16:45-17:00	Discussion and wrap up

Breaks in the morning and afternoon will be organised around 11.00 and 15.00. Exact time will depend on the progress of the sessions.

Thursday, 30 November 2017 – 09:00-17:00	
Time	**Item**
09:00-09:30	Reflection and follow up on day 1
09:30-13:00	**Flood and Drought – data (part 2)** *Overview and understand available near real time data for flood and drought assessment.* • Hands-on exercises – based on the Data and Information app. • Data representing the historic and current state as well as forecast data will be introduced. Outcome: Knowledge and understanding
13:00-14:00	*Lunch*
14:00-15:00	**Flood and Drought - dissemination** *Understand how reports or bulletins for dissemination could be generated. Use of QGIS for high-resolution maps.* • Hands-on exercises – use and setup of the reporting application

	• Generate maps using QGIS Outcome: Capacity and knowledge
15:00-16:45	**Drought indicators** *In depth understanding of key indicators to be used for drought assessment in Thailand.* • Hands-on exercises – how key indicators could be used for drought assessment • Specific examples from Thailand Outcome: Capacity and knowledge to use key indicators for drought assessment in Thailand.
16:45-17:00	Discussion and wrap up

Breaks in the morning and afternoon will be organised around 11.00 and 15.00. Exact time will depend on the progress of the sessions.

Friday, 1 December 2017 – 09:00-17:00	
Time	**Item**
09:00-09:30	Reflection and follow up on day 2
09:30-11:00	**Drought indicators (part 2)** *In depth understanding of key indicators to be used for drought assessment in Thailand.* • Hands-on exercises – how key indicators could be used for drought assessment • Specific examples from Thailand Outcome: Capacity and knowledge to use key indicators for drought assessment in Thailand.
11:00-13:00	**Drought – early warning** *Objective and workflow for drought early warning in Thailand.* • Hands-on exercises – based on the Drought Assessment app. Outcome: Practical understanding on application of drought early warning in Thailand.
13:00-14:00	*Lunch*
14:00-15:00	**Flood – forecast and data** *Understand how the medium range forecast could be used in flood management.* *Overview and status of the applications supporting flood management.* • Hands-on exercises – based on the data and information app. • Flash flood concept presentation and discussion. Outcome: Knowledge and understanding of flood related data and indices as well as state and uncertainty of short-term forecast.
15:00-15:30	**Flood and Drought – planned developments** *Understand the final deliverable from the project and how the planning process will be further supported through specific planning applications.* • Presentation of the up-coming applications Outcome: Knowledge and understanding of the complete system to be delivered as part of the project.
15:30-16:00	Discussion and wrap up

Breaks in the morning and afternoon will be organised around 11.00 and 15.00. Exact time will depend on the progress of the sessions.

** all material (presentations, step-by step guides, etc.) can be accessed here: https://goo.gl/GGf96z*

Annex 2 – Participants

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Ms. Chaweepan Suangkittikhun	Metropolitan Waterworks Authority (MWA)	
Ms Sureerat Putthakosa	Metropolitan Waterworks Authority (MWA)	
Mr. Nat Tangpanichayanont	Metropolitan Waterworks Authority (MWA)	
Mrs. Siwilai Kitpitak	Metropolitan Waterworks Authority (MWA)	
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Basin participants		
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Annex 3 – Evaluation form

Evaluation of Flood and Drought Management Tools Technical training

Name: **Organisation:**

What was your overall impression of the training?

Excellent ☐	Good ☐	Acceptable ☐	Below expectations ☐
Comments:			

General	Too high		Acceptable		Too low
How did you find the technical content of the course?	1	2	3	4	5
	Agree				Disagree
There was sufficient hands-on support during the training	1	2	3	4	5
Comments (specifically on the technical level of the training):					
	Too long				Too Short
The duration of the training was…	1	2	3	4	5
The time for discussions and group work was…	1	2	3	4	5
The time for hands-on use of the tools was…	1	2	3	4	5
Comments (specifically on length of the training and time provided to do each exercise):					

Presentations and demonstration of Flood and drought management tools	Agree				Disagree
I have a good overall understanding of the Flood and Drought Management Tools project and what it is trying to achieve	1	2	3	4	5
The presentations of the Flood and Drought Portal and the technical applications were clear and understandable	1	2	3	4	5
The demonstration of the Flood and Drought Portal and the technical applications were clear understandable	1	2	3	4	5
The written guidance and exercises for the Flood and Drought Portal and the technical applications were clear understandable	1	2	3	4	5
What could be improved and made clearer when presenting and demonstrating the tools?					
Which tool are you likely to use and how?					

Would you use the climate data presented in the data and information tool? How would you use this data?

Exercises and group work	Agree				Disagree
The exercises for each of the tools were easy to follow	1	2	3	4	5
The exercises helped increased my understanding of the technical applications	1	2	3	4	5
I feel that I will be able to use the technical applications after the training	1	2	3	4	5
What did you like or not like about the exercises for the tools?					
What could be improved and made clearer?					

Course practicalities	Agree				Disagree
The venue was satisfactory	1	2	3	4	5
Lunch and refreshments were satisfactory	1	2	3	4	5
The training was well organised	1	2	3	4	5
I received practical information well in advance	1	2	3	4	5
Comments:					

Annex 4 – Feedback

Utility training

General						n 15
Questions						
	Response					
	Excellent	**Good**	**Acceptable**	**Bellow Expectation**		
What was your overall impression of the training	5	10				
Comment	translation of importance context of WSP into Thai language					
	Too high		**Acceptable**		**Too low**	
	1	**2**	**3**	**4**	**5**	
How did you find the technical content of the course?	11	12	4	4		
	Agree				**Disagree**	
	1	**2**	**3**	**4**	**5**	
There was sufficient hands on support during the training	9	4	2			
Comment	some topic is difficult to understand					
	Too long				**Too short**	
	1	**2**	**3**	**4**	**5**	
How did you find the technical content of the course?	11	12	4	4		
The duration of the training was...			8	7		
The time for discussion and group work was...		1	11	3		
The time for individual hands-on exercises was...			10	5		
Comments (specifically on length of the training and time provided to do each exercise)	- the workshop should have longer duration than this - 3 days good					

Presentations and demonstrations of flood and drought management tools						n 15
Questions						
	Response					
	Agree				**Disagree**	
	1	**2**	**3**	**4**	**5**	
I have a good overall understanding of the Flood and Drought Management Tools project and what it is trying to achieve	8	5	1			
The presentations of the Flood and Drought Portal and the technical applications were clear and understandable	7	5	3			
The demonstration of the Flood and Drought Portal and the technical applications were clear understandable	7	5	3			
The written guidance and exercises for the Flood and Drought Portal and the technical applications were clear understandable	7	6	2			
What could be improved and made clearer when presenting and demonstrating tools?	- the tools to export data and info for further use and application - some in WSP part - WSP and reporting - Risk - Would like the tools can be applied in water supply development and					

	impact assessment on temperature change - obtaining comments periodically & updating
Which tool are you likely to use and how?	- WSP - all - try to use WSP tools - WSP - Climate change related to WSP - climate change associated to WSP
Would you use the climate data presented in the data and information tool? How would you use this data?	- use for risk assessment and for identify the proper risk - all - use as additional information for design analysis or evaluate the situation of raw water - WSP and monitoring - yes

Exercises and group work *n* 15

Questions					
	Response				
	Agree				**Disagree**
	1	**2**	**3**	**4**	**5**
The exercises for each of the tools were easy to follow	5	7	2	1	
The exercises helped increased my understanding of the technical applications	5	8	1	1	
I feel that I will be able to use the technical applications after the training	6	6	1	2	
What did you like or not like about the exercises for the tools?	- all - some formats were not finalized				
What could be improved and made clearer?	- need more time to review				

Course practicalities *n* 15

Questions					
	Response				
	Agree				**Disagree**
	1	**2**	**3**	**4**	**5**
The venue was satisfactory	5	8	1	1	
Lunch and refreshments were satisfactory	9	5	1		
The training was well organised	10	4		1	
I received practical information well in advance	7	5	1	1	1
Comment					

Basin training

General *n* 8

Questions					
	Response				
	Excellent	**Good**	**Acceptable**	**Bellow Expectation**	
What was your overall impression of the training		8			
Comment	- gain more knowledge and apply to the job - interesting training and get good support - gain knowledge about how to apply convert radar data to use easily				

	- the portal design is easy to use and more robust				
	Too high		**Acceptable**		**Too low**
	1	**2**	**3**	**4**	**5**
How did you find the technical content of the course?	4	2	2		
	Agree				**Disagree**
	1	**2**	**3**	**4**	**5**
There was sufficient hands on support during the training	5	2	1		
Comment	could be explain more about the climate change				
	Too long				**Too short**
	1	**2**	**3**	**4**	**5**
The duration of the training was...			7	1	
The time for discussion and group work was...		1	6	1	
The time for individual hands-on exercises was...			6	2	
Comments (specifically on length of the training and time provided to do each exercise)	- want to have more training days to 5 days to get more understanding - OK - good and flexible - it would be good if it include flood - 1 week and should be specific to the drought assessment, data and information				

Presentations and demonstrations of flood and drought management tools					
Questions			**Response**		
	Agree				**Disagree**
	1	**2**	**3**	**4**	**5**
I have a good overall understanding of the Flood and Drought Management Tools project and what it is trying to achieve		8			
The presentations of the Flood and Drought Portal and the technical applications were clear and understandable		8			
The demonstration of the Flood and Drought Portal and the technical applications were clear understandable	1	6	1		
The written guidance and exercises for the Flood and Drought Portal and the technical applications were clear understandable	2	4	2		
What could be improved and made clearer when presenting and demonstrating tools?	- tool for helping to compare data - add tool for comparing data in each block (select to show many graphs together) - want to have description/interpretation regarding evaluation of data - show output first that what is the objective of the module, what is the result and show method how to get this result, step by step - explain more detail for each index step by step to use the tools				
Which tool are you likely to use and how?	- rainfall data use for analysis of water situation during time of disaster - rainfall data for forecasting from historical data - SPI, CDI to check risk of drought, like tool to make report automatically - analysis indicator and creating a report - drought assessment and data and information because it can analyse the situation and easy for monitoring				

n *8*

	- indicator, report, data - drought assessment use for warning and present drought area - Data and Information, Reporting
Would you use the climate data presented in the data and information tool? How would you use this data?	- Rainfall, SWJ, VCJ - rainfall data, water body to look into flood risk - using climate data to analyse trend of water situation for reservoir management - Yes, I would like it. To forecast and predict for future and can design for warning and management. - Yes, make a weekly report for monitoring - yes, using for drought monitoring

Exercises and group work *n* 8

Questions	**Response**				
	Agree				**Disagree**
	1	**2**	**3**	**4**	**5**
The exercises for each of the tools were easy to follow	3	3	2		
The exercises helped increased my understanding of the technical applications	3	5			
I feel that I will be able to use the technical applications after the training	2	5	1		
What did you like or not like about the exercises for the tools?	- liked exercise on the first day because it is similar and can apply to real job - liked data that can apply to analyse later - liked hands-on exercise that can do by ourselves and can learn the problem -create report is interested. And if can link result automatic would be nice. - it easy to use - very much, like - yes, I liked it, very clear and simple.				
What could be improved and made clearer?	- resources of data, concept for basic knowledge - inform the sources of calculation to understand interpretation of result - should show unit in every graphs, topic in issue analysis should have link to indicator creation - I have a lot of comment during the class. - report generator				

Course practicalities *n* 8

Questions	**Response**				
	Agree				**Disagree**
	1	**2**	**3**	**4**	**5**
The venue was satisfactory	2	5	1		
Lunch and refreshments were satisfactory	3	4	1		
The training was well organised	3	4	1		
I received practical information well in advance	4	4			
Comment	- good venue but hard traffic - waiting for flood management tools training course				