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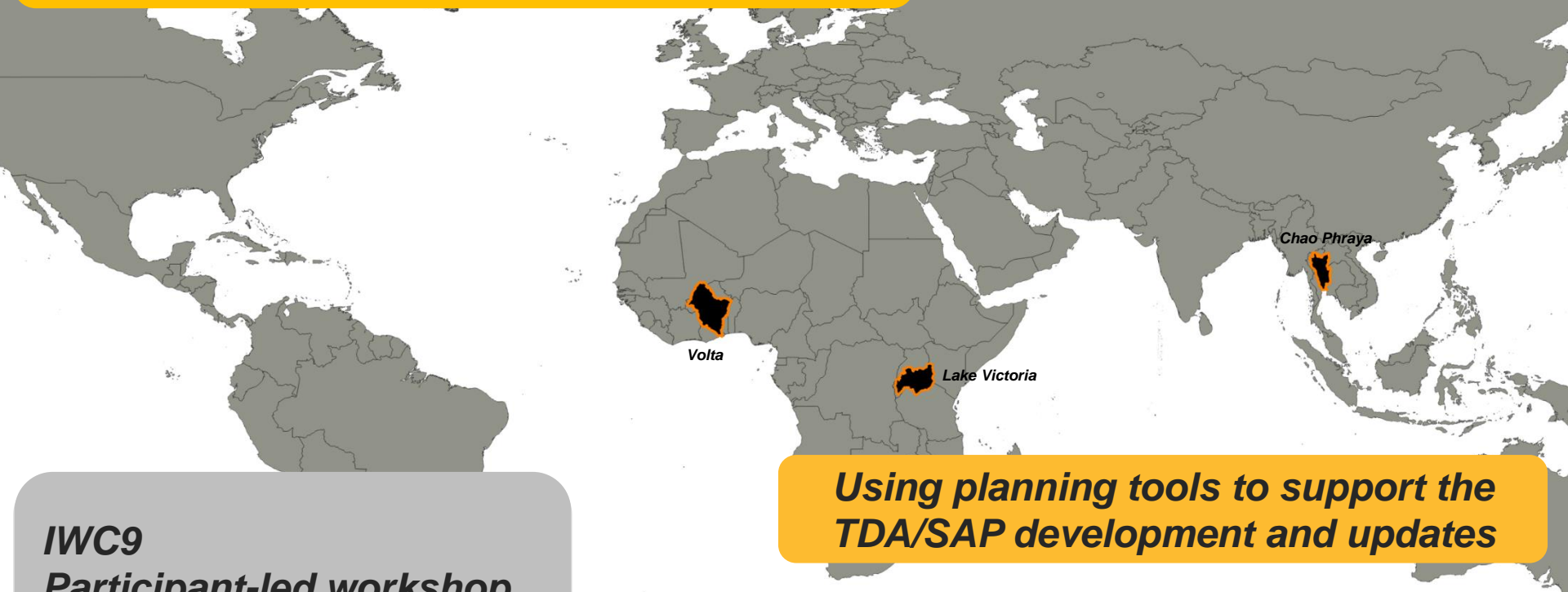
For more information contact:

Oluf Zeilund Jessen – DHI: ozj@dhigroup.com

Katharine Cross – IWA: katharine.cross@iwahq.org

Design: www.chris-wells.com

FLOOD & DROUGHT MANAGEMENT TOOLS



IWC9
Participant-led workshop
Marrakech — 6 nov 2018

*Using planning tools to support the
TDA/SAP development and updates*



Introduction | Peter Bjørnsen, UNEP-DHI

Overview of the portal | Bertrand Richaud, DHI

Roundtable discussions *(with guided questions)*

Highlights from roundtable discussions | Katharine Cross, IWA *(facilitator)*

Strategic recommendations | Per B. Hansen, DHI

Rationale

- Frequency, unpredictability and severity of flood and drought events
- Improvements needed in our ability to recognise and address the risks
- Identified need for tools that can provide flood and drought information into planning:
 - GEF Transboundary Basins - Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP)
 - Basin plans – IWRM plans, basin investment plans
 - Water utility plans – water safety planning

Strategic Action 3.1: Advance information exchange and early warning

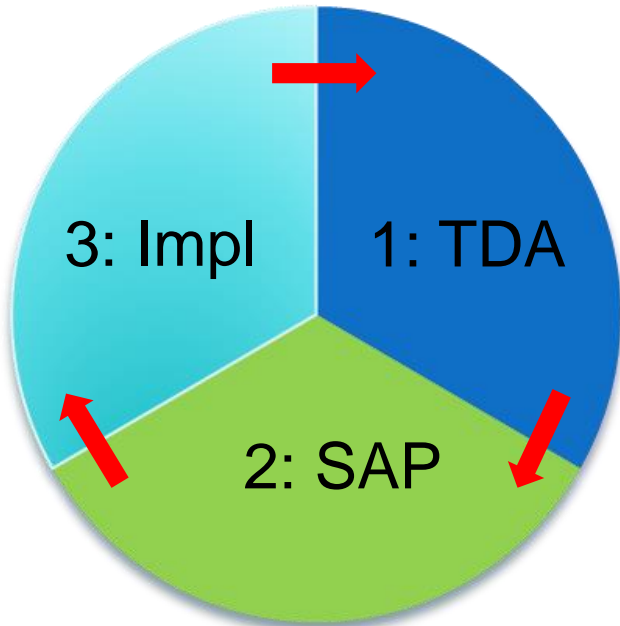
- Flood and drought early warning systems and disaster risk management plans;
- Nature based efforts for disaster risk management, including floods, droughts, and coastline protection;
- Enhanced quality, coverage and availability of information on surface and groundwater availability and use;
- Increased capacity to gather, distill and process data sources into policy relevant analysis;
- Enhanced capacity on national and regional dialogues to support decision making and identify joint action.

Strategic Action 3.2: Enhance regional and national cooperation on shared freshwater surface and groundwater basins

- Common, participatory fact-finding and agreement on cooperative opportunities incl. the formulation of TDA/SAP
- Capacity building efforts to level the playing field across countries, including negotiation skills and int. water law;
- Processes to formulate and formalize cooperative legal and institutional frameworks;
- Identify and leverage resources for investments addressing SAP identified priorities;
- National reform of policies, strategies and regulations in accordance with regional agreements and MEA commitments;
- Improved policy formulation processes and conjunctive management of surface and groundwater resources;
- Periodical update of existing Transboundary Diagnostic and Strategic Action Programs - or their equivalents;
- Engagement with national, regional and global stakeholders to increase collaboration through IW-LEARN.

Strategic Action 3.3: Investments in water, food, energy and environmental security

- Supply chain approaches for increased water efficiency and reduction of ecosystems pressures;
- Increase water efficiency, reuse, and reduce point and non-point sources of pollution addressing both primary and emerging pollutants, along the S2S continuum;
- De-risk innovation in development through piloting of innovative technologies;
- Nature based approaches to improve infiltration, avoid sedimentation and erosion through IWRM and SLM;
- Protect and rehabilitate aquatic ecosystems, especially wetland areas, river banks, mangroves, and other key habitats;
- Establish minimum environmental flows to maintain healthy ecosystems and aquatic biodiversity;
- Sustain freshwater fisheries and aquaculture via improved management strategies and policy formulation processes;
- Support fragile and/or conflict affected countries, via a country based pilot to fully engage in the transboundary process



Operational planning



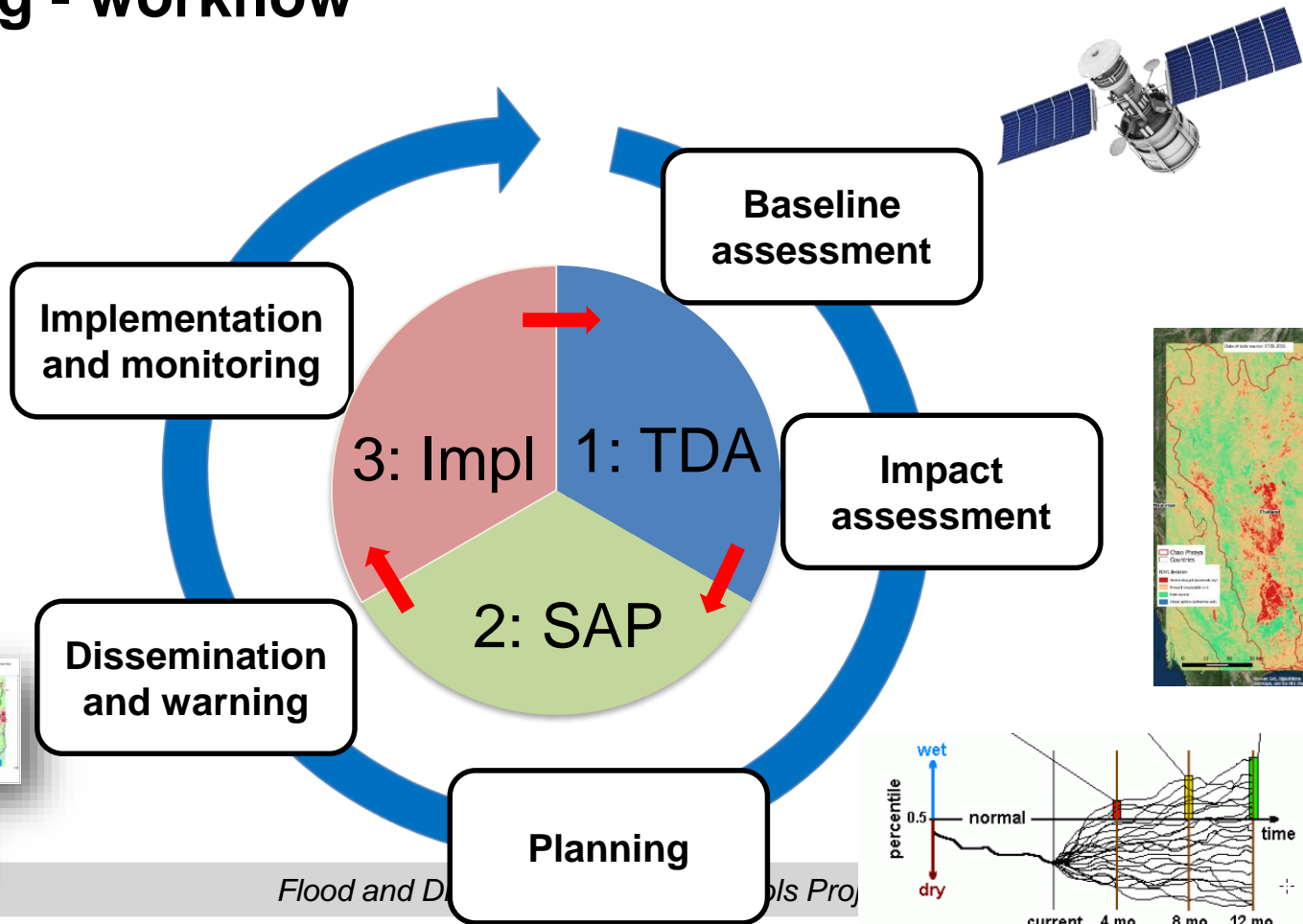
Short-term and seasonal management

Strategic planning



Long-term investments

Planning - workflow



Flood and Drought Planning Tools Project

Pilot Basins - Testing the project outputs

The project is working with three pilot basins for development and testing of the project outputs before it can be promoted for wider use.



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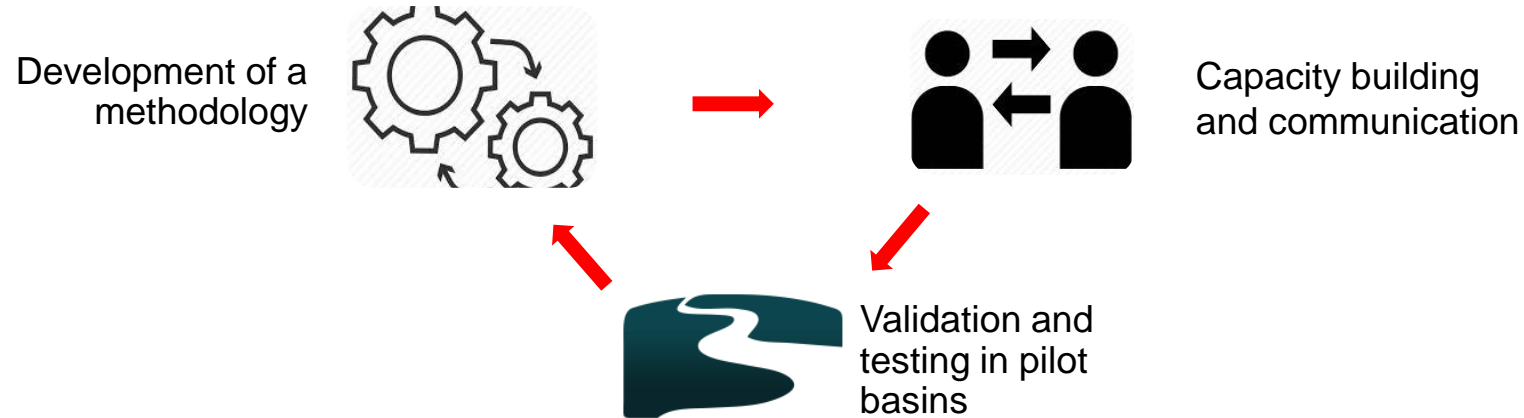
Highlights from roundtable discussions | Katharine Cross, IWA *(facilitator)*

Strategic recommendations | Per B. Hansen, DHI

Video removed

Project objective

To improve the ability of land, water and urban area managers across scales to address floods and droughts in their planning processes by developing technical software tools which can be applied to address these challenges



Flood and Drought web based portal

The screenshot displays the 'Flood and Drought Portal' website. At the top, it features logos for gef, UN environment, IWA, and DHI, along with the MIKE logo. The navigation bar includes 'HOME', 'User: oaj', 'Workgroup: Public', and 'Area: Thailand'. The main content area is titled 'About the DataPortal' and contains text about the portal's purpose and access to various tools. Below this, there are ten icons representing different tools: ISSUE ANALYSIS, WATER INDICATOR, DATA AND INFORMATION, DROUGHT ASSESSMENT, CROP APPLICATION, FLOOD ASSESSMENT, BASIN PLANNING, WATER SAFETY PLANNING, RDM TOOL, and REPORTING. At the bottom, several smaller screenshots show the portal's interactive features, including maps of Thailand and data tables.

About the DataPortal

The Flood & Drought portal is developed as part of the Flood and Drought Management Tools project. For more information on the project please visit the project home page at: <http://fomt.livlearn.org/en>

The Flood & Drought portal provides access to a number of apps supporting decision makers at basin and local level. The aim is to support existing planning processes as TDA/SAP and IWRM at basin scale and Water Safety Planning at local scale through the technical apps. The apps could be used individually or in connection.

Please visit the [user guide](#) for more indepth information on the use of the apps and their intended support for the different stages within basin and local level planning.

Knowledge portal with discussion forum and upcoming online courses: Select the "Knowledge portal" in the ? menu or use the link - [KnowledgePortal](#)

For video tutorials and overview: [YouTube](#)

ISSUE ANALYSIS
Causal Chain analysis and WRIAM. Understand and prioritise the causes behind issues.

WATER INDICATOR
Identify water related indicators to support management and decision-making.

DATA AND INFORMATION
Access to near real-time data. Flood and drought indices. Climate forecast and climate change data.

DROUGHT ASSESSMENT
Locate and identify hazards, estimate impacts and provide risk assessment.

CROP APPLICATION
Visualise crop calendar, estimate crop water requirement and crop yield.

FLOOD ASSESSMENT
(Under development). Locate and identify hazards, estimate impacts and provide risk

BASIN PLANNING
Create and evaluate basin plans.

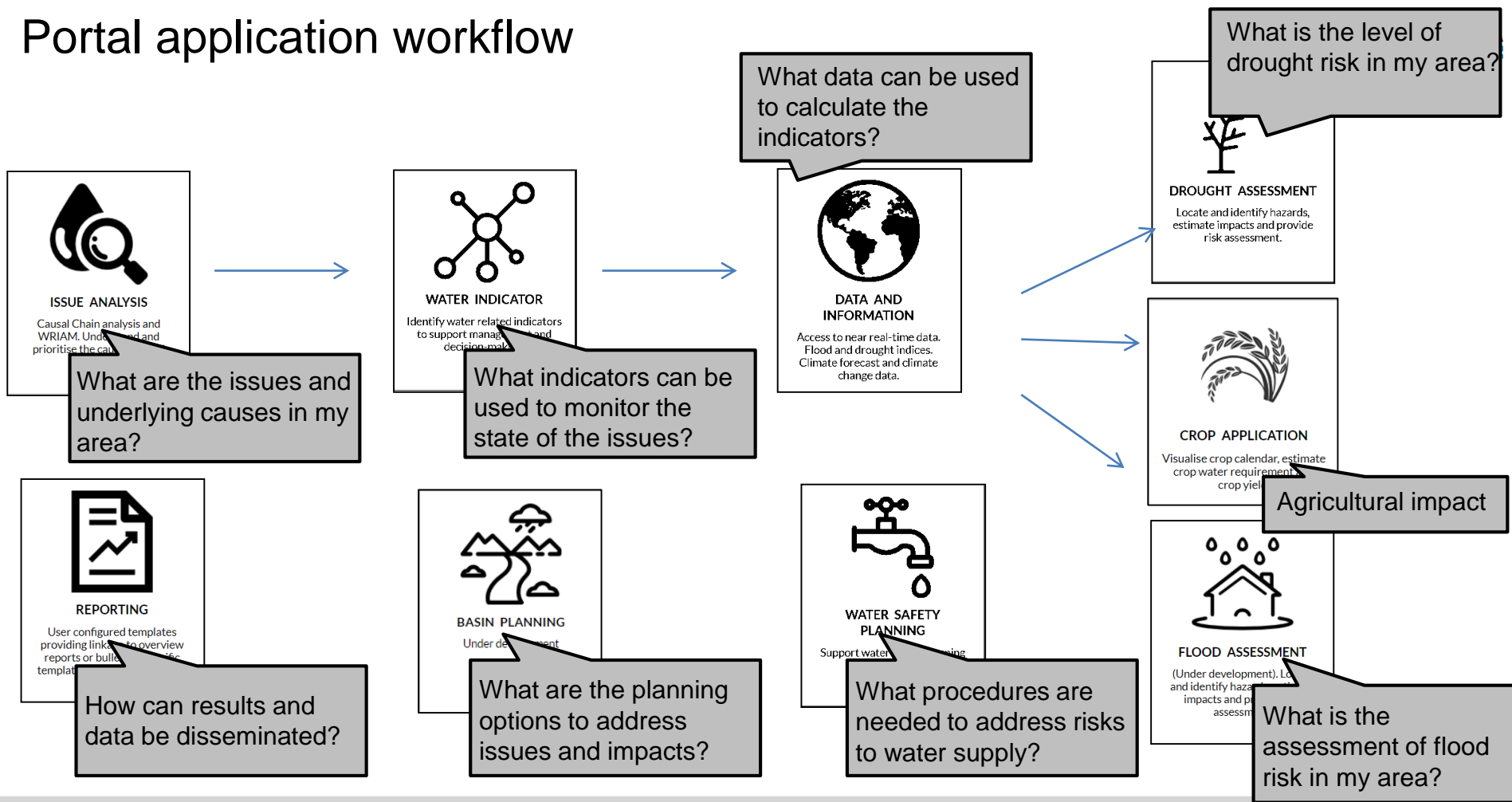
WATER SAFETY PLANNING

RDM TOOL
Robust Decision Making Tool

REPORTING
User configured templates

www.flooddroughtmonitor.com

Portal application workflow



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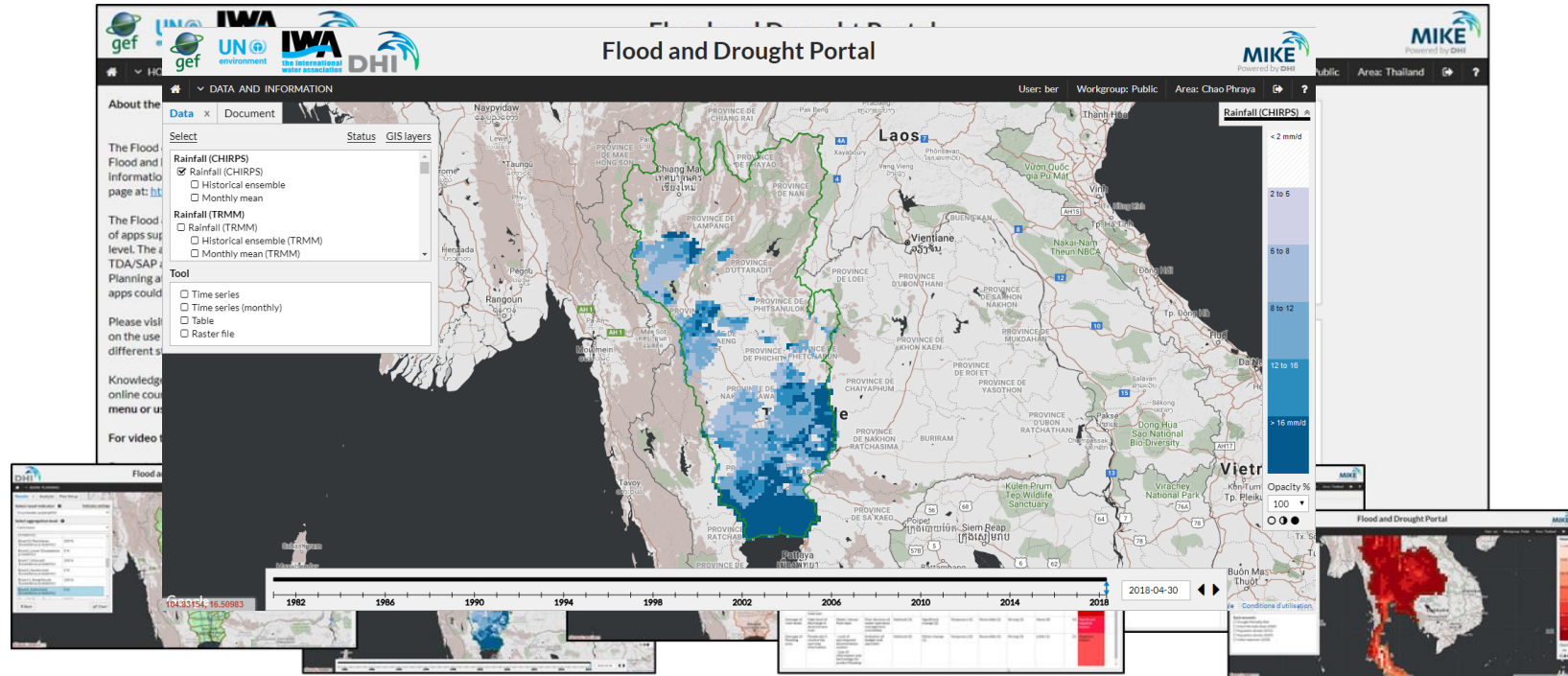
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REPORTING
User configured templates

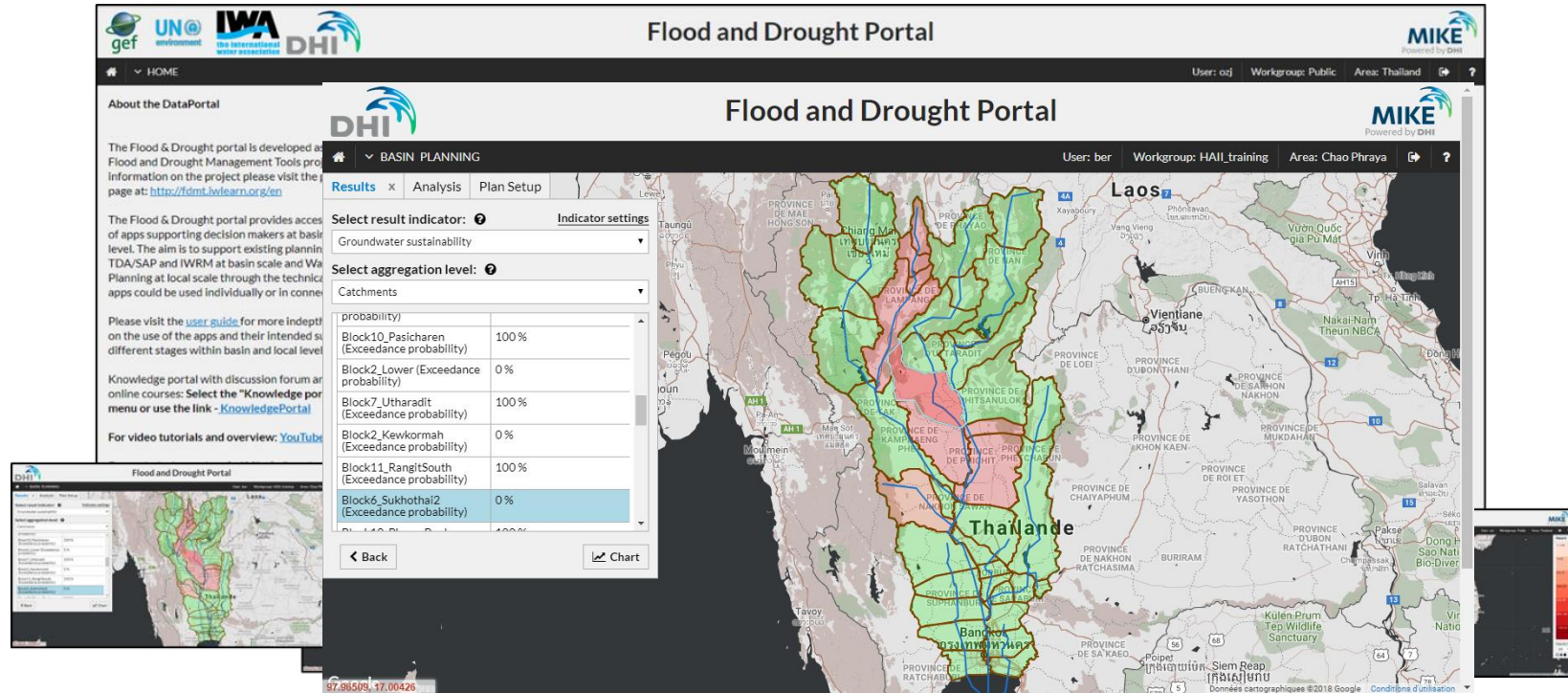
www.flooddroughtmonitor.com

Flood and Drought web based portal



www.floordroughtmonitor.com

Flood and Drought web based portal



www.flooddroughtmonitor.com

Flood and Drought web based portal

The screenshot displays the 'Flood and Drought Portal' interface. The top navigation bar includes logos for gef, UN environment, IWA, and DHI, along with the MIKE logo. The main content area is titled 'Flood and Drought Portal' and shows a 'CROP APPLICATION' section. On the left, there is a sidebar with 'About the DataPortal' and 'The Flood & Drought portal provides access to a number of apps supporting decision makers at basin and local level.' The main area features a map of Thailand with a selected area in the north. A 'Crop calendar' table is displayed, showing the growth and harvest periods for various crops. Below the table, there is a 'List of crops in the area' section with checkboxes for Oats, Potatoes, Pulses, Rapeseed, Rice, Rye, and Soybeans. The 'Crop calendar' table is as follows:

Crop	Feb 2014	Mar	Apr	May	Jun	Jul	Aug	Sep
Potatoes_Plant								
Potatoes_Growing								
Potatoes_Harvest								
Rice_Plant								
Rice_Growing								
Rice_Harvest								

The map shows the location of the selected area in the north of Thailand, with coordinates 102.38696, 16.86763. The map also shows the location of Bangkok and other major cities in Thailand.

www.flooddroughtmonitor.com

Project methodology – Issue Analysis



ISSUE ANALYSIS

Causal Chain analysis and
WRIAM. Understand and
prioritise the causes

What are the issues and
underlying causes in my
area?

Project methodology – Issue Analysis

Overview and switch between issues

Create new issue for analysis

Clone current issue

Edit current issue

Delete current issue

User information

Workgroup management

The screenshot shows the 'ISSUE ANALYSIS' tool interface. At the top, there's a navigation bar with a home icon, a dropdown menu, and user/workgroup information (User: ozj, Workgroup: Public, Area: Volta). Below this is a toolbar with buttons: Overview, New, Clone, Edit, and Delete. The main content area displays the details of a selected issue: 'Issue: Water quantity and seasonal flows', 'User: admin', 'Last change: 2017-03-21 09:10:29', and a description: 'Relates to the availability of water across the basin for socio-economic and cultural uses.' Below the description is a section for 'Issue analysis' with a legend for impact levels: No importance, Slight negative impact, Moderate negative impact, Negative impact, Significant negative impact, and Major negative impact. A table follows, showing various factors and their impact scores. The first row is highlighted in red.

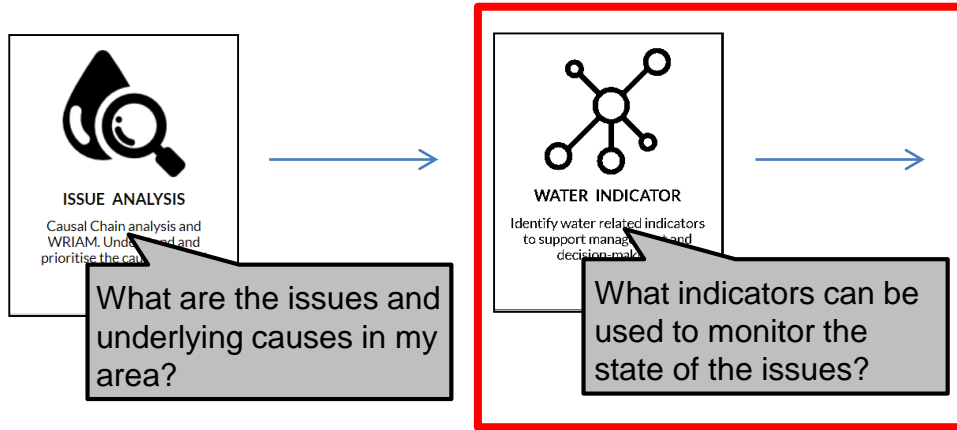
Immediate impact	Immediate cause	Underlying cause	Root cause	Extent	Seriousness	Permanence	Irreversibility	Cumulative character	Level of documentation	Score	Assessment	
Loss of biodiversity	Creation of dams and impoundments	Unsustainable practices	Migration from rural to urban - urban growth	Regional/national	Significant change	Permanent	Irreversible	Moderate	Some	30	Negative impact	
Water	Damming of the	Poor agricultural	Low level of	Regional/national	Significant change	Temporary	Reversible	Moderate	Some	18	Moderate	

Objectives:

- Identify the key environmental issues
- Understand the causes behind the issues

Stakeholder facilitation tool used in the early planning stages

Project methodology – Water Indicators



Project methodology – Water Indicators

Framework view
Issue tab
New indicator

Climate > Climate Vulnerability

Indicator
Climate Vulnerability Index

Description
The Climate Vulnerability Index (CVI) is used as an integrated assessment of local vulnerability to water-related risks. It is a composite indicator, determined as a function of climate exposure, resilience and adaptability. The CVI takes into account a wide range of relevant factors to capture the key drivers of human vulnerability to climate related impacts on water resources.

Keyword
climate change adaptation freshwater availability water scarcity water stress
natural resource management sustainable livelihoods irrigation agricultural development
water related hazards disaster planning disaster management disaster preparedness health
vulnerability

Metadata sheet

Page: 1 of 4 Automatic Zoom

UNEP-DHI PARTNERSHIP
Centre on Water and Environment
Water Indicator Builder
Indicator metadata sheet

GENERAL INFORMATION	
Title	Climate Vulnerability Index
Category	Climate Subcategory Climate Vulnerability
Purpose	The Climate Vulnerability Index (CVI) is used as an integrated assessment of local vulnerability to water-related risks. It is a composite indicator, determined as a function of climate exposure, resilience and adaptability. The CVI takes into account a wide range of relevant factors to capture the key drivers of human vulnerability to climate related impacts on water resources.
POLICY RELEVANCE	
Policy Relevance	This indicator is relevant for identifying regions or populations that are vulnerable to climate change impacts in relation to water resources. It can be useful in prioritizing policy actions related to disaster planning and preparedness, as well as natural resource allocation. When combined with socioeconomic or demographic variables, the CVI may help to identify trends in equity and may contribute to poverty reduction efforts. Reporting on this indicator supports ongoing assessment of climate related risks and strategic action to combat human vulnerability to climate change.

Show all indicators

Indicator search

User: NishaGH Workgroup: Private Area: Malawi

☒ View only approved indicators All Q Search

Keyword Metadata sheet

aptation water scarcity water stress	ASI.pdf
agricultural development food security	
r stress rural livelihoods	
early warning systems land degradation	
gation water demand livestock watering	Agriculture water withdrawals_Aug2016pdf.pdf
water scarcity climate change vulnerability	
anning drought preparedness food security	
oods water allocation	
water demand water stress; water scarcity	Area Irrigated by Groundwater_Aug2016.pdf
n water efficiency soil moisture soil quality	
nt rural livelihoods	
water pollution groundwater depletion	

Project methodology – Water Indicators

Framework view Issue tab Indicator view

Indicator main group Indicator subgroup

Indicator

The screenshot shows the 'WATER INDICATOR' web application interface. At the top, there is a navigation bar with tabs for 'Framework', 'Issue', and 'Indicator'. Below the tabs are buttons for 'Open', 'New', and 'Clone'. The main content area displays a list of drought frameworks. The first framework, '1. Meteorological drought', is expanded, showing subgroups like 'Rainfall' and 'Temperature'. Each subgroup contains a list of specific indicators, such as 'Effective Drought Index' and 'Mean Temperature and Temperature Range'. Red arrows point from labels to various parts of the interface: 'Framework view' points to the 'Framework' tab; 'Issue tab' points to the 'Issue' tab; 'Indicator view' points to the 'Indicator' tab; 'Indicator main group' points to the '3. Hydrological drought' framework; 'Indicator subgroup' points to the 'Reservoirs' subgroup; and 'Indicator' points to a specific indicator, 'Soil Moisture Index Percentile Change'.

Framework: * Drought framework User: admin Last change: 2017-10-23 08:20:09 Description: Indicator framework used for drought management

1. Meteorological drought

- Rainfall
 - Effective Drought Index
 - Rainfall deviation
 - Rainfall Index
 - Standardised Precipitation-Evapotranspiration Index (SPEI)
 - Standardized Precipitation Index (SPI)
- Temperature
 - Mean Temperature and Temperature Range
 - Monthly Average Changes in Temperature
 - Temperature

2. Agricultural drought

- Crop development
 - NDVI anomaly
 - NDVI deviation
 - Normalized Difference Vegetation Index
 - Standardised vegetation index
 - Vegetation condition index
- Soil water content
 - Soil Moisture Index
 - Soil Moisture Index Deviation
 - Soil Moisture Index Percentile
 - Soil Moisture Index Percentile Change

3. Hydrological drought

- Reservoirs
 - Climate Moisture Index
 - Historical Drought Events
 - Reservoir Storage
- Streamflow
 - Dry Season Flow Index
 - Flow Duration Curve
 - Monthly Average Changes in Streamflow
- Wetland
 - Change in Wetland Areas

4. Socio-economic drought

- Agriculture
 - Agricultural Stress Index
 - Agriculture Withdrawals
- Land use
 - Land Use Change
- Social and socio-economic
 - Direct Natural Disaster Economic Loss
 - Economic Dependence on Water Resources
 - Population with Access to Improved Drinking Water
 - Social Water Stress Index

5. Combined drought indicators

- Combined Drought Indicator

Project methodology – Water Indicators

Framework **Issue** Indicator

Open

Issue: Drought Thailand User: ozj Last change: 2018-06-09 17:46:13 Description: Thailand drought

☒ Immediate impact ☒ Immediate Cause ☒ Underlying Cause ☒ Root Cause ☐ Related Indicator

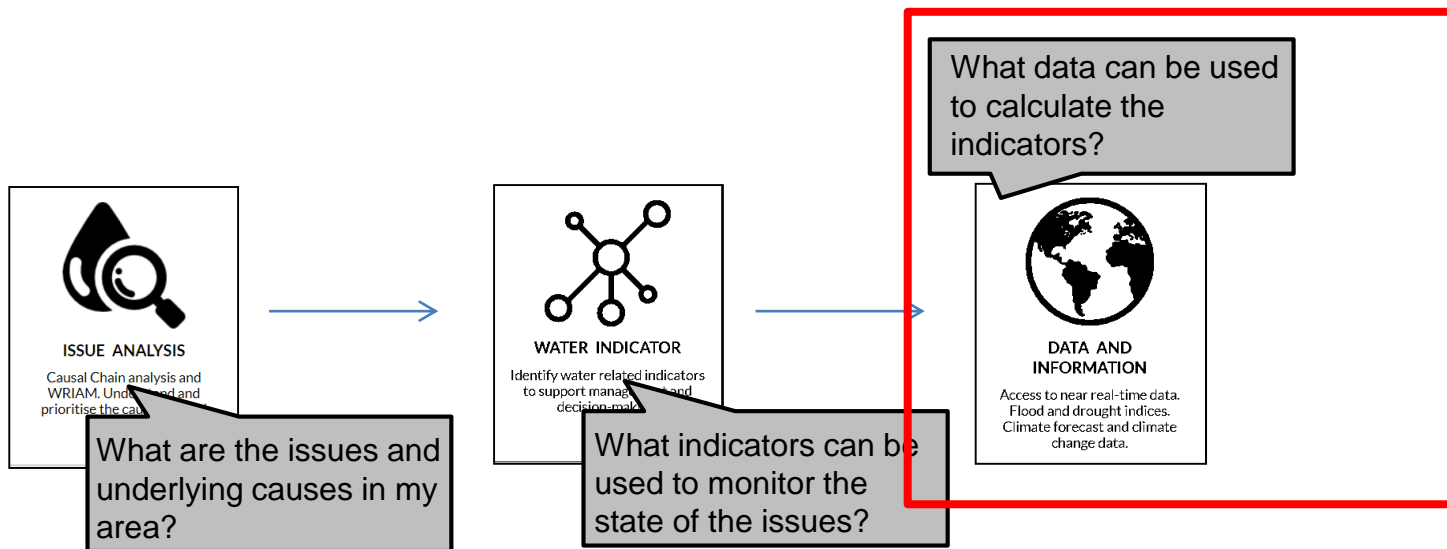
<div>Significant negative impact, Score:42</div> <div>water quality impact (tap water)</div> <div>Land Use Change</div> <div>Population with Access to Improved Drinking Water</div> <div>salinity intrusion</div>	<div>Significant negative impact, Score:36</div> <div>water shortage</div> <div>Population with Access to Improved Drinking Water</div> <div>lack of rainfall</div> <div>Standardized Precipitation Index (SPI)</div>	<div>Moderate negative impact, Score:12</div> <div>Low agriculture productivity</div> <div>Agricultural Stress Index</div> <div>lack of good quality of water irrigation</div> <div>Social Water Stress Index</div>
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Objectives:

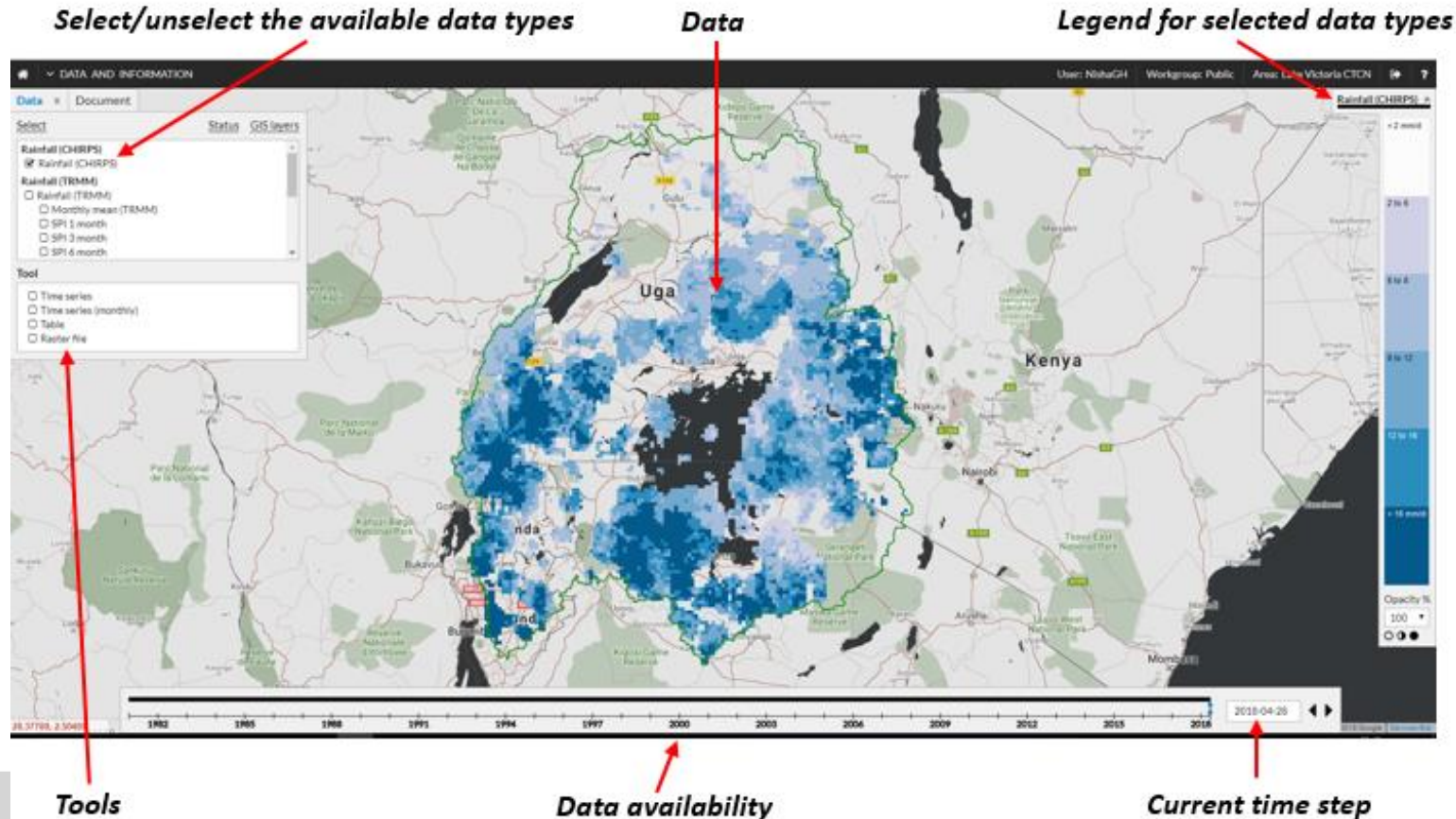
- Identify the relevant water indicators for the key environmental issues
- Facilitate stakeholder agreement on monitoring and evaluation indicators

Selection of few relevant water indicators for monitoring and evaluation

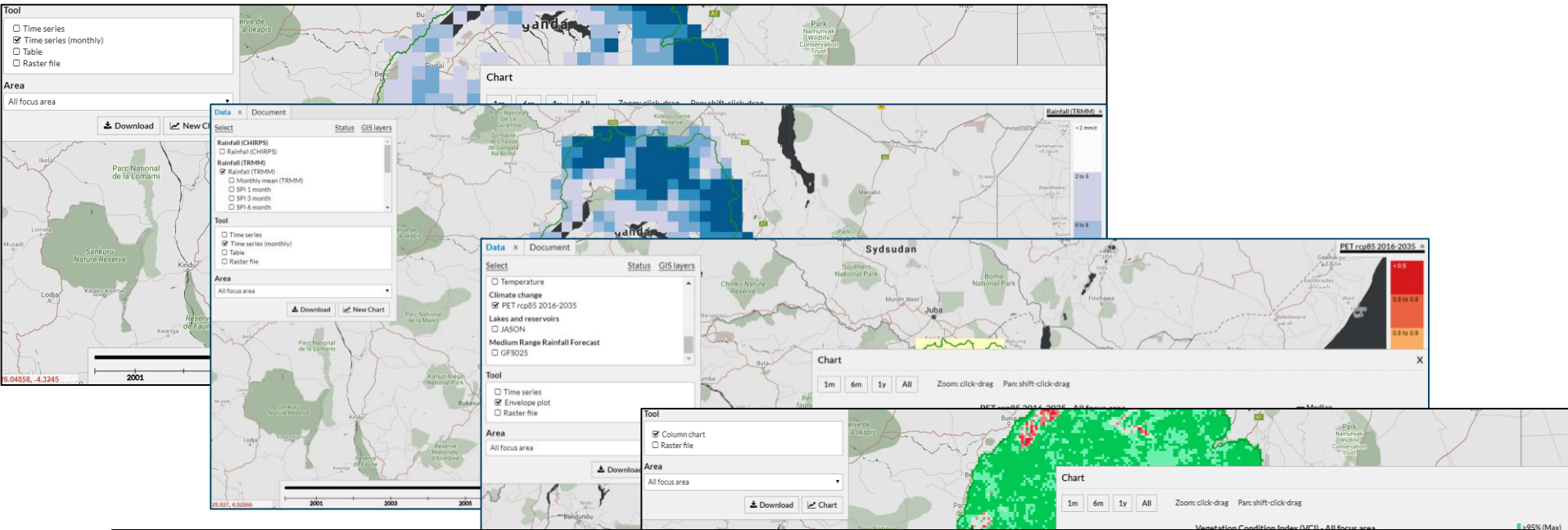
Project methodology – Data and Information



Project methodology – Data and Information



Project methodology – Data and Information

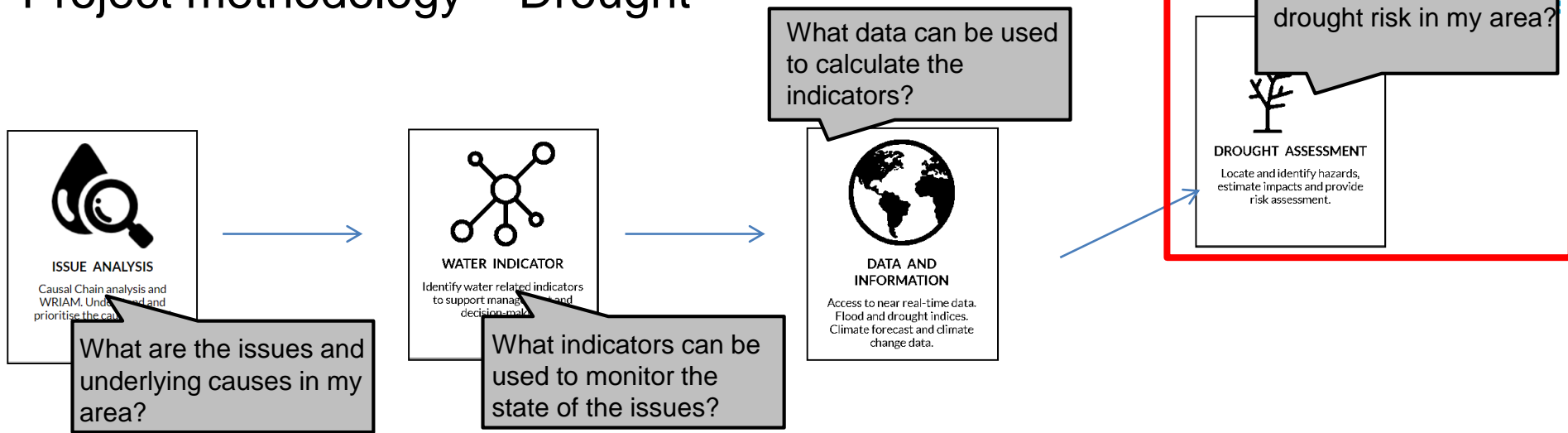


Objectives:

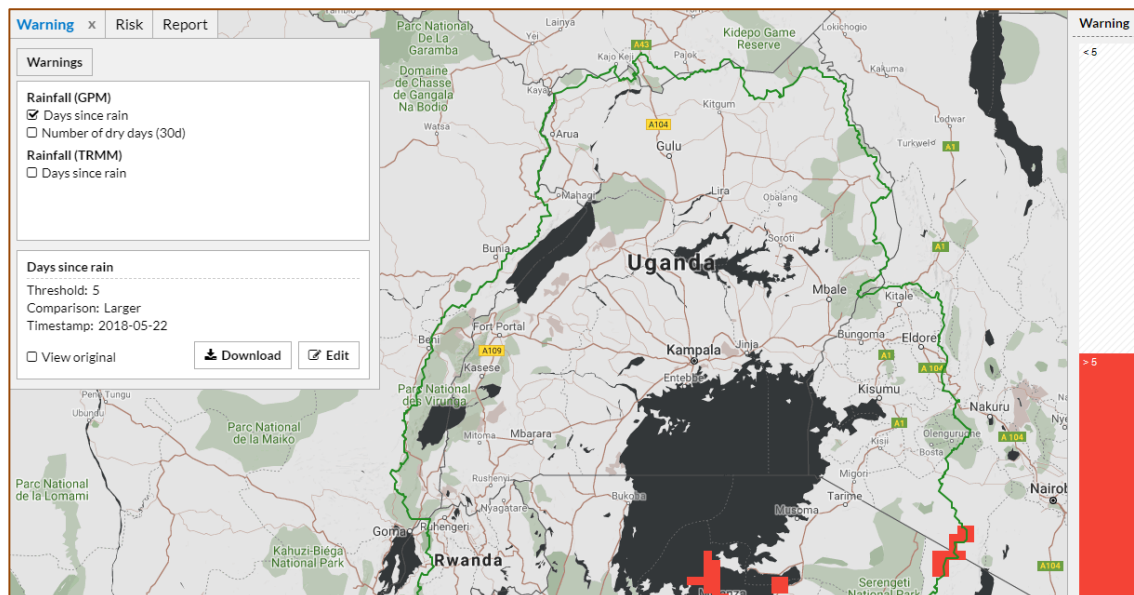
- Data availability – historic, near-real time, forecast and projected
- Free access to basic dataset for water related planning

Facilitate improved decision making

Project methodology – Drought



Project methodology – Drought

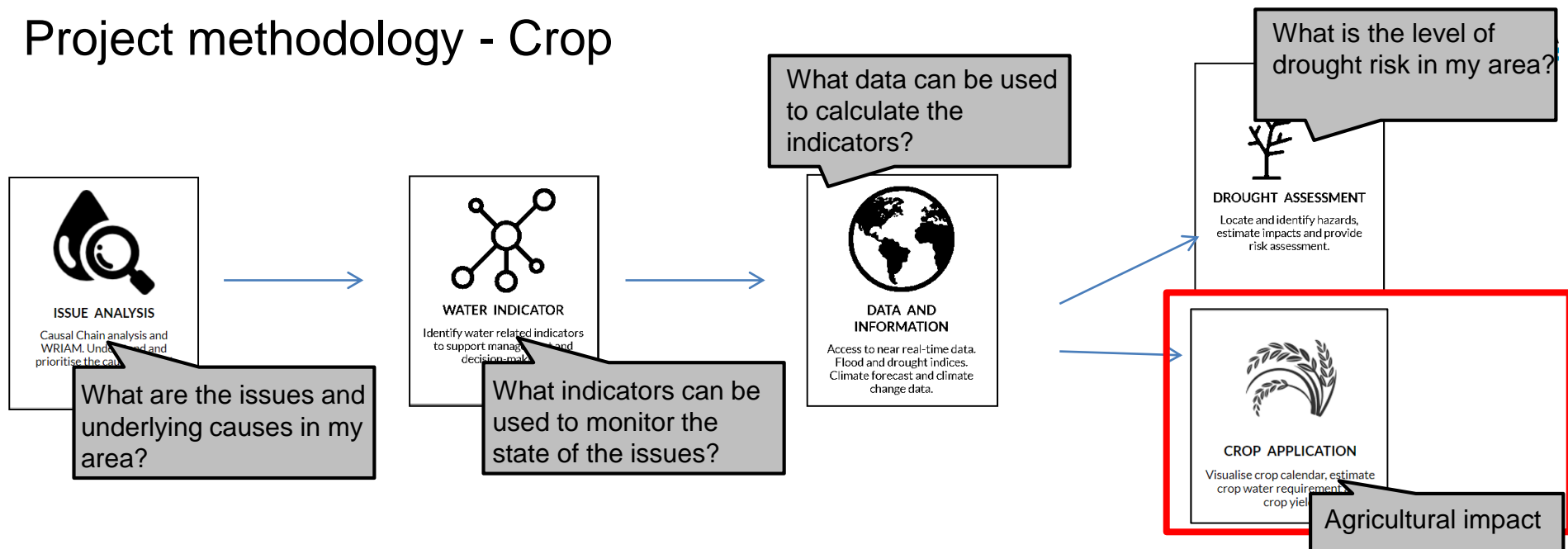


Objectives:

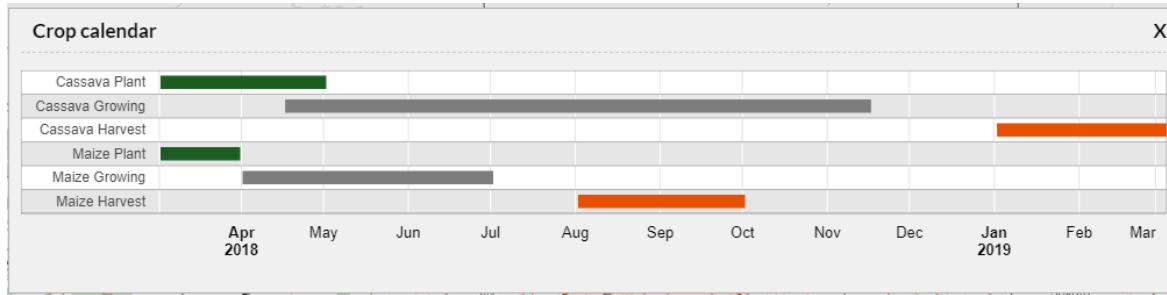
- Drought hazard identification and early warning
- Drought risk assessment

Drought assessment and early warning

Project methodology - Crop



Project methodology – Crop



HOME CROP APPLICATION

Data Crop Calendar **Yield estimates** x tt

Input Type ☒ User defined ☐ Ensemble

User defined Input table for Water requirements and Yield estimates [Clear table](#) [Add new](#)

ID	Areaname	Climate	CC Scenario/ Forecast mode	Crop	Soil	Planting	Irrigated	Fraction of RAW	Action	Result
----	----------	---------	-------------------------------	------	------	----------	-----------	--------------------	--------	--------

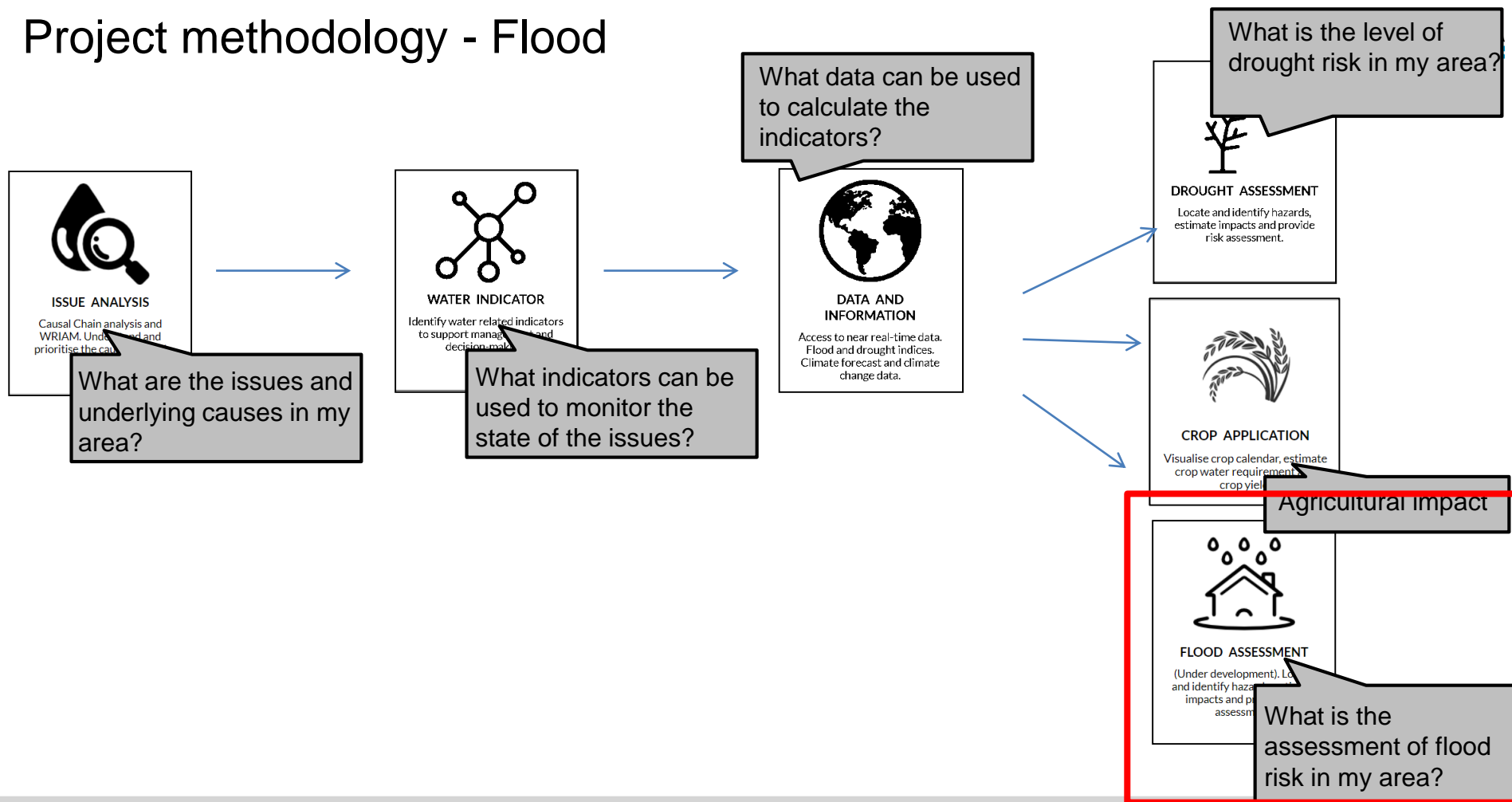
[Show results](#)

Objectives:

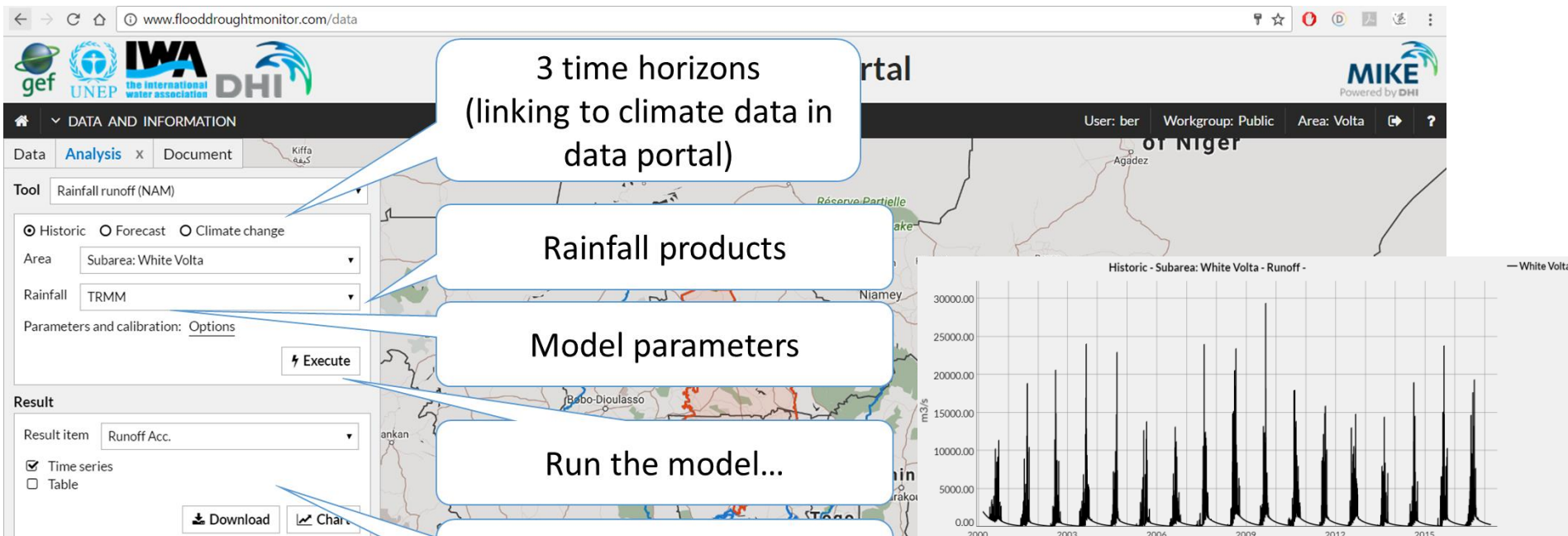
- Crop related information source
- Assessment of crop water requirement and crop yield (current and future)

Impact assessment on agricultural sector

Project methodology - Flood



Project methodology – Flood

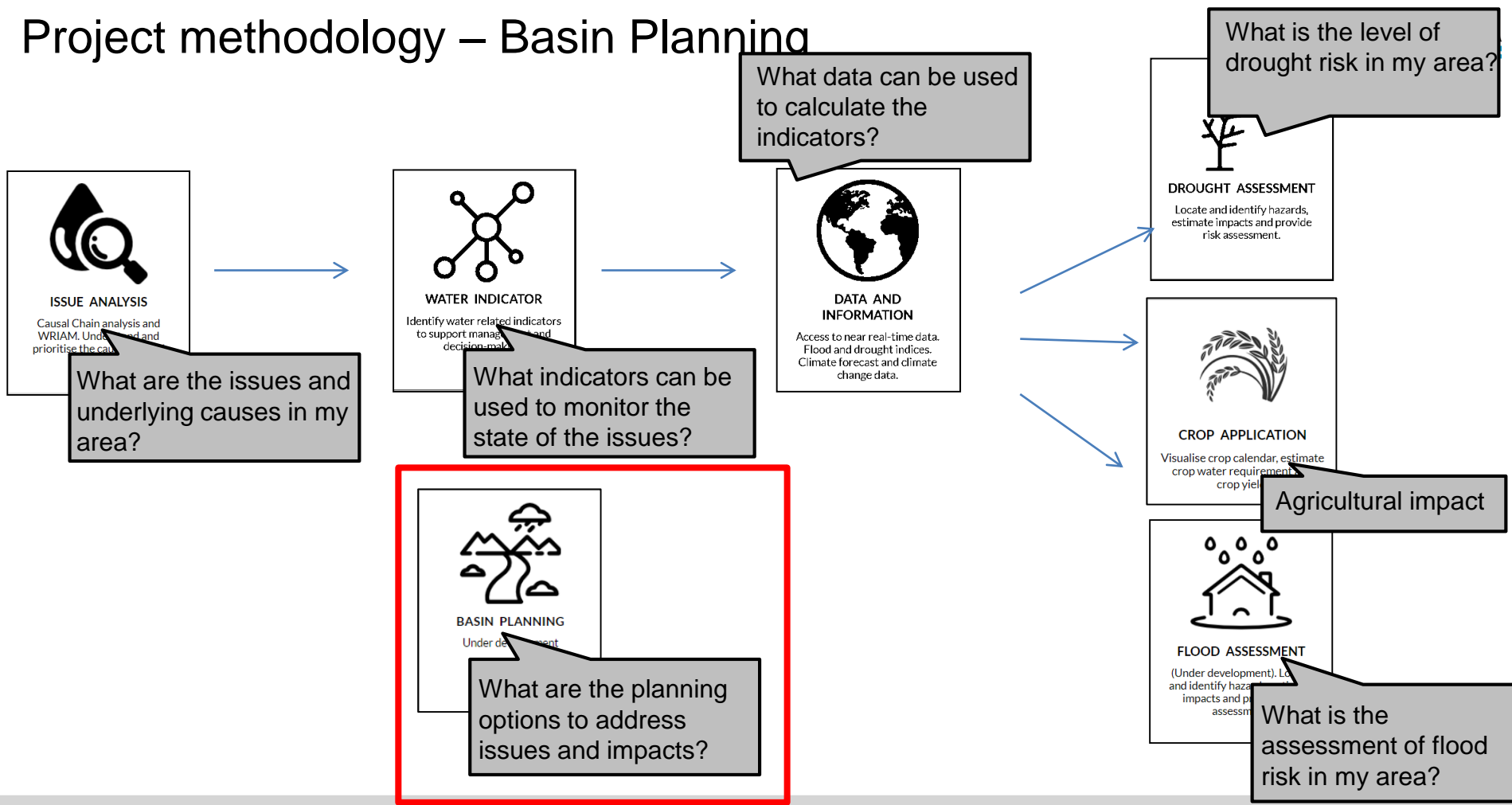


Objectives:

- Flood related information base (flood maps, flood indicators...)
- Hydrograph calculation and evaluation (rainfall runoff)

Flood information and assessment

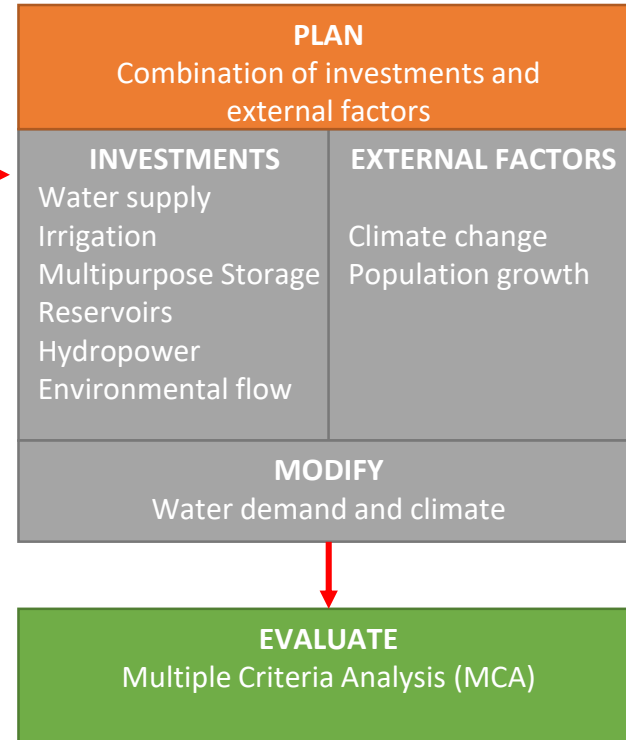
Project methodology – Basin Planning



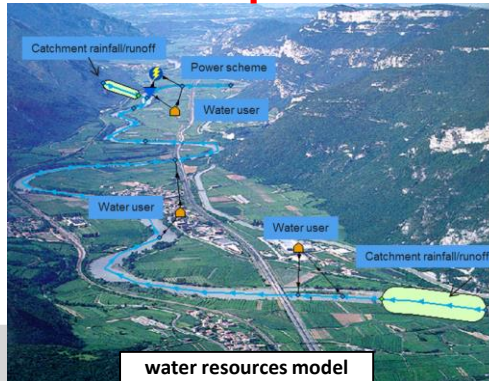
Project methodology – Basin Planning



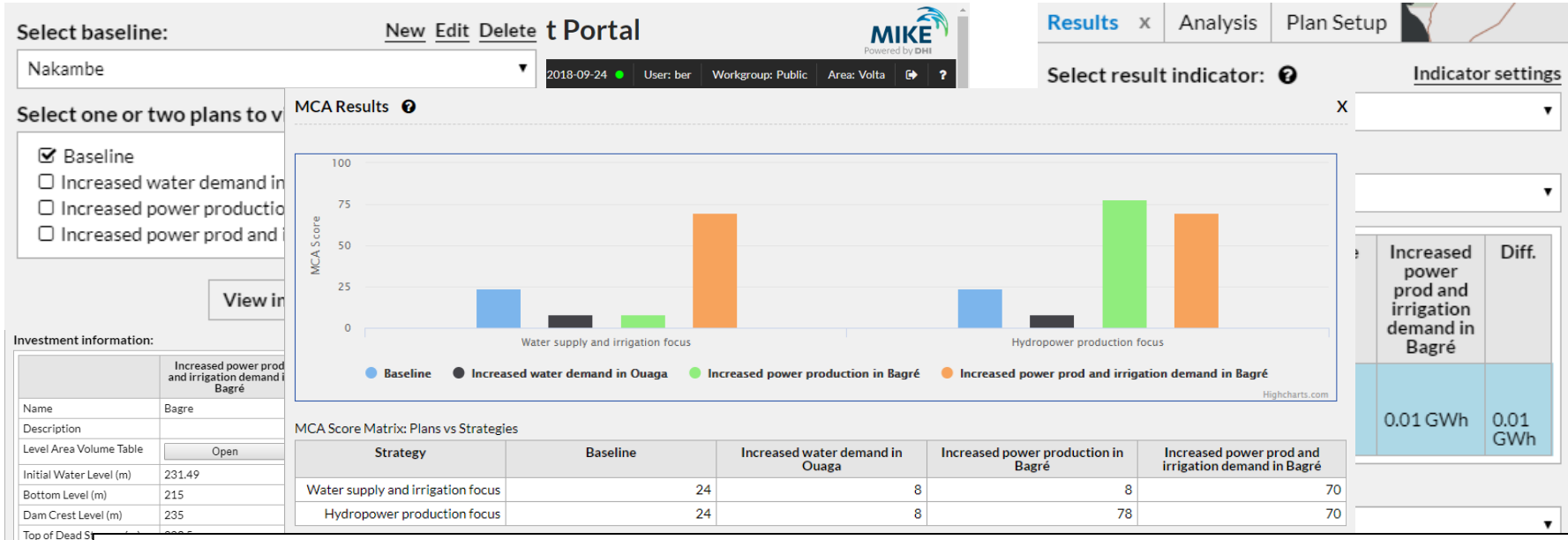
*A baseline plan is established by the tool.
New plans created will incur in alterations to the baseline model.*



*A user uploads the
baseline model to
the application*



Project methodology – Basin Planning

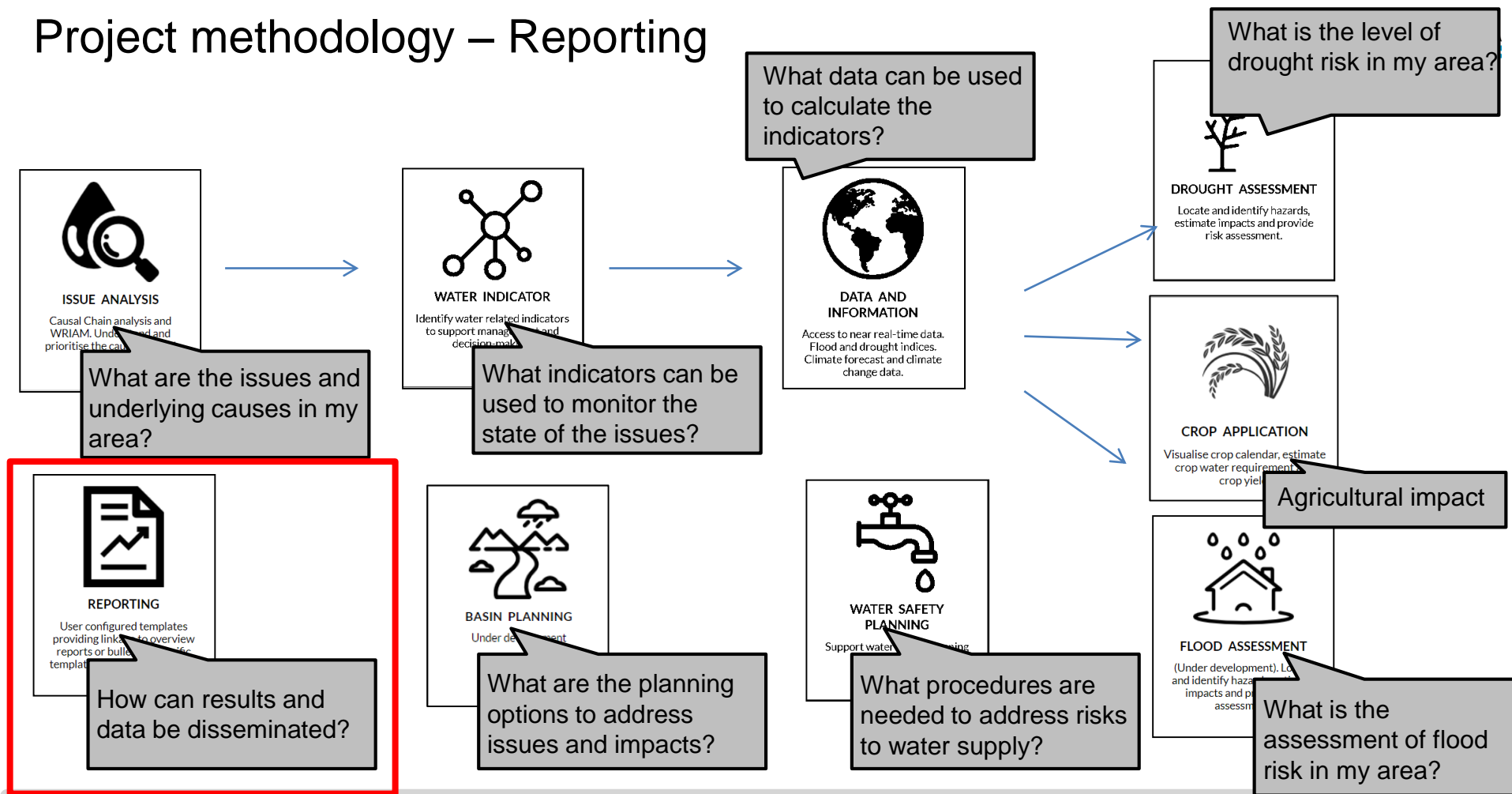


Objectives:

- Evaluate existing plans (basin, catchment, local...)
- Create new plans and evaluate using Multi-criteria approach (MCA)

Facilitating basin planning for decision makers (non model experts)

Project methodology – Reporting



Project methodology – Reporting

Flood and Drought Portal

User: ber Workgroup: Private Area: Chao Phraya

Report Upload

Open New Clone Edit Delete Preview Generate Download as Word Download as PDF Copy PDF link

Report: Clone by BER User: ber Last change: 2018-02-08 09:21:10 Description:

Tag	Source	Type	Item	Setting
Image: Project logo	Data	Image	General\Project logo	imageWidth: imageHeight:
MAP: Overview map	data drought	Image	General\Basin overview	imageWidth: 500 imageHeight:
Chart: Historical rainfall as ensemble	Data	Chart	Rainfall Climate\Envelope TRMM	analysisArea: allArea
Table: rainfall historical data	Data			
Map: Spatial distribution of last month rainfall	data drought			
Map: SPI 3 month - 4 parts	data drought			
Map: temperature deviation map	data drought			

Template: Drought report.docx
Update frequency (weeks): 2
Alert email:

Template report with tags

RAINFALL OVERVIEW BULLETIN

Background

This report addresses the rainfall conditions in the basin and aims at providing an overview based on the long-term statistics.

Basin overview

(Map: Basin overview)

Rainfall

Final report with input

RAINFALL OVERVIEW BULLETIN

Background

This report addresses the rainfall conditions in the basin and aims at providing an overview based on the long-term statistics.

Basin overview

Objectives:

- Assist in generating user defined reports and bulletins
- Automated submission of reports and bulletins

Facilitate automated reports and bulletins

Introduction | Peter Bjørnsen, UNEP-DHI

Overview of the portal | Bertrand Richaud, DHI

Roundtable discussions *(with guided questions)*

Highlights from roundtable discussions | Katharine Cross, IWA *(facilitator)*

Strategic recommendations | Per B. Hansen, DHI

Questions for Roundtable discussions

Understanding your experience

1. Have you already done a TDA or SAP in your basin?
2. What planning approaches/tools do you use in your basin?
3. Do you use updated climate information to plan for floods and droughts in your current planning process (e.g. TDA/SAP)?
4. If so, where do you get this information from, and how do you use it?
5. How do you monitor progress of the implementation of the SAP in your basin?
6. Do you rely on earth observations when monitoring the progress of the implementation of the SAP in your basin?
7. Do you have access to frequently updated earth observation data/images? At what cost?

Understanding your needs/gaps

8. What data and analysis are missing?

Applying the Flood and Drought Portal

9. Do you see a potential for applying the tools presented to improve the stakeholder consultations and thus the planning in your basin? How?

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For more information contact:

Oluf Zeilund Jessen – DHI: ozj@dhigroup.com

Katharine Cross – IWA: katharine.cross@iwahq.org

Design: www.chris-wells.com