WATExR

Climate seasonal prediction for adapting water resources to extreme events

ERA4CS European Research Area for Climate Services

JPI Climate

REPORT

WATExR Co-development workshop CHALLENGES

October 2017

This report summarizes the Interaction 1.1: CHALLENGES in WP1 of WATExR, and corresponds to Deliverable D1.1

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Text and pictures: Miquel Angel Rodriguez-Arias and Rafael Marcé

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PRE-MEETING research

Methods

Examination of WATExR proposal and mailing discussion between workshop facilitator and project owner in order to:

a) identify key issues and challenges of WATExR
b) define the objectives of the project owner for the meeting
c) consider the participant profiles
d) select the best strategic design techniques considering the topic, the objectives of the project owner and the profile of participants

Key issues:

First proposal from facilitator

- Stakeholder engagement
- Team building
- Case studies
- Climate data
- Methodologies

Project owner comments

- Stakeholder engagement → OK, but stakeholder are co-developers in WATExR
- Team building → OK
- Case studies → OK
- ~~Climate data~~ → This will be covered by another activity during the kick-off.
- Methodologies → OK, but avoid entering in too many details. Always at a conceptual level.

Final set of key issues

- Team building
- Case studies
- Co-developers engagement
- Concept of the workflow

INSIGHT 1 → The workshop will be implemented in three blocks, each devoted to one of the selected key issues. Co-developers engagement will be a cross-cutting topic. A session on Friday, a the end of the kick-off meeting, will serve as a report back and wrap-up activity

Objectives

The facilitator asked the project owner to interweave the concept of co-developers engagement in all activities. The project owner produced the following list of objectives:

GENERAL

- To facilitate team building
- To foster the implication of everybody
- To define a road-map for WATEXR

BLOCK 1: Team building

- To make sure everyone gets on board. Group composed of some people knowing each other quite well and other people new with no previous contact.
- To foster the implication of everybody, particularly co-developers
- To define a concept of WATEXR that is clear for everyone from the start

BLOCK 2: Case studies

- To identify them and make everyone aware of others' challenges.
- To exchange experiences and opinions across case-studies.
- To identify main co-developers interest in each case study.

BLOCK 3: Concept of the workflow

- To define a common general architecture of the tools
- To define a particular implementation in each case-study
- To ensure co-developers vision is adequately represented in the implementations

INSIGHT 2 → As team building and team involvement are both highly relevant for the project owner, the workshop will be based on activities and techniques that try to maximize both individual involvement and group interaction

Participants profile

STEERING ROLES:

- Project Owner (Rafael Marcé-RM): coordinator of WATEXR and workshop promoter → he choose to set apart his project owner role during the workshop and be just another participant → profile as participant.
- Facilitator (Miquel Angel Rodriguez-Arias): the workshop designer, developer and rapporteur following the needs of the project owner. Expert of strategic design methodologies as well as in knowledge generation processes.

The facilitator asked the project owner to define the profile of the participants before the workshop. He produced the following list (including himself as a participant):

PARTICIPANT PROFILES (20):

- RM: Researcher with expertise on biogeochemical modelling and organic carbon dynamics in freshwaters. Out of the box thinker, usually confronting statutory knowledge.
- María Dolores Frias (DF): Climate scientist. No experience working with her before producing the WATExR proposal, but seems collaborative and open-minded.
- Sixto Herrera (SH): Climate scientist. No experience working with him before before poducing the WATExR proposal, but seems collaborative and open-minded.
- Carina Isdahl (CI): co-developer Norwegian case study. Cannot draw a profile.
- Øyvind Kaste (ØK): researcher. Cannot draw a profile.
- Marc Scheibel (MS): co-developer for German case-study, subcontractor. Cannot draw a profile.
- Dennis Trolle (DT): researcher, expert in dynamical modeling. RM does not know him personally, but apparently a very active, engaging and collaborative researcher.
- Anders Nielsen (AN): researcher. Cannot draw a profile.
- Karsten Bolding (KB): researcher. Cannot draw a profile.
- Gudrun Frandsen Krogh (GFK): co-developer Danish case-study. Cannot draw a profile.
- Elvira de Eyto (EdE): researcher and co-developer for the Irish case-study. Smart and collaborative scientist. Hard-worker.
- Eleanor Jennings (EJ): researcher. Has been coordinator in previous projects of the group. Creative thinker, amazing skills for team building.
- Chenxi Mi (CXM): researcher. Cannot draw a profile.
- Bertram Boehrer (BB): Researcher. RM knows BB, but cannot really draw a profile. Expert in physical limnology.

- Don Pierson (DP): Researcher, very smart and with experience with stakeholders. Coordinator of the "twin" project PROGNOS.
- Justin Brookes (JB): Researcher, expert in modeling and water quality issues. Also acts as a co-developer for the Australian case-study. Very active in the field.
- Elias Munthali (EM). Early stage researcher. Always eager to learn.
- Antoni Munné (AM): Co-developer for the Spanish case-study. Former-researcher, very interested in interfacing with research projects with an applied perspective.
- Juan Carlos García (JC): Co-developer for the Spanish case-study. Former-researcher, he has a clear idea about what he wants to get from a collaboration with a research project.
- Alo Laas (AL): Researcher and co-developer. He is not officially in the project but invited to the meeting.

INSIGHT 3 → As the project owner wanted to be also a participant of the workshop, no more information regarding the techniques and activities to be implemented was shared with him in order to avoid biases on his contributions

INSIGHT 4 → As the profiles of participants were diverse and complementary, during the workshop group membership with be altered on each block in order to guarantee maximum exposition to each other

Co-development techniques

For each block and considering both the general and specific objectives, the lack of experience of co-development workshops of participants as well as the diversity on their expertise, the facilitator choose some co-development techniques that he considered appropriate to deal with specific challenges.

OBJECTIVES		CO_DEVELOPMENT TECHNIQUES
GENERAL	Team building	All
	Implication of everybody	All
	Road-map for WATEXR	All
BLOCK 1: Team Building	Inclusiveness	Discovering connections
	Implication of participants	Discovering connections Conceptual Sketch
	Concept of WATExR	Conceptual Sketch
BLOCK 2: Case studies	Identify challenges	Challenge mapping
	Exchange between case-studies	Challenge mapping
	Co-developers interests	Challenge mapping
BLOCK 3: Concept of the workflow	General architecture of tools	Graphical conceptual design Prototyping
	Particular implementation in case studies	Specific Prototyping
	Co-developers vision	Graphical conceptual design Prototyping Specific Prototyping
Friday wrap-up	Assessment of the meeting	Summary words and headlines
	Critical points identification	Open discussion

INSIGHT 5 → Most participants have never been exposed to co-development techniques, hence only tools easy to explain and to implement that do not require previous experience have been selected

INSIGHT 6 → The time required for a ideation session with inexperienced participants and for research purposes is quite uncertain, hence despite a meeting agenda will be defined, the implementation will be quite flexible. The only fixed elements of the agenda will be the blocks (INSIGHT 1). The session will be on Tuesday, after the one-day official kick-off meeting. Wednesday and Thursday will be devoted to QGIS plug-ings in the case study sites. Co-development resumes on Friday (last day).

AGENDA

Tuesday, 17.10.2017

Time	Activities
08:30 – 10:00	Welcome and introduction to WATEXR's co-development activities Short presentation of WATExR Explanation of the co-development workshop dynamics
10:00 – 11:00	**BLOCK 1: Team building** Network strengths and weaknesses WATExR concept
11:00 – 11:30	COFFEE BREAK
11:30 – 13:00	**BLOCK 2: Case studies** Identify case-studies Experience sharing Co-developers' vision
13:00 – 14:00	LUNCH BREAK
14:00 – 16:00	**BLOCK 3: Concept of the workflow** General concept of the workflow and attributes General architecture of the tool
16:00 – 16:30	COFFEE BREAK
16:30 – 18:00	Implementation in the case-studies

Friday, 20.10.2017

Time	Activities
11:30 – 13:00	Wrap up Summary of the meeting Critical points identification

BLOCK 1: Team Building

Network - strengths and weaknesses (Discovering connections):

STEP 1 → People briefly self-introduce and we make a graph where the initials of each person are encircled and all form a circumference. Spontaneously, we decided to define four groups of people: Developers (blue initials), co-developers (black), a mix of these two (red), and modellers (green).

STEP 2 → After everyone was introduced and included in the plot, several people complained that the true profile was not well represented. We decided to draw patches of colour inside the bubble of each person to better profile them, or any other way of including the identifying colour in the bubble. At this stage, the climate forecasters thought that it would be useful to identify people in the climate arena in the plot, and we did so with a red cross.

STEP 3 → After this, everyone drew a line between her/his bubble and any known person BEFORE WATExR. The colours of the lines in the pot do not have any particular meaning.

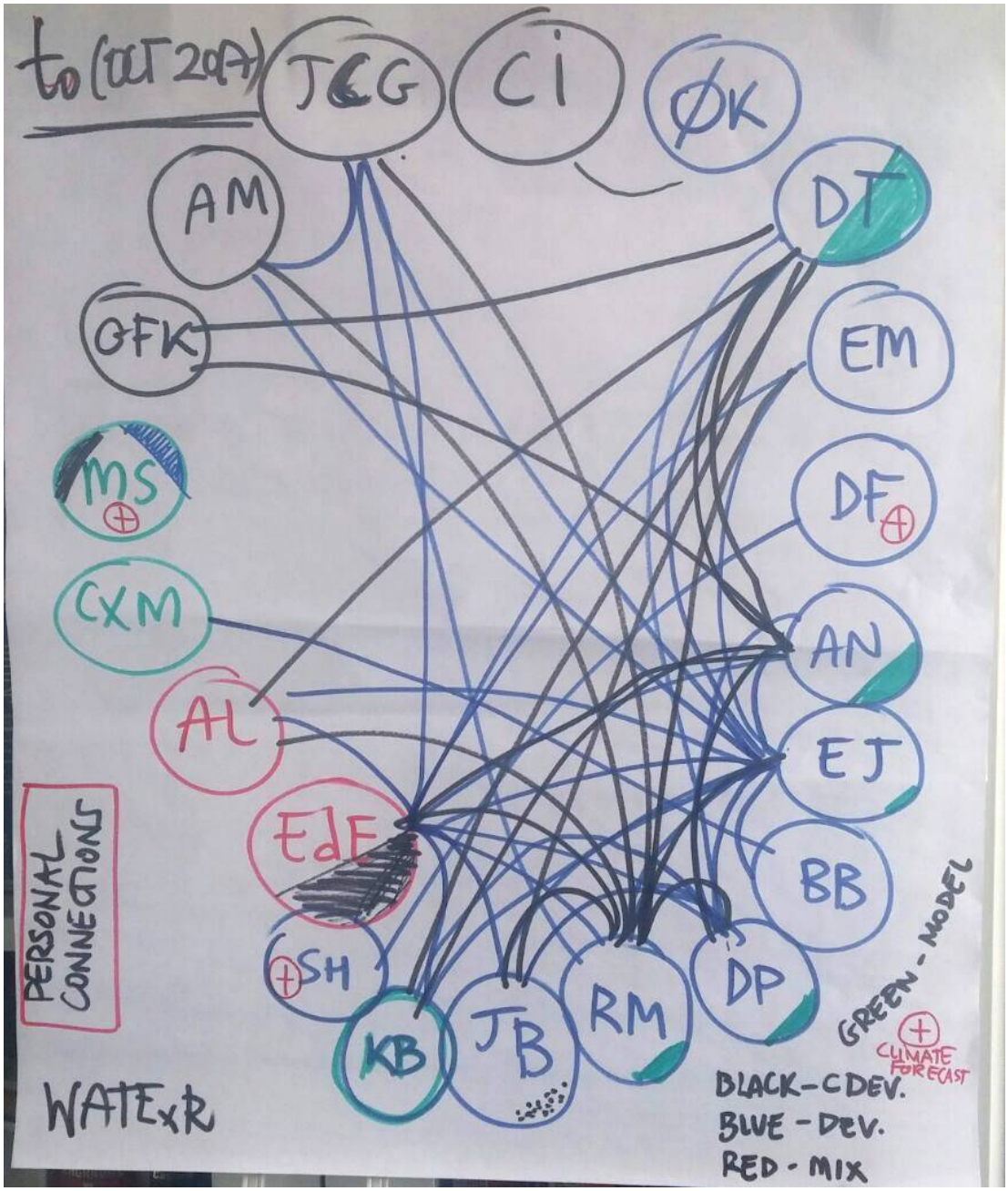
Discovering Connections sketch after Step 3 (next page)

Main comments arising after the activity:

- Impressive degree of previous interactions between participants. Very good starting point (the team is almost ready, no need for intense team building activities)

- Co-developers are comparatively less connected, but quite a lot considering this is a research project.

- Definitely, climate scientists are the most isolated group. The project must consider this and plan activities accordingly.

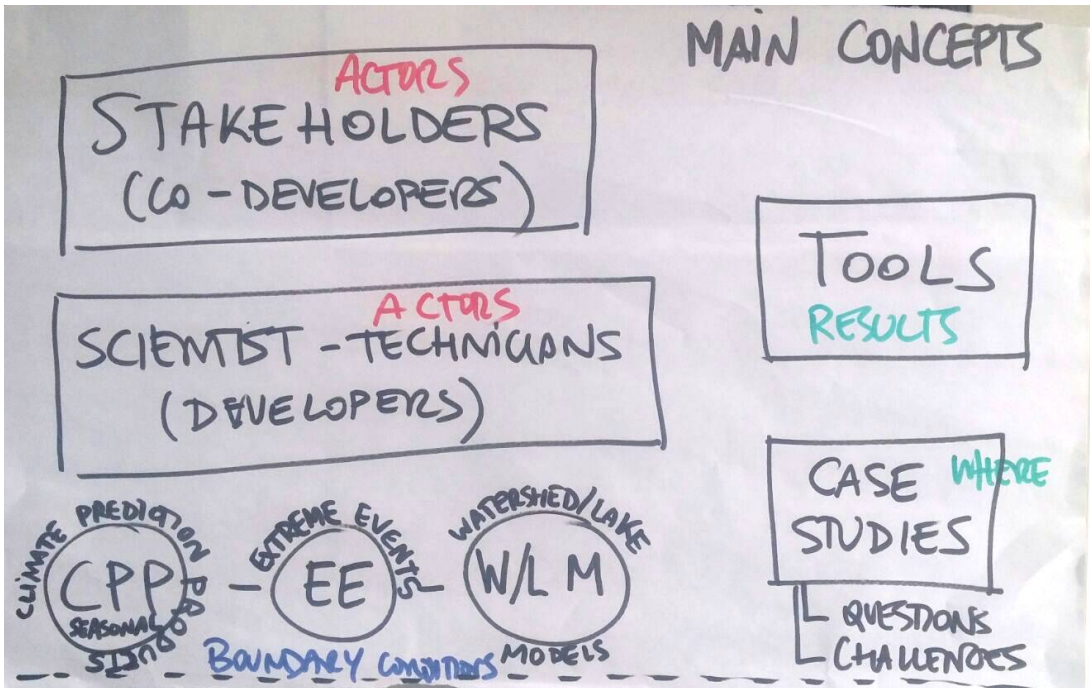

to (OCT 2017)
JCG
Ci
ØK
AM
DT
GFK
EM
MS
DF
CXM
AN
AL
EJ
EdF
BB
PERSONAL CONNECTIONS
SH
DP
RM
JB
KB
GREEN - MODEL
CLIMATE FORECAST
WATExR
BLACK - C DEV.
BLUE - DEV.
RED - MIX

WATExR concept (Conceptual sketch):

STEP 1 → With the help of the facilitator we identified the main components of WATExR: Stakeholders, that we name co-developers, Scientists/Technicians (developers), Tools, Case studies, Climate prediction products, Watershed/lake models, and the concept of extreme events.

STEP 2 → The components were then incorporated into a conceptual graph (very simple, to avoid discussions at this stage, we wanted to produce something that everyone could agree upon). At this moment, some of the components where labelled After everyone was introduced and included in the plot, (actors, results, where).

The conceptual sketch after Step 2



BLOCK 2: Case studies

Identify case-studies, share experiences, co-developers' vision (Challenge Mapping):

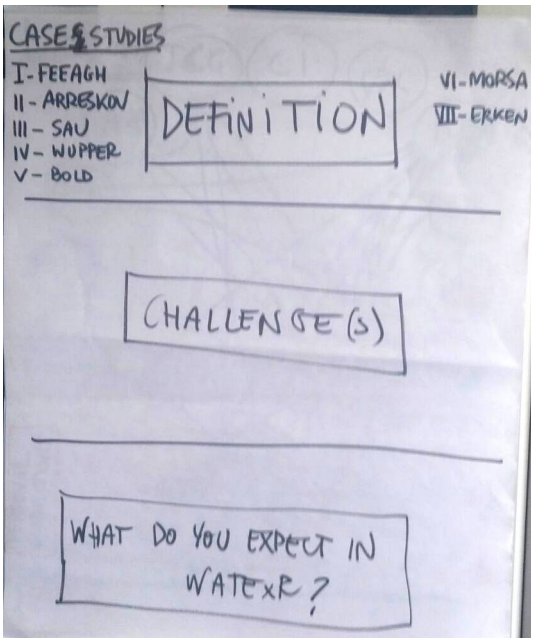
STEP 1 → Co-developers were grouped considering the seven case studies in WATERxR (I-Feeagh, II-Arreskov, III-Sau, IV-Wupper, V-Bold, VI-Morsa, and VII-Erken). The groups included all people involved in a given case study, trying to exclude developers if possible.

STEP 2 → Each group had a piece of paper in a wall of the room, where they had to discuss and enumerate items to fill three equal area boxes: DEFINITION, CHALLENGE(S), and WHAT DO YOU EXPECT IN WATExR? The format of the exercise implicitly posed a limit on the amount of information that people could include in the boxes. A small indication on the state of observations (in terms of data) was also included in the last section.

STEP 3 → After groups finished the writing, a representative for each case study explained the contents of their poster to the audience. During the presentations, people (developers and co-developers) were free to write comments in colour post-its and stick them on the poster being discussed or in any other. Direct questions were not allowed, any comment should be posed through a post-it.

STEP 4 → After the round of presentations, we opened a discussion, but based on the comments on the post-its. All post-its were discussed, sometimes merging post-its including similar comments, and always identifying the person who stuck the particular post-it being discussed.

Template offered to the groups in Step 2



Contents of the different posters after STEP 3 (transcription, pictures of the original posters at the end of the document)

CASE I – FEEAGH

DEFINITION

Fish
Phenology
Production
Forestry
Salmon
DOC
Eel
Rain/Flood
Climate sensitive
Decline
Temperature

CHALLENGES

Future stocks
Local-Extinction → Post-it: !
Increase/Decrease DOC
Adaptation
Warm Wet Winters
Multple stressors
Changing summers
Phenological changes

WHAT DO YOU EXPECT IN WATExR?

OBS.>OK
Modelling tool that predicts
→ Animal smolt output (or juvenile production)
→ Silver eel production
→ Silver eel migration
→ DOC autumn flux
→ Salmon smolt migration

→ Post-it 1
Higher trophic levels
→ Dynamic model
→ More complex

→ Post-it 2
Operational management

CASE II – ARRESKOV

DEFINITION

Typical shallow Danish lake
Eutrophic, problems/Challenge with WFD
- Key indicators: phyto (%cyano), macrophytes, fish, N, P

CHALLENGES

. Compliance with WFD in light of climate change
. The “allied attack” effects

WHAT DO YOU EXPECT IN WATExR?

OBS.>OK
Moldelling tools that may be used for planning – also in relation to the time scale of water action plan generation (i.e. ~ 6 year) → Post-it 1: Planning → Post-it 2: Also seasonal?
Be able to test mitigation scenarios → Post-it 3: II What kind of scenarios and are they relevant for other case studies?

CASE III – SAU/SQ/PAS

DEFINITION

Reservoir 160 hm3 (first of two) in the middle of Ter River
Watershed 1600km2
Eutrophicated, invasive species

CHALLENGES

Properly manage:
- Heat waves
- Drought
- Reduce nutrient inputs
- Floods/residence time of water

→ Post-it 1: operation/management of reservoir

WHAT DO YOU EXPECT IN WATExR?

OBS.>OK
- Tools and protocols to prevent blue-algae blooms
- Cause-effect relationship
    -Temp
    -Water col. stabilit.
    - N/P relationship
- Relationship floods/residence time

→ Post-it 2: EWS
→ Post-it 3: Better knowledge
→ Post-it 4: Operational management
→ Post-it 5: Do you have a record of cyanobacteria scums?
→ Post-it 6: WFD! 2021-2027
→ Post-it 7: Do you manage watershed land use as well? → What are your legal possibilities
→ Post-it 8: Have you already applied in-system measures to hamper blooms?
→ Post-it 9: Compound problems → Multiple stressors
→ Post-it 10: Relative roles of short term climate
longer term Nutrient loadings

CASE IV – WUPPER

DEFINITION

Coupled reservoir system, various claims of utilization (operational coupled model for quantity and quality, climate change adaption)

CHALLENGES

- Fulfil optimized the various claims of utilization with regard to the available amount of water and the water quality
- Handling and adaption to the climatic changes through shifting of the rainfall (higher flash floods and longer dru periods)

→ Post-it 1: Combination of
climate issues
economical issues
services to people

WHAT DO YOU EXPECT IN WATExR?

OBS.>OK
- Operational coupled model of reservoir and streams with quantity and quality
- More flexible maintance rules for better adaptation → optimized reservoir management.
- Optimized reaction by “looking” regulary into the future

→ Post-it 2: Planning
→ Post-it 3: Operational management
→ Post-it 4: EWS
→ Post-it 5: Knock on impacts → beyond seasonal
→ Post-it 6: Reliable! For management or will not be used
→ Post-it 7: Relative roles of short term climate
Long term nutrient loading

CASE V – BOLD

DEFINITION

Toxic cyanobacteria, DOC, stratification
Water quantity
Local catchment + pumped river Murray sources

CHALLENGES

10-15% reduction in rainfall predicted. Which will impact both local catchment source & river Murray flow
Pumping water is expensive & needs to be optimised

→ Post-it 1: Extremes in the future?
→ Post-it 2: Economical issues
→ Post-it 3: Managing water scarcity

WHAT DO YOU EXPECT IN WATExR?

OBS.>OK
<u>Quality</u>
- Prediction of how risk may vary

<u>Quantity</u>
Understanding of how pumping may increase in future. → Post-it 4: Extremes in the future? → Post-it 5: Planning
- Feed this into planning for multiple sources for city
    - *[unreadable, see picture at the end of this report]*
    - pumping
    - local catchment

→ Post-it 6: Interaction nutreint loadings hydrology - stratification
→ Post-it 7: Complex biogeochemistry → Drought sensitive

CASE VI – MORSA

DEFINITION

Lake Vansjø - drinking water and recreation
Had toxic cyanobacteria
WFD compliance
Measures – agriculture and waste water

CHALLENGES

Drinking water quality (colour/toxic algae)
Recreation – bathing water quality
WFD compliance

→ Post-it 1: Blooms abd recreational use

WHAT DO YOU EXPECT IN WATExR?

OBS.>OK
Water level regulation – early warning
Agriculture advice to farmers due to floods and heavy rain
Drinking water – early warning to the water company

→ Post-it 2: Public advice
→ Post-it 3: EWS
→ Post-it 4: GENDER DIMENSION!
Advice to
Farmers → PRE. MALE?
Water use → PRE. Decisions FEMALE?
→ Post-it 5: Decadal predictions useful?

CASE VII – ERKEN

DEFINITION

Algal blooms *[something unreadable around this word, see the picture at the end of this report]*
Recreation
Water supply (backup)
Research+Education center → Post-it 1: !
Climatic drivers
- Stratification
- Lake-watershed

CHALLENGES

Shallow complex + changing lake
Sensitive to climate

→ Post-it 2: understanding blooms

WHAT DO YOU EXPECT IN WATExR?

OBS.> Since 1989
Better models – including biology
Better seasonal forecasts
Better understanding of blooms

→ Post-it 3: Better knowledge
→ Post-it 4: 1- Specific climate factors? 2. response between blooms to stratification? Especially to diurnal stratification?

BLOCK 3: Concept of the Workflow

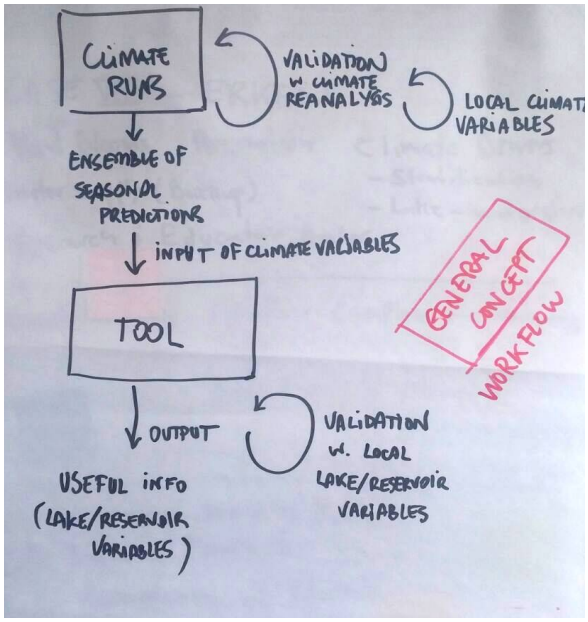
General concept of the workflow and attributes (Graphical conceptual design):

STEP 1 → With the help of the facilitator and the lessons learned from the previous activities, we tried to draw a conceptual graph of the workflow in the case studies of WATExR (very simple, we wanted to produce something that everyone could agree upon). Although simple, the elaboration of this sketch was not free of discussions, including a revisit of the climate seasonal prediction talk from Monday.

STEP 2 → After this, the group tried to visualize the tool depicted in the conceptual sketch. To do so, we elaborated an open list of keywords contributed by the participants.

STEP 3 → The group decided that we had to better define the possible elements contained in the tool depicted in the conceptual sketch, in order to start designing the workflow. We then repeated the last exercise writing an open list of elements of the tool contributed by the participants. This list will be then used to start designing the tool.

The workflow sketch after Step 1



List of keywords for the visualization of the tool after Step 2 (transcription, picture of the original poster at the end of the document)

- User-oriented

- Variable complexity
- Developer-oriented
- Temporal dimension
- Spatial dimension
- Scenarios
- Probabilities
- Open/non commercial
- Risk assessment
- Exchangeable
- EWS *[probably stands for Early Warning System]*
- Ongoing evaluation (performance)
- Advice (protocols, risk mitigation)
- Multi-user approach (novel/experienced)
- Web based
- Bucket model
- Decision support system
- Interactive tool to test mitigation actions
- Simple end-user interface
- Integrating existing models
- Recalibration
- Include management scenarios and produce outputs to compare scenarios
- Graphical user interface
- Educationally oriented
- Useful for non experts
- Workflow that can be adapted to any site

List of the elements of the tool after Step 3 (transcription, picture of the original poster at the end of the document)

- Weather input → Forecasts
  → Reanalysis
- User-Defined model → Post-processor
- Local observation data
- Watershed model → several choices
- Lake model → several choices

- Decision making tool
- Scenario generator
- GIS
- Graphical output
- Uncertainty analysis tool
- Graphical user interface
- Statistical tools
- Multi-user approach in the user interface
- Data output
- Switches on/off
- Decision tool

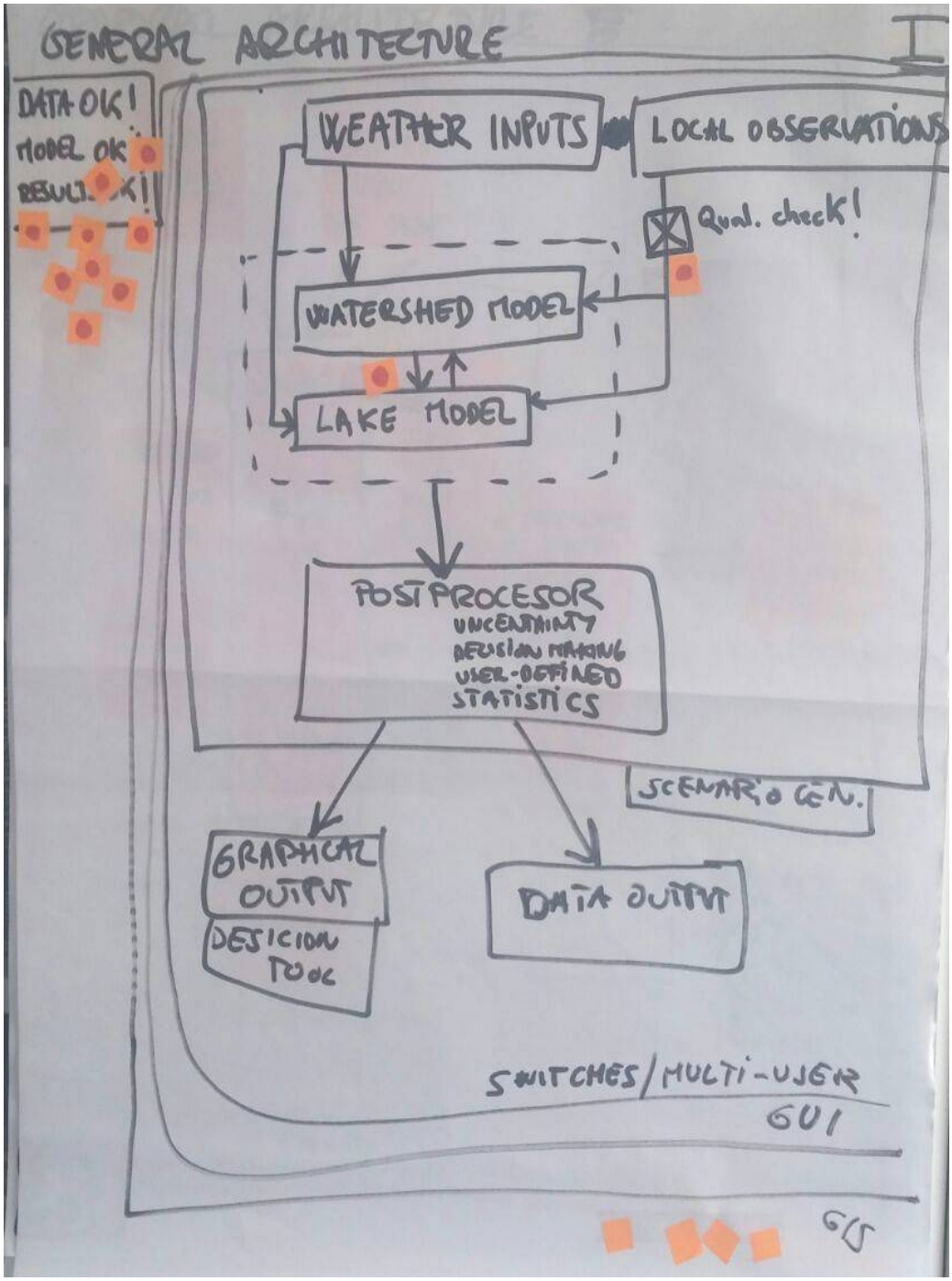
General architecture of the tool (Prototyping):

STEP 1 →	The group split in four groups. Then, each group had to draw a diagram showing the general architecture of the tool using, if possible, the elements listed in the former activity, and always coherent with general concept drawn.
STEP 2 →	Every person has two votes (stickers with points) that must place in particular elements of any diagram the person judges particularly relevant or adequate. The votes are put directly in the posters in two rounds.
STEP 3 →	After this, the participants have to vote the best overall architecture among the four proposals, placing a sticker at the bottom of the poster.

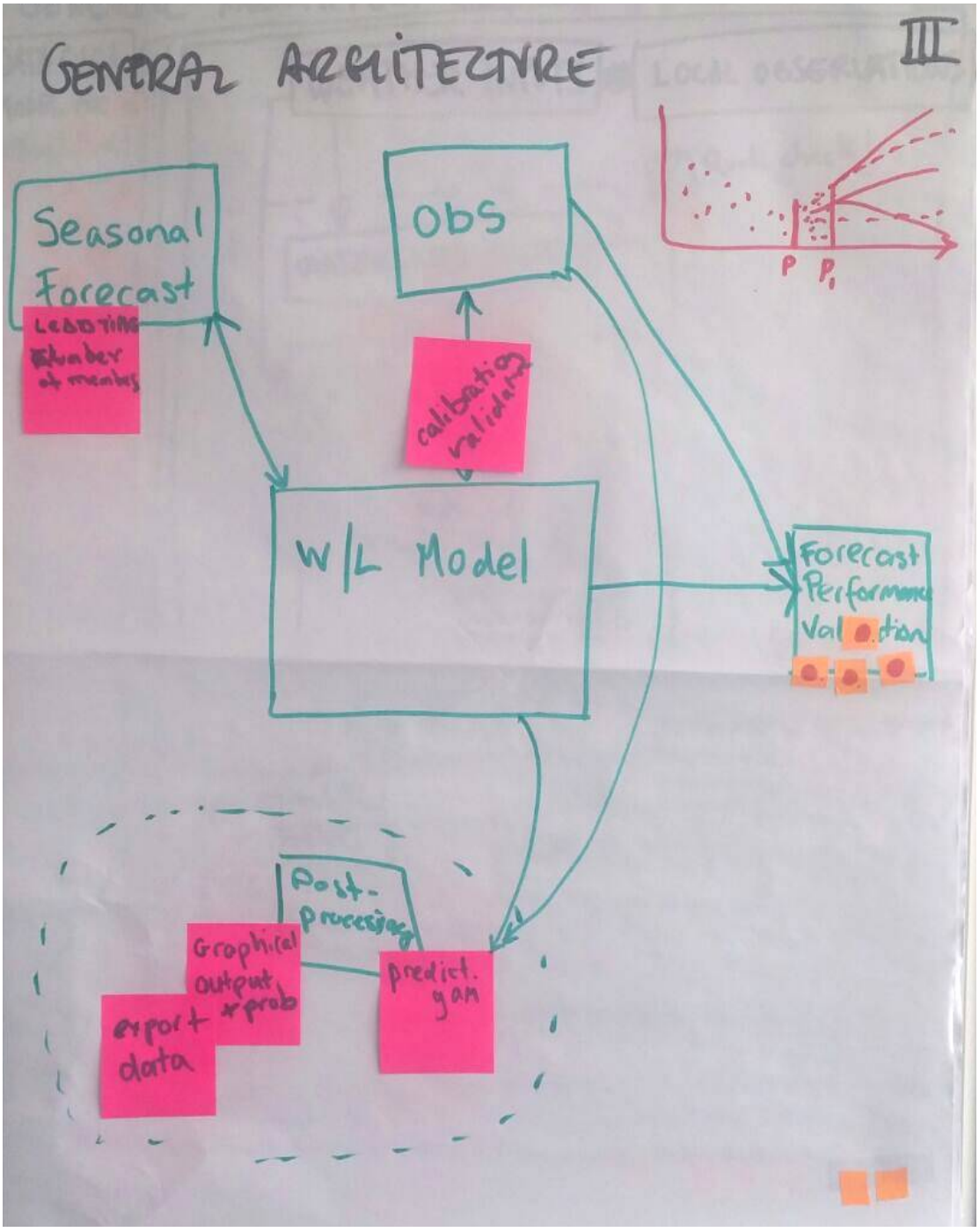
Main comments arising after the activity:

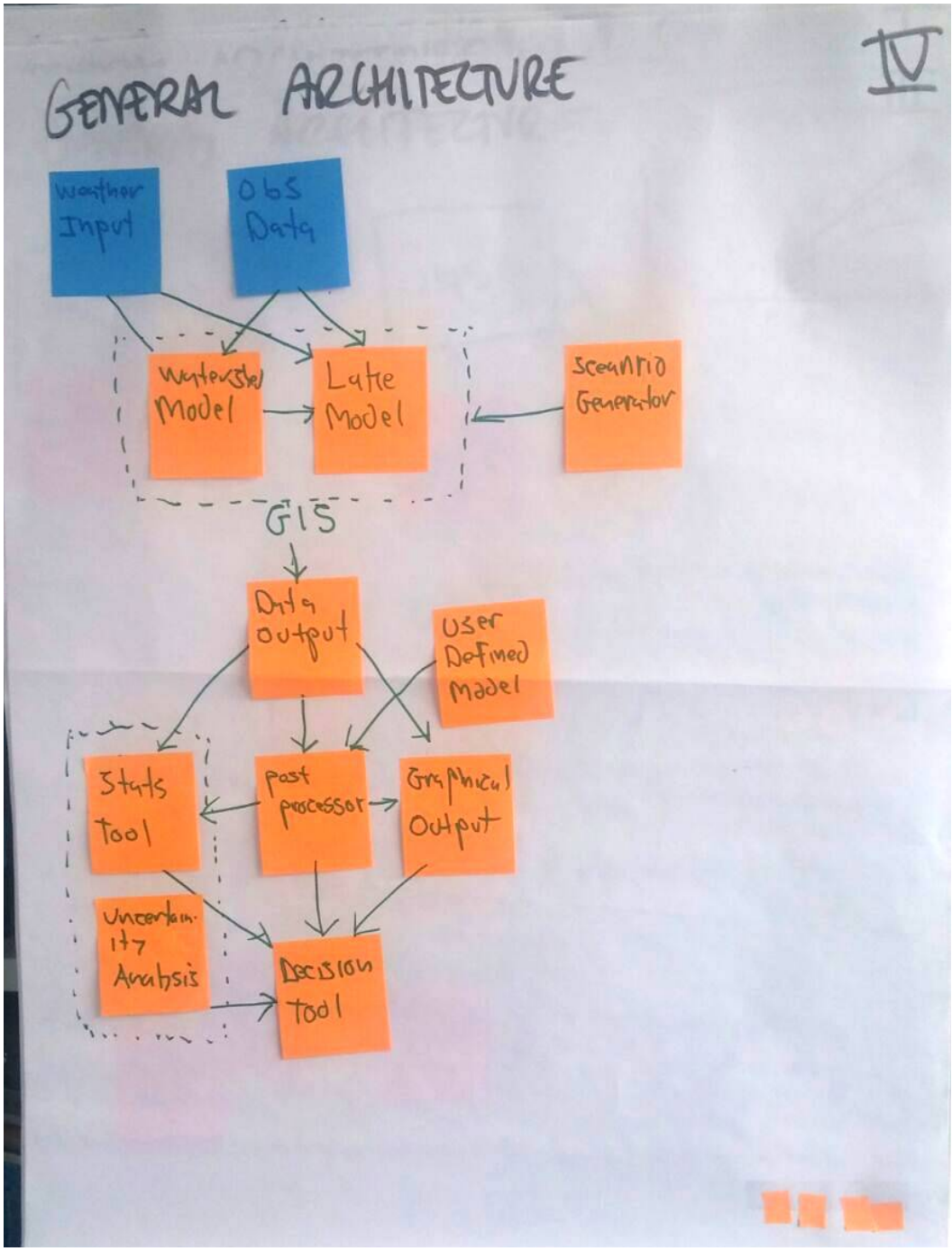
- The group II produced the general architecture that was more voted, and was then kept for the next activity.

The four general architectures proposed, with the different votes (stickers) after Step 3 (next 4 pages)


GENERAL ARCHITECTURE
DATA OK!
MODEL OK
WEATHER INPUTS
LOCAL OBSERVATIONS
Qual. check!
WATERSHED MODEL
LAKE MODEL
POSTPROCESOR
UNCERTAINTY
DECISION MAKING
USER-DEFINED
STATISTICS
SCENARIO GEN.
GRAPHICAL OUTPUT
DECISION TOOL
DATA OUTPUT
SWITCHES/MULTI-USER
GUI
GIS


GENERAL ARCHITECTURE
LOCAL OBS.
WEATHER INPUT
FORE.
FORECAST PERFORMANCE VALIDATION
WATERSHED MODEL
USER DEFINED
MULTI-USER OPTIONS
ON/OFF
POST PROCESSOR
STATS TOOLS
GRAPHICAL OUTPUT
+ DATA OUTPUT
DECISION MAKING TOOL
LAKE MODEL
OBS
DATA
SCENARIO TESTING
CALIBRATION VALIDATION
UNCERTAINTY ANALYSIS
QUALITY CHECK
GIS GUI


GENERAL ARCHITECTURE
III
Seasonal Forecast
Obs
calibration validation
W/L Model
Forecast Performance Validation
Post-processing
Graphical output + prob
export data
predict. yam


GENERAL ARCHITECTURE
IV
Weather Input
Obs Data
Watershed Model
Lake Model
Scenario Generator
GIS
Data Output
User Defined Model
Stats Tool
Post processor
Graphical Output
Uncertainty Analysis
Decision Tool

Implementation in the case-studies (Specific prototyping):

STEP 1 → In this step the members of each case study used the general architecture devised by Group II in the previous activity as a reference to implement the tool in their particular case study. For this, they were supplied by a black/white copy of Group II general architecture, and colour pens to identify in the plot:

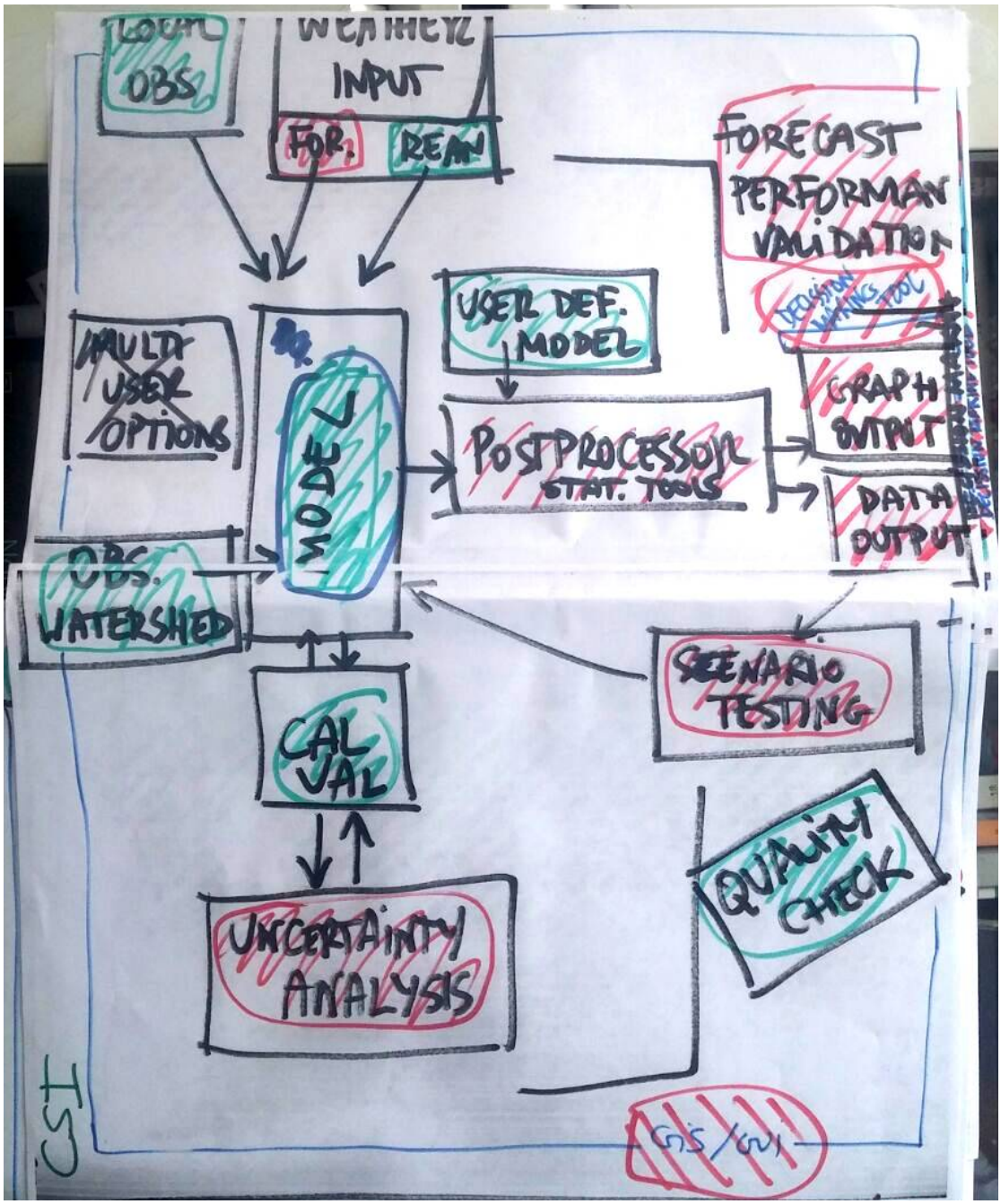
- GREEN: components of the tool already present in the case study
- RED: elements currently lacking
- BLUE: an alternative will be used in this case study
- BLACK: the case study does not want this element in the tool

STEP 2 → After finalising Step 1, a representative of each case study explained to the participants the rationale of the colours chosen for each element in the plot, with a discussion of the overall fit of the architecture in the case study. The discussion was intended to provide the opportunity to case study leaders to familiarize with the architecture and start thinking on the steps needed to implement it in WATExR.

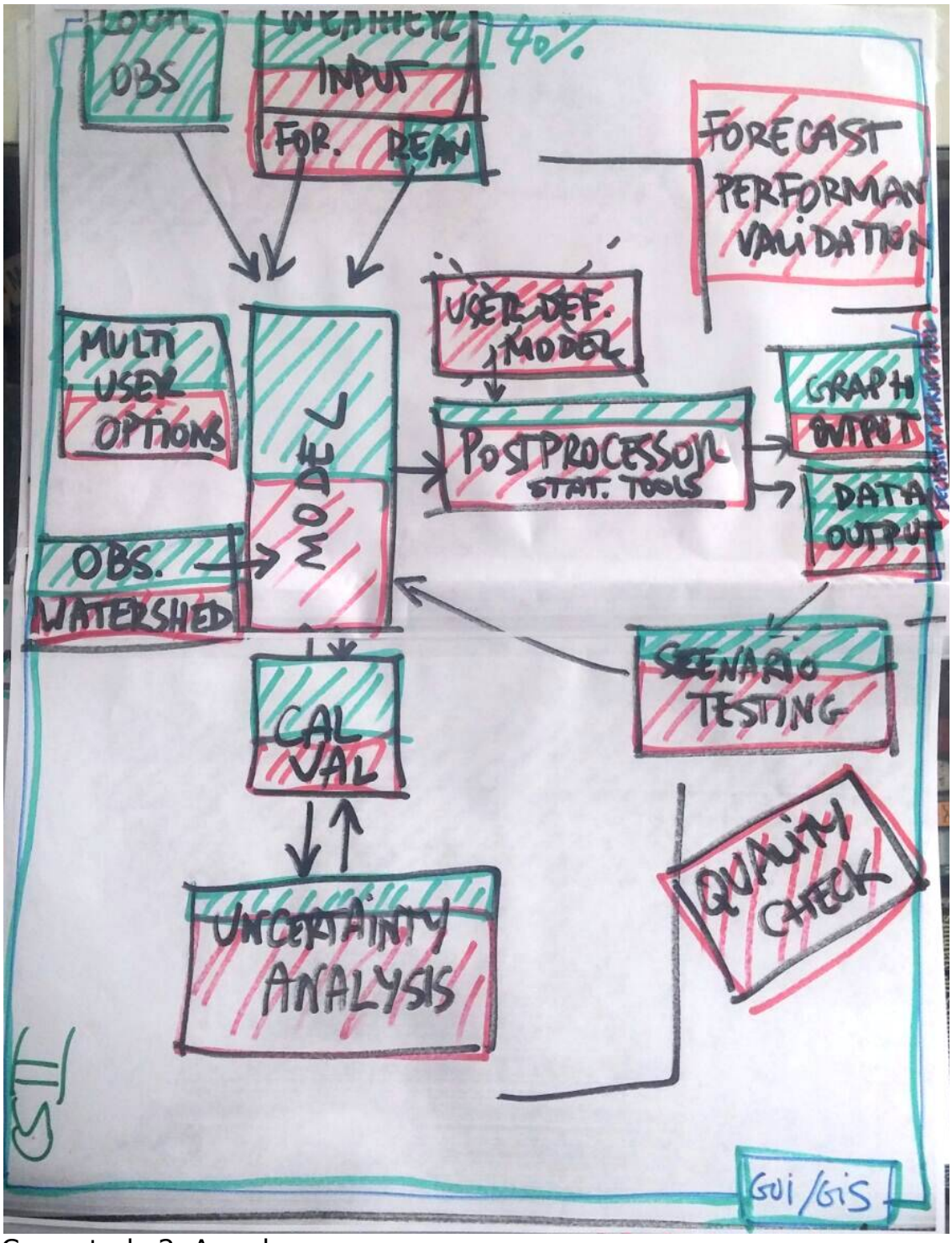
Main comments arising after the activity:

- It is worth to mention that no case study raised major concerns about the general architecture and the implementation on the case studies.

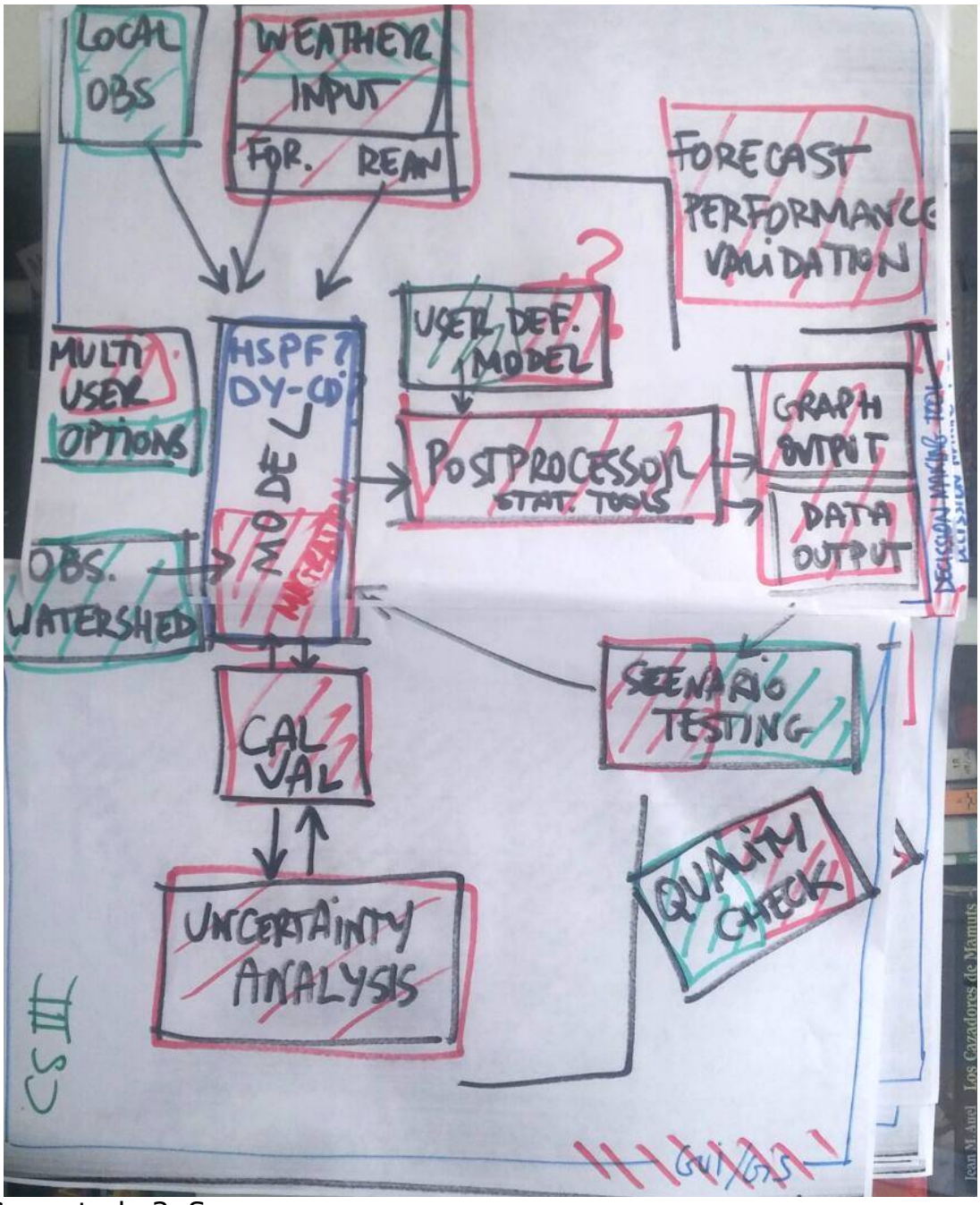
The seven implementations of the general architecture after Step 1. The numbering is an in previous exercises (I-Feeagh, II-Arreskov, III-Sau, IV-Wupper, V-Bold, VI-Morsa, and VII-Erken). For practical reasons during the workshop, the templates lack some space in the right side, where the box for "decision making tool" should be.



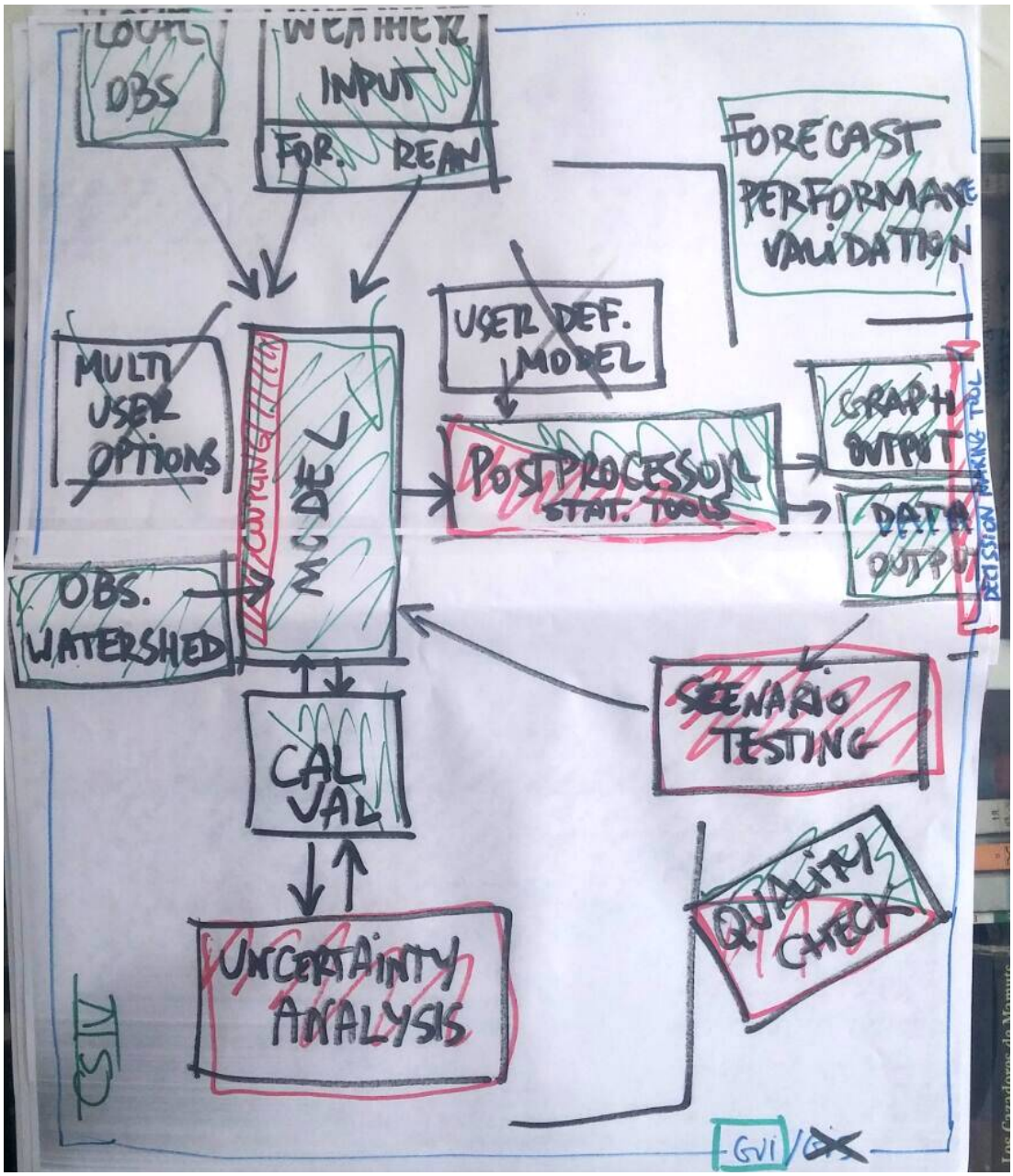
Case study 1. Feeagh



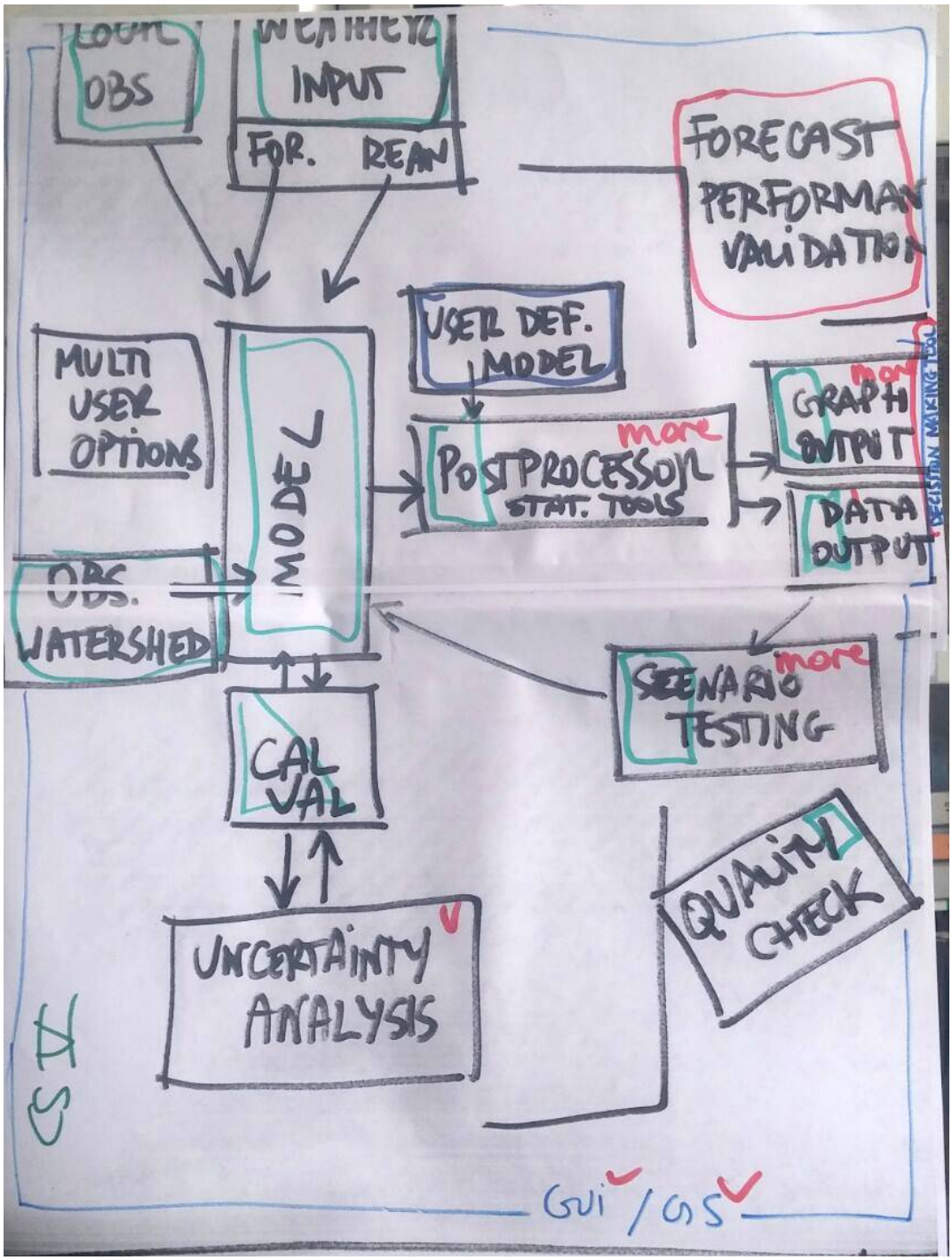
Case study 2. Arreskov



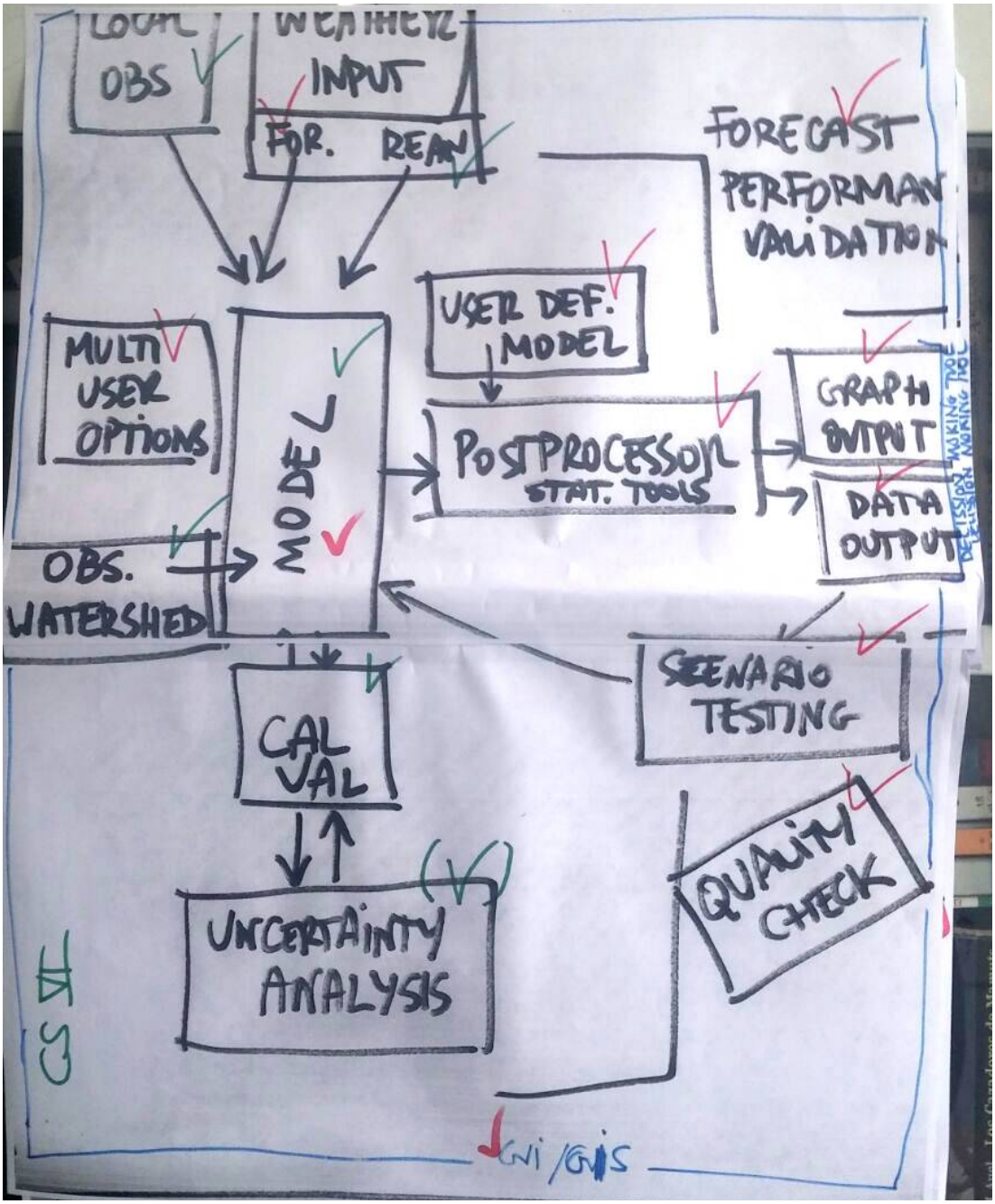
Case study 3. Sau



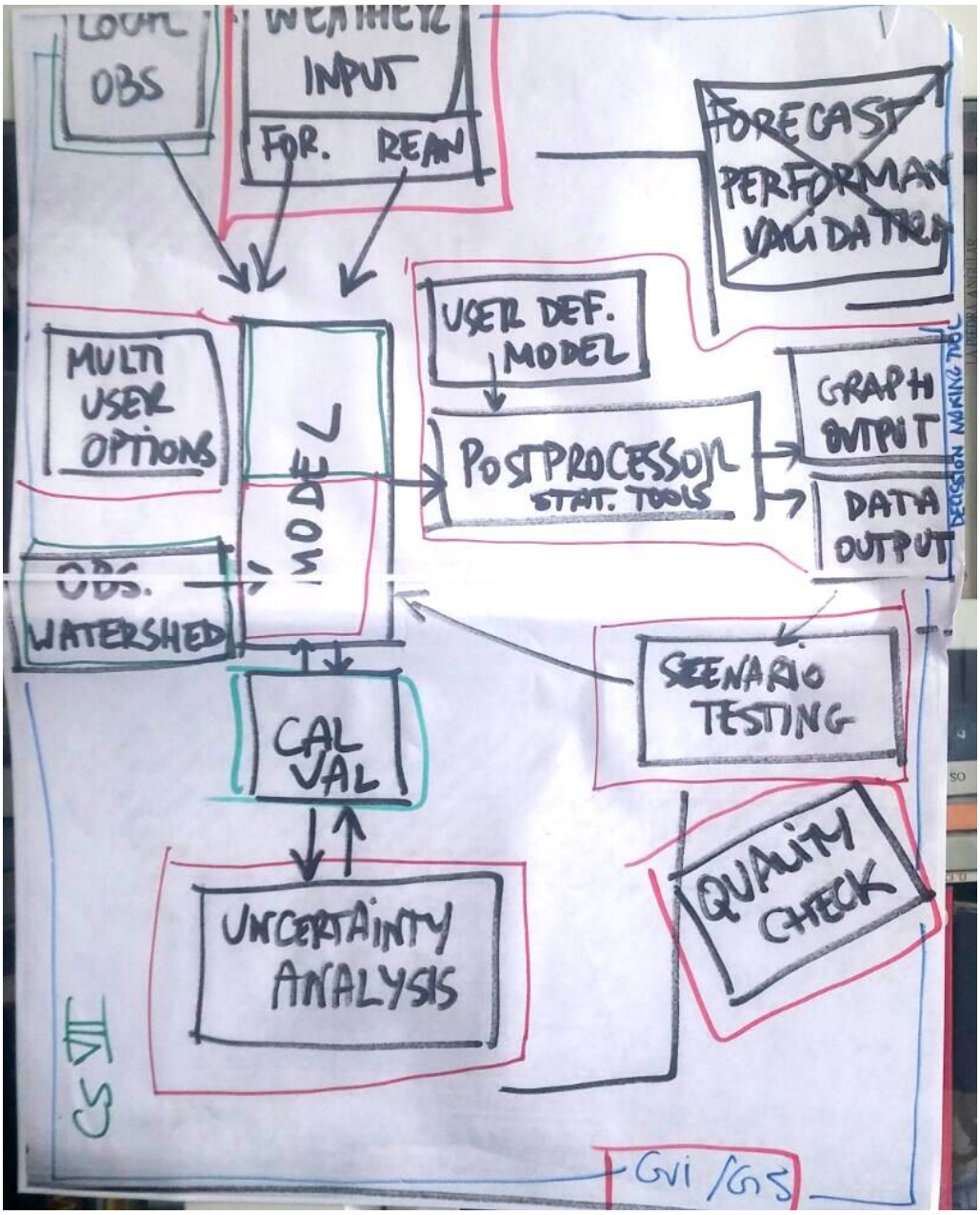
Case study 4. Wupper



Case study 5. Bold



Case study 6. Morsa



Case study VII. Erken

Friday wrap-up

Summary of the meeting (Summary words and headlines):

STEP 1 → Each person is asked to write a word in a board, that somehow summarizes the meeting.

STEP 2 → After this, we had three rounds of voting, in which each person identified one of the words in the list as representative of the meeting. The votes were scored drawing a point by the word. The three votes per person could be awarded to different words. After this, 4 words were selected as the Summary Words of the meeting, attending to the high number of votes they attracted.

STEP 3 → Each participant was asked to secretly write a headline for the meeting, that should include the 4 Summary Words (or slight modifications) identified in Step 2. Then all headlines were written in the board.

List of words, votes, and selected Summary Words after Step 2 (transcription, picture of the original poster at the end of the document)

EDUCATION – 2 votes

DINNER – 1 big vote

SATISFY – 0 votes

COOPERATION – 5 votes - SUMMARY WORD!

KNOWLEDGE – 7 votes - SUMMARY WORD!

MODEL – 2 votes

EFFICIENT – 0 votes

NETWORKING – 8 votes - SUMMARY WORD!

ENGAGEMENT – 2 votes

FUN – 2 votes

ENTHUSIASTIC – 4 votes - SUMMARY WORD!

List of headlines produced after Step 3 (transcription, picture of the original poster at the end of the document)

- Once again it was shown that true knowledge is a product of networking, cooperation and enthusiasm.

- WATExR kick-off meeting enthusiasms participating researchers and establishes the basis for a cooperative knowledge network.

- Cooperation, knowledge, and network enthusiastically propels forecasts of water quality through the WATExR projects.

- Rafa's enthusiasm and knowledge on how to select Spanish wine considerably enhanced networking and cooperation.

- The beginning of an enthusiastic cooperation to improve knowledge in a network of helpful people.

- Multi-disciplinary networking, a new frontier in advancing scientific knowledge.

- Use of scientific networking receives enthusiastic cooperation.

- Enthusiastic cooperation breeds knowledge which is *[unreadable]* through networking

- The efficient and enthusiastic networking and cooperation of WATExR workshop improve our knowledge.

- Announcement: The new knowledge Network of Enthusiastic Collaborative Scientists (KNEC).

- The best cooperation and networking research project with enthusiastic and well knowledge scientists

Critical points for the next 6 months (Open discussion):

STEP 1 → A list of critical points/issues is elaborated from contributions from the participants, in an open discussion. Some critical points/issues are related to a person who must take care of it. Arrows and lines relate critical points/issues.

List of critical points/issues identified, and responsible people, after Step 1 (transcription, picture of the original poster at the end of the document). Items in green squares in the poster were written bold in the transcription. Some arrows and lines present in the original poster were not transcribed in this list.

- Phyton
- Model calibration → for extreme events CXM AL
- Case studies homogeneity (from the beginning) RM
- **Homework ← (ability to do the tasks) KB TL -RM**
- **Allocation of tasks (risk avoidance) (execution masterplan) DT JB**
  AN TL -RM
- Christmas Holiday
- Missing nice dinners (overview)
- Bureaucracy (issue in Spain) DF
- Research questions
- Co-developers input
- **Climate prediction integration → to solve issues ASAP (main issue first 6 months) TL-DF DF RM DT AN EM**
  - **→ Important to deal with this at the beginning**
  - **→ End users needs**
  - **→ Testing relationships in the project**
- High frequency of observations (task) CXM
- Stake holder interest
- Data formats (task)
- Capacity building EM
- Messing model
- Internal communication

- Reporting DP → keep track of everything → project archive → **slack account TL-DP**

- Accountability

- Free play

- Web page and GIT

- Sharing KB → Hive behaviour

- National funding

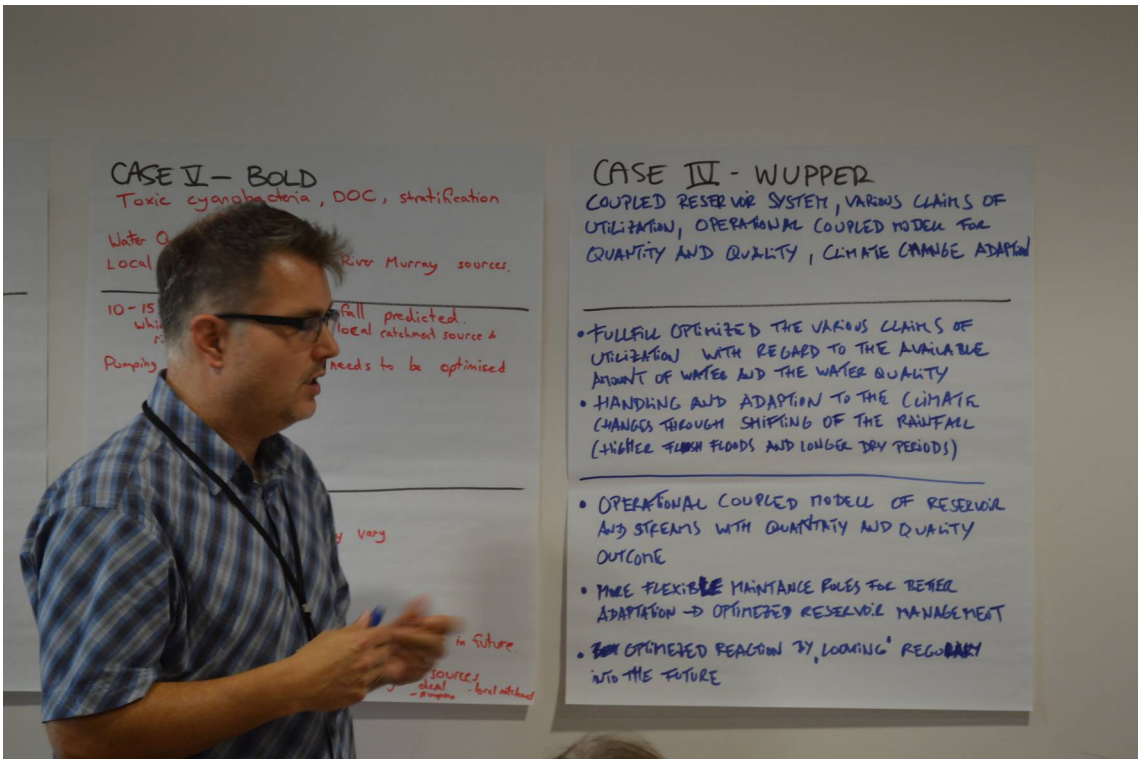
- New staff DP → Resources (including human resources) (allocation and availability)

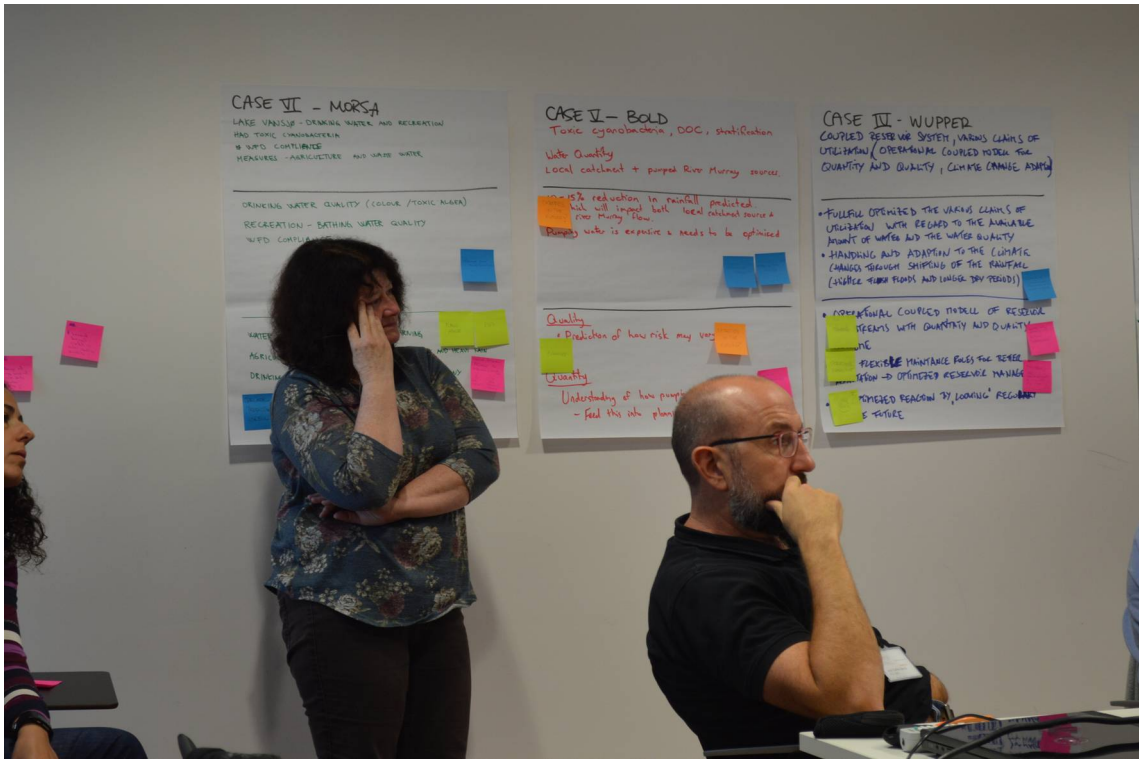
- Integration of new staff JL JB → networking events

- Uncertainty assessment JL AL

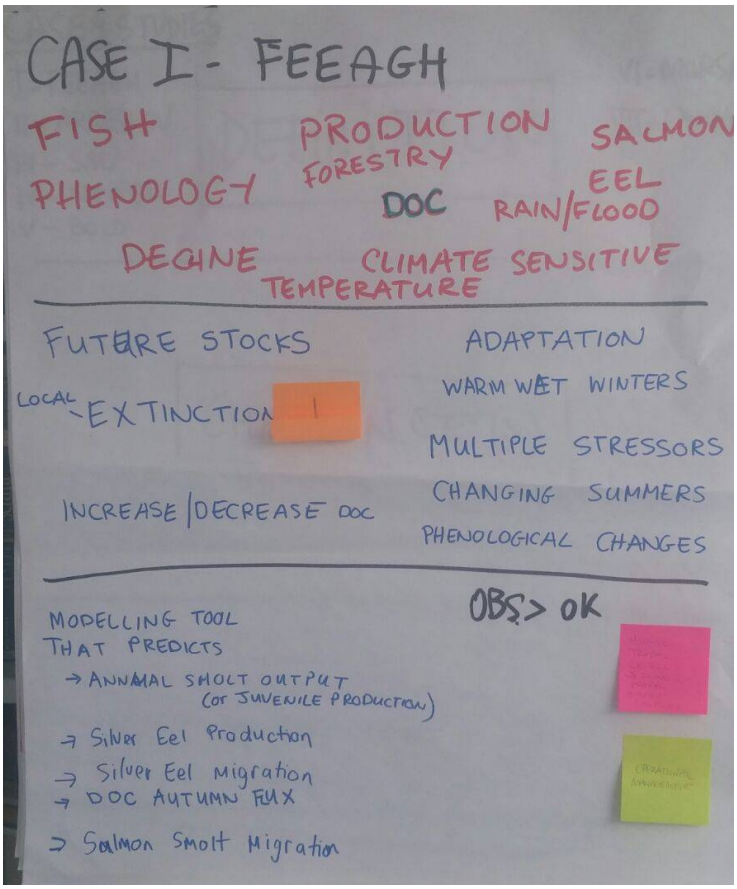
Annex – Pictures of the activities

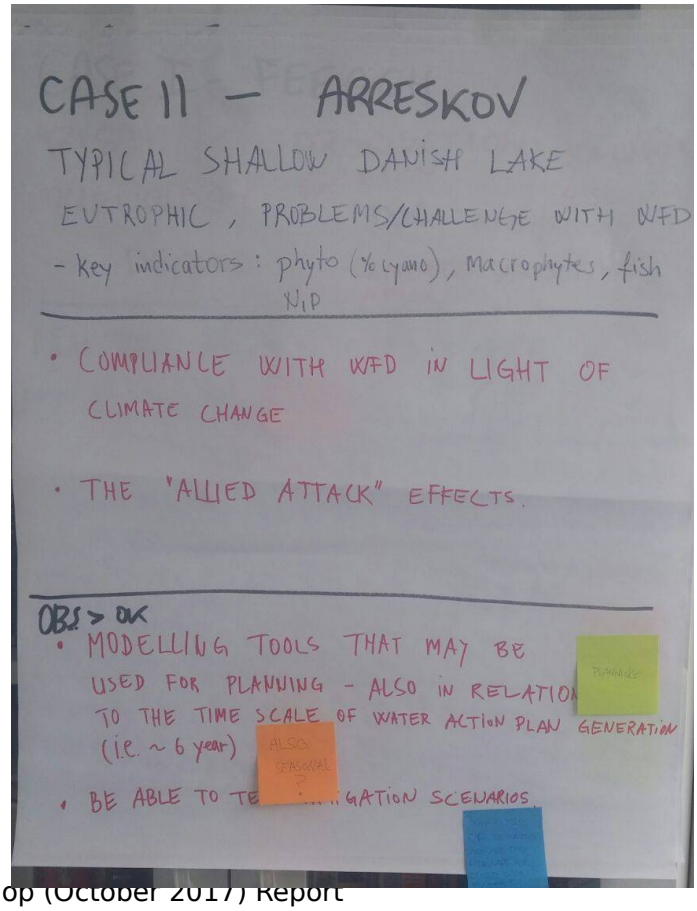
Workshop dynamics

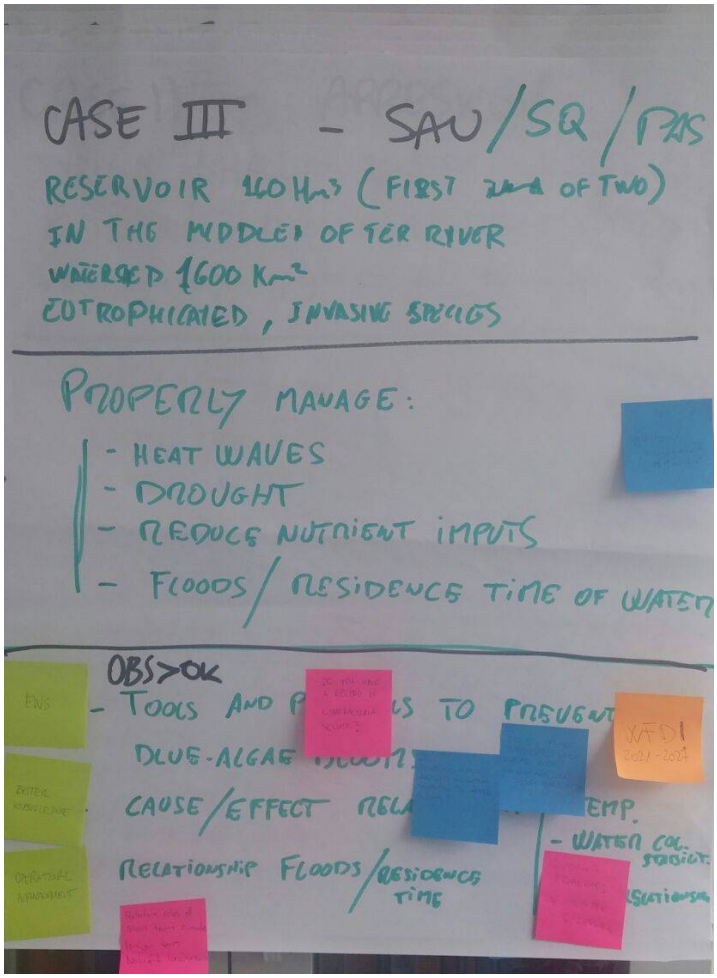

CASE V – BOLD
Toxic cyanobacteria, DOC, stratification
River Murray sources.
predicted.
local catchment source &
needs to be optimised
CASE III - WUPPER
COUPLED RESERVOIR SYSTEM, VARIOUS CLAIMS OF UTILIZATION, OPERATIONAL COUPLED MODEL FOR QUANTITY AND QUALITY, CLIMATE CHANGE ADAPTION
• FULLFIL OPTIMIZED THE VARIOUS CLAIMS OF UTILIZATION WITH REGARD TO THE AVAILABLE AMOUNT OF WATER AND THE WATER QUALITY
• HANDLING AND ADAPTION TO THE CLIMATE CHANGES THROUGH SHIFTING OF THE RAINFALL (HIGHER FLOOD FLOODS AND LONGER DRY PERIODS)
• OPERATIONAL COUPLED MODELL OF RESERVOIR AND STREAMS WITH QUANTITAIY AND QUALITY OUTCOME
• MORE FLEXIBLE MAINTANCE RULES FOR BETTER ADAPTATION → OPTIMIZED RESERVOIR MANAGEMENT
• OPTIMIZED REACTION BY 'LOOKING' REGULARLY INTO THE FUTURE

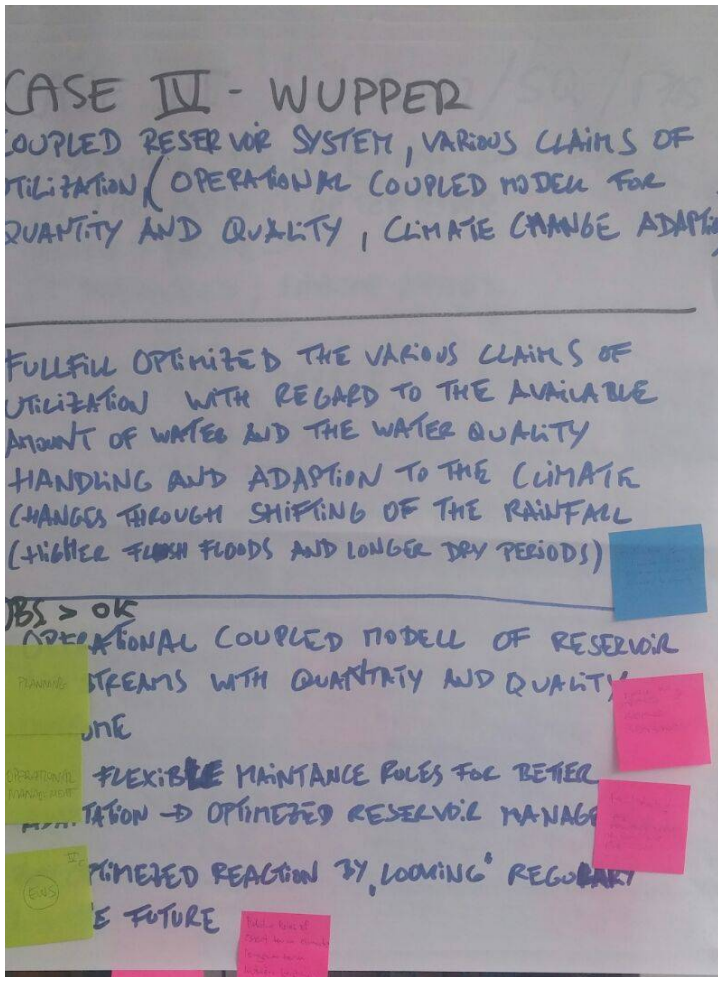

CASE VI - MURSA
CASE V - BOLD
Toxic cyanobacteria, DOC, stratification
Water Quantity
Local catchment + pumped River Murray sources
CASE III - WUPPER

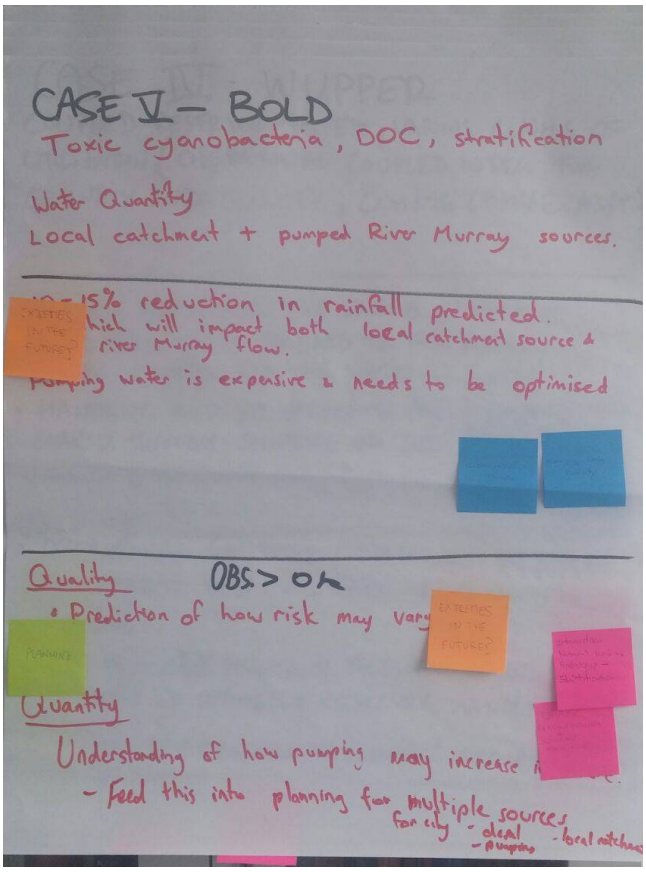
Output

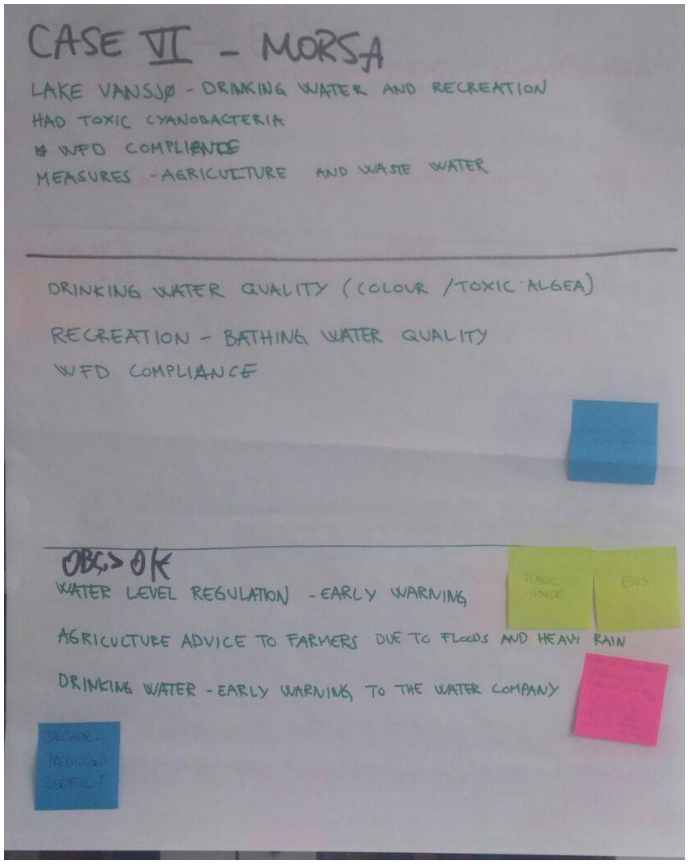

CASE I - FEEAGH
FISH
PRODUCTION
SALMON
PHENOLOGY
FORESTRY
EEL
DOC
RAIN/FLOOD
DECINE
CLIMATE SENSITIVE
TEMPERATURE
FUTURE STOCKS
ADAPTATION
LOCAL EXTINCTION
WARM WET WINTERS
MULTIPLE STRESSORS
INCREASE/DECREASE DOC
CHANGING SUMMERS
PHENOLOGICAL CHANGES
OBS> OK
MODELLING TOOL
THAT PREDICTS
→ ANNUAL SMOLT OUTPUT
(or JUVENILE PRODUCTION)
→ Silver Eel Production
→ Silver Eel Migration
→ DOC AUTUMN FLUX
→ Salmon Smolt Migration

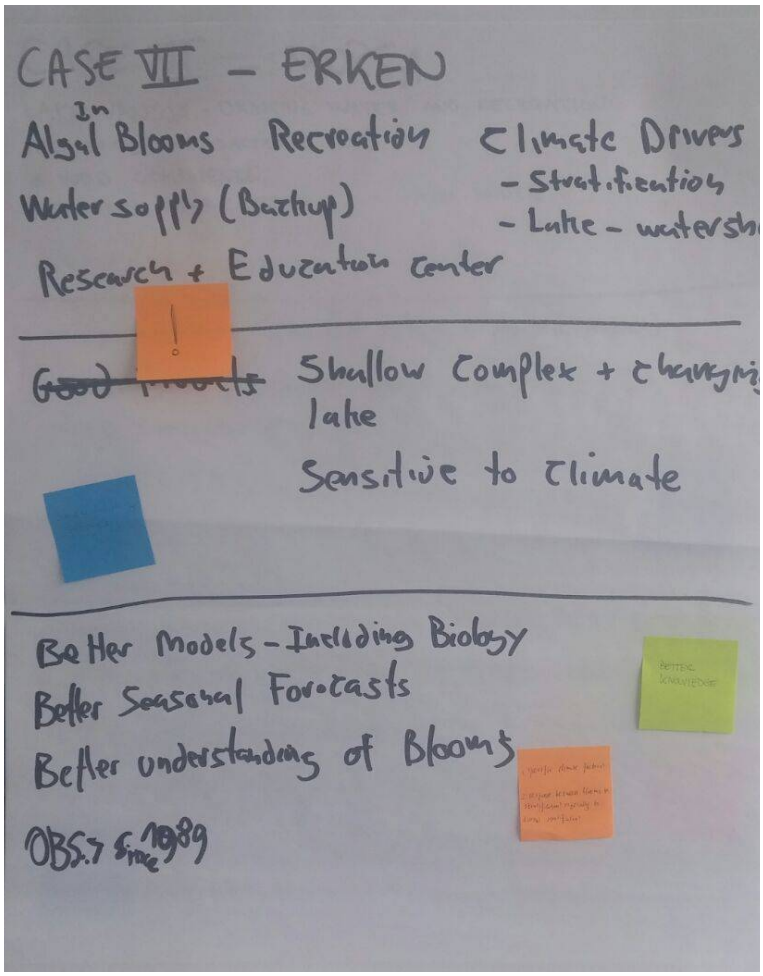

CASE II - ARRESKOV
TYPICAL SHALLOW DANISH LAKE
EUTROPHIC, PROBLEMS/CHALLENGE WITH WFD
- Key indicators: phyto (% cyano), Macrophytes, fish
N,P
• COMPLIANCE WITH WFD IN LIGHT OF CLIMATE CHANGE
• THE "ALLIED ATTACK" EFFECTS.
OBS> OK
• MODELLING TOOLS THAT MAY BE USED FOR PLANNING - ALSO IN RELATION TO THE TIME SCALE OF WATER ACTION PLAN GENERATION (i.e. ~ 6 year)
• BE ABLE TO TE... GATION SCENARIOS

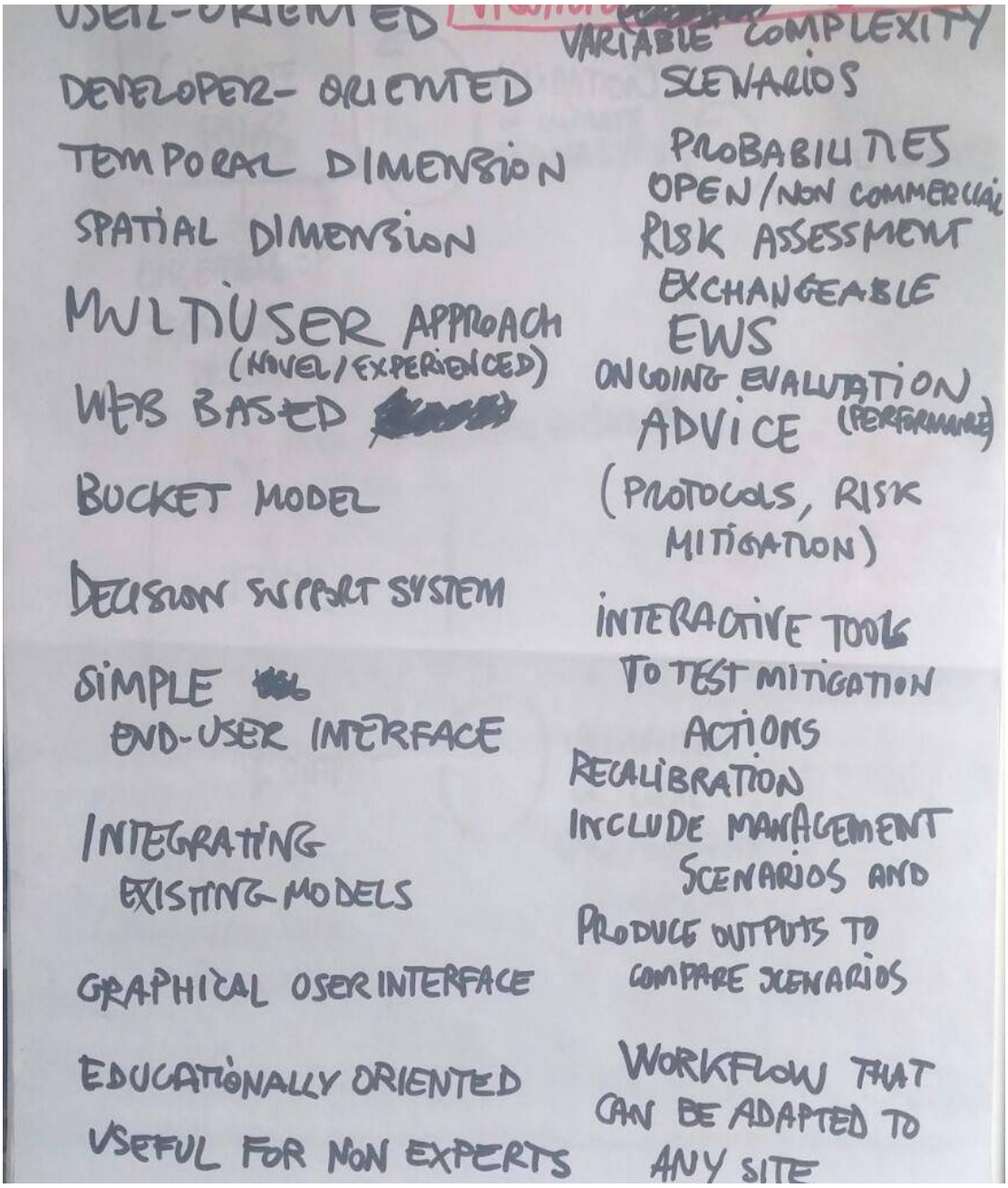

CASE III - SAU/SQ/PAS
RESERVOIR 160 Hm³ (FIRST 2nd OF TWO)
IN THE MIDDLE OF TER RIVER
WATERSHED 1600 Km²
EUTROPHICATED, INVASIVE SPECIES
PROPERLY MANAGE:
- HEAT WAVES
- DROUGHT
- REDUCE NUTRIENT IMPUTS
- FLOODS / RESIDENCE TIME OF WATER
OBS>OK
- TOOLS AND P S TO PREVENT
BLUE-ALGAE
CAUSE/EFFECT REL EMP.
- WATER QU. STATUS
RELATIONSHIP FLOODS/RESIDENCE TIME

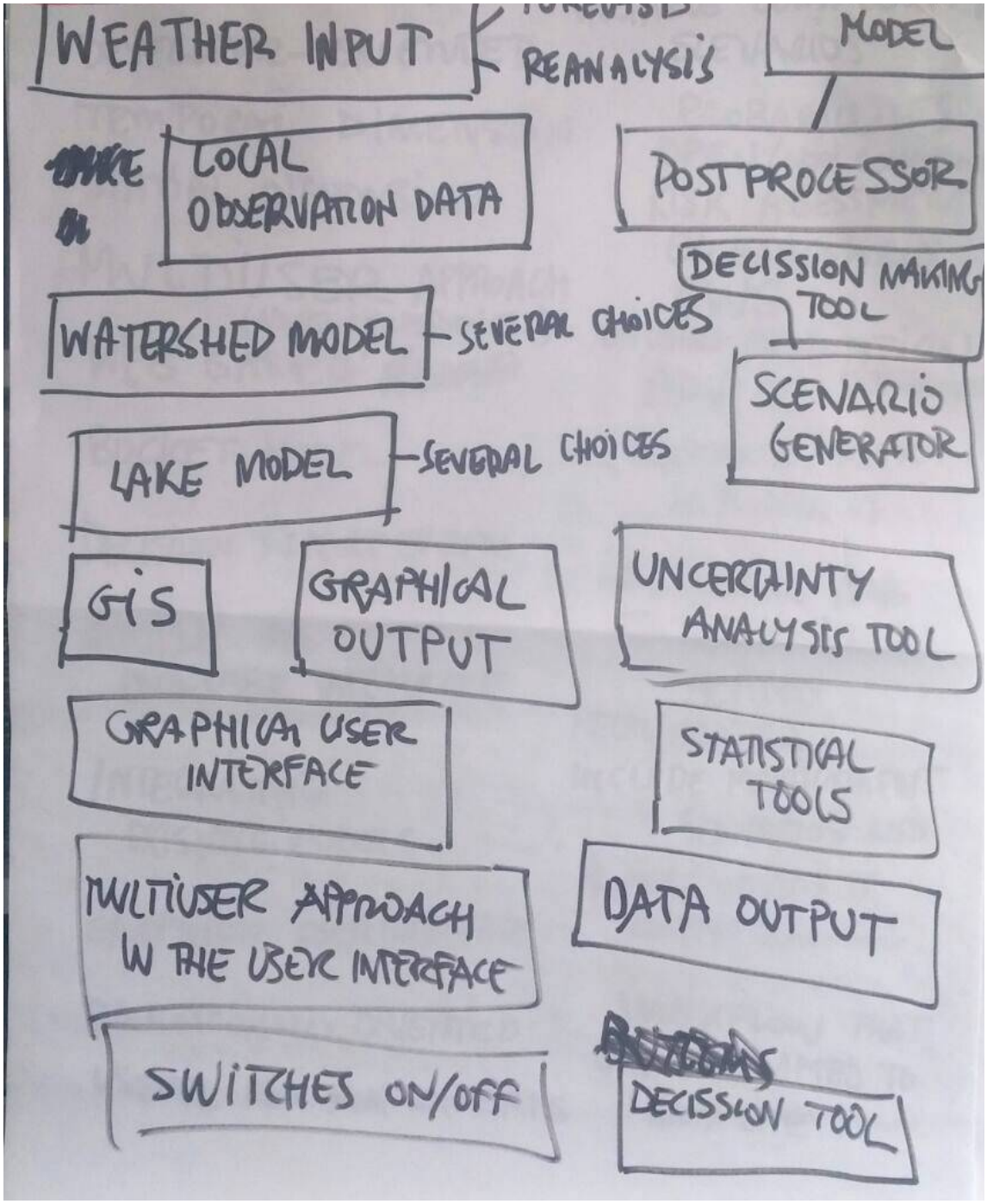

CASE III - WUPPER
COUPLED RESERVOIR SYSTEM, VARIOUS CLAIMS OF
UTILIZATION (OPERATIONAL COUPLED MODEL FOR
QUANTITY AND QUALITY, CLIMATE CHANGE ADAPT
FULLFILL OPTIMIZED THE VARIOUS CLAIMS OF
UTILIZATION WITH REGARD TO THE AVAILABLE
AMOUNT OF WATER AND THE WATER QUALITY
HANDLING AND ADAPTION TO THE CLIMATE
CHANGES THROUGH SHIFTING OF THE RAINFALL
(HIGHER FLUSH FLOODS AND LONGER DRY PERIODS)
OBS > OK
OPERATIONAL COUPLED MODELL OF RESERVOIR
STREAMS WITH QUANTITY AND QUALITY
FLEXIBLE MAINTANCE RULES FOR BETTER
TATION → OPTIMIZED RESERVOIR MANAG
PTIMIZED REACTION BY „LOOKING" REGU
E FUTURE

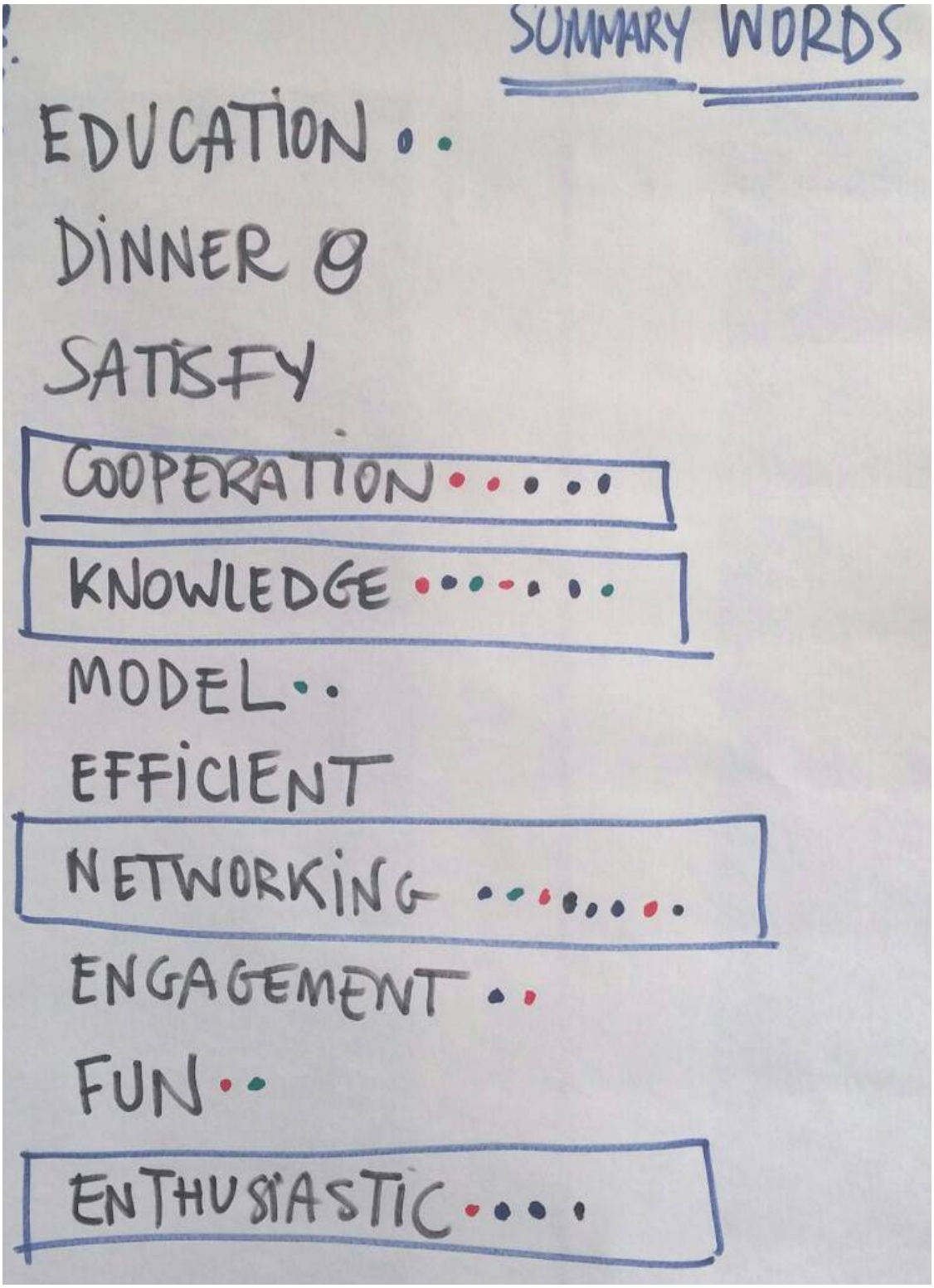

CASE V – BOLD
Toxic cyanobacteria, DOC, stratification
Water Quantity
Local catchment + pumped River Murray sources.
15% reduction in rainfall predicted.
which will impact both local catchment source &
river Murray flow.
pumping water is expensive & needs to be optimised
Quality
OBS > OK
• Prediction of how risk may vary
Quantity
Understanding of how pumping may increase
- Feed this into planning for multiple sources
for city
- ideal
- pumping
- local catchm

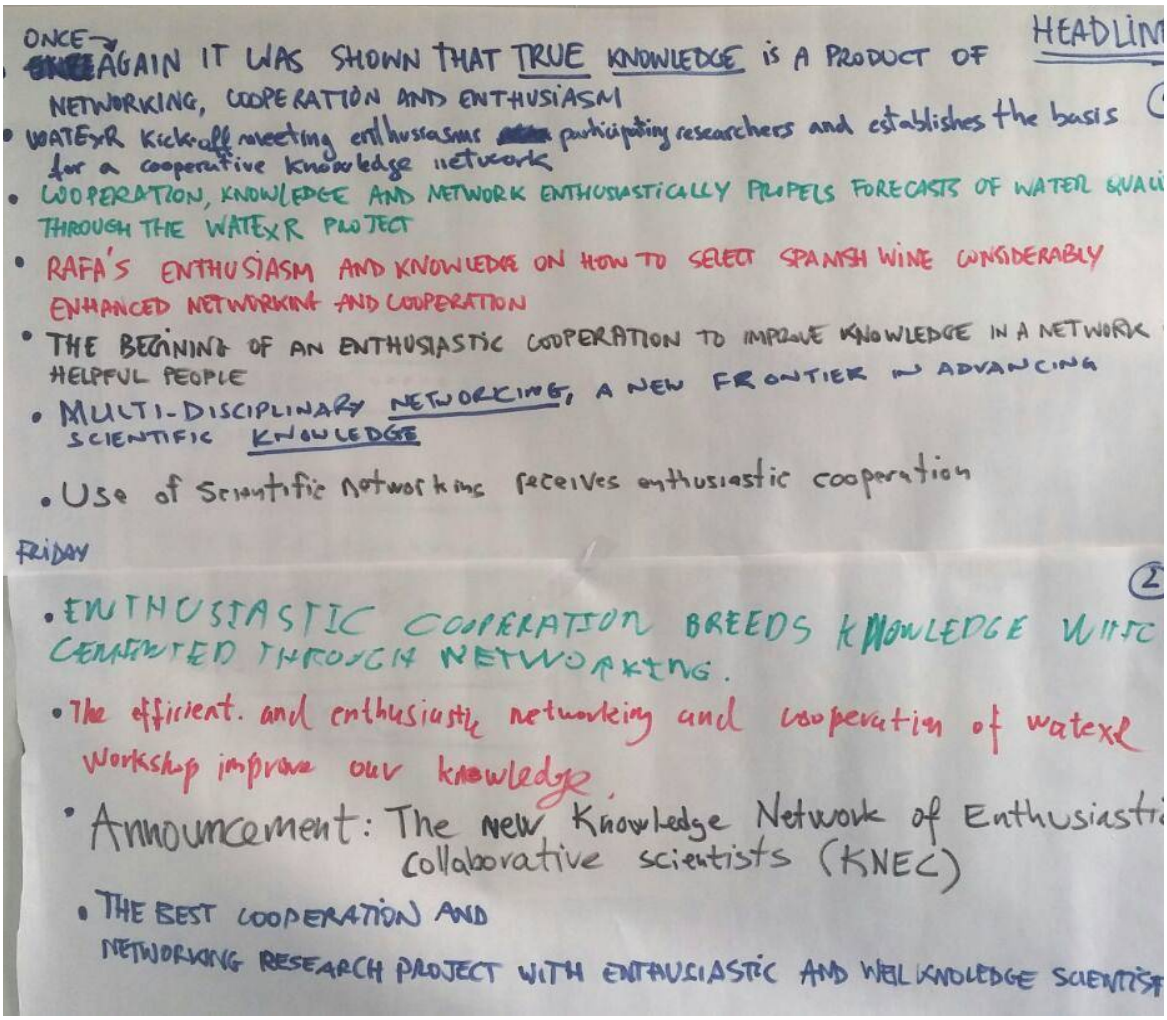

CASE VI - MORSA
LAKE VANSJØ - DRINKING WATER AND RECREATION
HAD TOXIC CYANOBACTERIA
WFD COMPLIANCE
MEASURES - AGRICULTURE AND WASTE WATER
DRINKING WATER QUALITY (COLOUR / TOXIC ALGEA)
RECREATION - BATHING WATER QUALITY
WFD COMPLIANCE
OBS > OK
WATER LEVEL REGULATION - EARLY WARNING
AGRICULTURE ADVICE TO FARMERS DUE TO FLOODS AND HEAVY RAIN
DRINKING WATER - EARLY WARNING TO THE WATER COMPANY

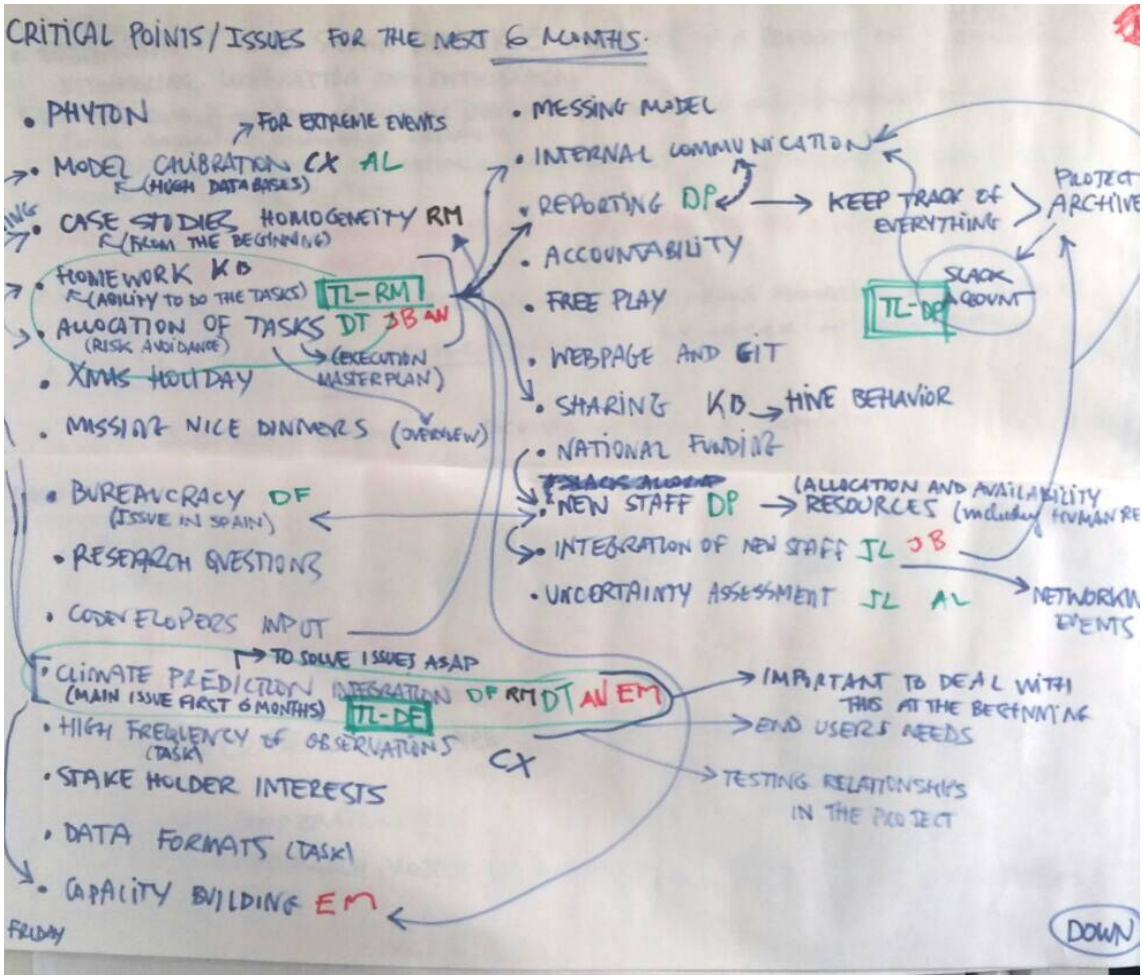

CASE VII – ERKEN
In
Algal Blooms
Recreation
Climate Drivers
- Stratification
Water supply (Backup)
Research + Education center
!
Shallow Complex + changing
lake
Sensitive to Climate
Better Models – Including Biology
Better Seasonal Forecasts
Better understanding of Blooms
OBS: Since 1989


USER-ORIENTED
DEVELOPER- ORIENTED
TEMPORAL DIMENSION
SPATIAL DIMENSION
MULTIUSER APPROACH
(NOVEL/EXPERIENCED)
WEB BASED
BUCKET MODEL
DECISION SUPPORT SYSTEM
SIMPLE
END-USER INTERFACE
INTEGRATING
EXISTING MODELS
GRAPHICAL USER INTERFACE
EDUCATIONALLY ORIENTED
USEFUL FOR NON EXPERTS
VARIABLE COMPLEXITY
SCENARIOS
PROBABILITIES
OPEN/NON COMMERCIAL
RISK ASSESSMENT
EXCHANGEABLE
EWS
ONGOING EVALUATION
ADVICE
(PROTOCOLS, RISK
MITIGATION)
INTERACTIVE TOOLS
TO TEST MITIGATION
ACTIONS
RECALIBRATION
INCLUDE MANAGEMENT
SCENARIOS AND
PRODUCE OUTPUTS TO
COMPARE SCENARIOS
WORKFLOW THAT
CAN BE ADAPTED TO
ANY SITE


WEATHER INPUT
REANALYSIS
MODEL
LOCAL OBSERVATION DATA
POSTPROCESSOR
DECISSION MAKING TOOL
WATERSHED MODEL
SEVERAL CHOICES
SCENARIO GENERATOR
LAKE MODEL
SEVERAL CHOICES
GIS
GRAPHICAL OUTPUT
UNCERTAINTY ANALYSIS TOOL
GRAPHICAL USER INTERFACE
STATISTICAL TOOLS
MULTIUSER APPROACH IN THE USER INTERFACE
DATA OUTPUT
SWITCHES ON/OFF
DECISSION TOOL


SUMMARY WORDS
EDUCATION
DINNER @
SATISFY
COOPERATION
KNOWLEDGE
MODEL
EFFICIENT
NETWORKING
ENGAGEMENT
FUN
ENTHUSIASTIC


ONCE AGAIN IT WAS SHOWN THAT TRUE KNOWLEDGE IS A PRODUCT OF
NETWORKING, COOPERATION AND ENTHUSIASM
WATEXR kick-off meeting enthusiasms participating researchers and establishes the basis for a cooperative knowledge network
COOPERATION, KNOWLEDGE AND NETWORK ENTHUSIASTICALLY PROPELS FORECASTS OF WATER
THROUGH THE WATEXR PROJECT
RAFA'S ENTHUSIASM AND KNOWLEDGE ON HOW TO SELECT SPANISH WINE CONSIDERABLY ENHANCED NETWORKING AND COOPERATION
THE BEGINING OF AN ENTHUSIASTIC COOPERATION TO IMPROVE KNOWLEDGE IN A NETWORK
HELPFUL PEOPLE
MULTI-DISCIPLINARY NETWORKING, A NEW FRONTIER IN ADVANCING SCIENTIFIC KNOWLEDGE
Use of Scientific Networking receives enthusiastic cooperation
FRIDAY
ENTHUSIASTIC COOPERATION BREEDS KNOWLEDGE
CEMENTED THROUGH NETWORKING.
The efficient and enthusiastic networking and cooperation of watexr
Announcement: The new Knowledge Network of Enthusiastic
collaborative scientists (KNEC)
THE BEST COOPERATION AND
NETWORKING RESEARCH PROJECT WITH ENTHUSIASTIC AND WELL KNOWLEDGE


CRITICAL POINTS / ISSUES FOR THE NEXT 6 MONTHS.
PHYTON
FOR EXTREME EVENTS
MODEL CALIBRATION CX AL
(HIGH DATA BASES)
CASE STUDIES HOMOGENEITY RM
(FROM THE BEGINNING)
HOMEWORK KB
(ABILITY TO DO THE TASKS)
TL-RM
ALLOCATION OF TASKS DT JB AN
(RISK AVOIDANCE)
(EXECUTION MASTERPLAN)
XMAS HOLIDAY
MISSING NICE DINNERS (OVERVIEW)
BUREAUCRACY DF
(ISSUE IN SPAIN)
RESEARCH QUESTIONS
CODEVELOPERS INPUT
TO SOLVE ISSUES ASAP
CLIMATE PREDICTION INTEGRATION DP RM DT AN EM
(MAIN ISSUE FIRST 6 MONTHS)
TL-DE
HIGH FREQUENCY OF OBSERVATIONS
(TASK)
CX
STAKE HOLDER INTERESTS
DATA FORMATS (TASK)
CAPACITY BUILDING EM
FRIDAY
MISSING MODEL
INTERNAL COMMUNICATION
REPORTING DP
KEEP TRACK OF EVERYTHING
PROJECT ARCHIVE
ACCOUNTABILITY
FREE PLAY
SLACK ACOUNT
TL-DE
WEBPAGE AND GIT
SHARING KB → HIVE BEHAVIOR
NATIONAL FUNDING
NEW STAFF DP
(ALLOCATION AND AVAILABILITY
RESOURCES (including
INTEGRATION OF NEW STAFF JL JB
UNCERTAINTY ASSESSMENT JL AL
NETWORKIN
EVENTS
IMPORTANT TO DEAL WITH THIS AT THE BEGINNING
END USERS NEEDS
TESTING RELATIONSHIPS IN THE PROJECT
DOWN