ClimateWater Final Symposium

Budapest 13-14 October 2011

Short overview of the entire project: ClimateWater: Bridging the Gap Between Adaptation Strategies of Climate Change Impacts and European Water Policies

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P1,VITUKI

Abstract ₀ (max. 2000 char.)

The Project ClimateWater is aimed as the first step on the analysis and synthesis of data and information on the likely (known, assumed, expected, modelled, forecasted, predicted, estimated etc.) water related impacts of the changes of the climate with special regard to their risk and to the urgency of getting prepared to combat these changes and their impacts. The Project will identify all adaptation strategies that were developed in Europe and also globally for handling (preventing, eliminating, combating, mitigating) the impacts of global climate changes on water resources and aquatic ecosystems, including all other water related issues of the society and nature. Research needs in the field of 'climate impact on the water cycle and water users' will be identified with special regard to enable the ranking of adaptation action in the light of the magnitude of impact on water resources and the urgency of the action needed. The most important output of the project will be the identification of gaps that would hinder the implementation of the EU water policy in combating climate impacts on water.

CONTENT

WP2 Analysis and Synthesis of Water Related Impacts.

WP3 Analysis and Synthesis of Methodologies of Adaptation Measures

WP4 Identification of Research Needs

WP5 Identifying and Bridging Gaps in Water Related European Policies

WP6 Dissemination of Knowledge

WP2 Analysis and Synthesis of Water Related Impacts

CONTENT

WP2.1 Water management and other water-related impacts on the society and the economy (P8 UNILEI)
2.1.1: Direct impacts on the life and health of the population and the wealth of the nations (P1, VITUKI)
Floods and excess water (P6, Geonardo)
Water supply (P3 CNR-IRSA)
Water quality (P1 VITUKI)
Drought and water scarcity (P9, SHMU)
2.1.2 Indirect impacts on the society through direct impacts on economic activities (P9, SHMU)
Water management (P1, VITUKI)
Agriculture (P2 UNIDEB)
Agriculture (P2 UNIDEB)
Navigation (P10, SOGREAH)
Hydropower and nuclear power generation (P10, SOGREAH)
Tourism (P11 MRA)
Land use planning **(**P8 UNILEI**)**

WP2 Analysis and Synthesis of Water Related Impacts

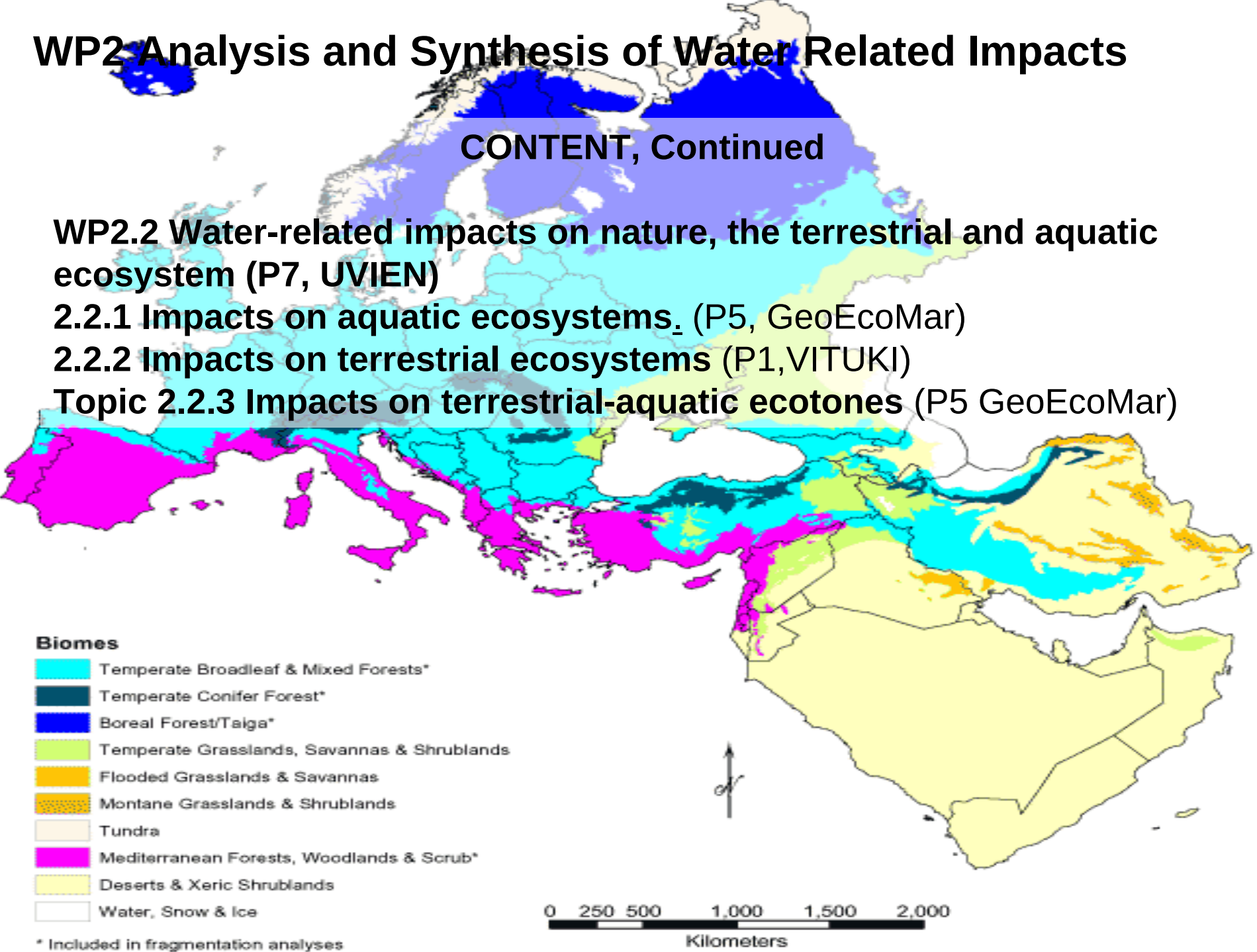
CONTENT, Continued

WP2.2 Water-related impacts on nature, the terrestrial and aquatic ecosystem (P7, UVIEN)

2.2.1 Impacts on aquatic ecosystems. (P5, GeoEcoMar)

2.2.2 Impacts on terrestrial ecosystems (P1,VITUKI)

Topic 2.2.3 Impacts on terrestrial-aquatic ecotones (P5 GeoEcoMar)



Behind WP2, there are series of Thematic Focus reports and Task-leader Leports. as will be illustrated below

The collection of these special reports were uploaded to homepage as seen above, especially designed for PO, who asked for explanation

This slide shows the series of thematic focuses and the task leader report of Indirect impacts

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Path: library/for_po/wp2_supporting_docs/wp211_direct_impacts

Name	Last modified	Size	Last modified by
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annex_i_on__floods_for_wp211_task_leade	01-Nov-2010 17:34	6823424	Geza Jolankai
annex_ii_on_water_supply_for_wp211_task	01-Nov-2010 17:36	2094080	Geza Jolankai
annex_iii_on_water_quality_for_wp211_tas	01-Nov-2010 17:39	3336704	Geza Jolankai
annex_iv_on_drought_for_task_leaader_rep	01-Nov-2010 17:40	207360	Geza Jolankai
taskleader_report_for_wp_211_direct_impa	01-Nov-2010 17:30	101376	Geza Jolankai

There are some 15 pcs huge reports, that give track of all inputs by partners

This is the first page of one of the Thematic Focus reports

European Water Policies

Thematic Focus evaluation for

Water Supply- Annex II to TL report on WP2.1.1

of **WP 2 – Analysis and synthesis of water related climate change impacts**

Sub WP	2.1 – Water management and other water-related impacts on the society and on the economy		
Topic	2.1.1 – Direct impacts on the life and health of the population and the wealth of the nations		
Partner making the focus	Partner 3: CNR-IRSA (I), refs: 1, 2, 3	**Contributing partner(s)**	Partner 9 SHMU (SK), refs: 4-18 Partner 11: MRA (MT) Refs:19, 23

Description as of DoW: Water supply with special regard to the availability of the quantity of drinking water resources and to the expected changes in water demand. Subdivision according to water resource types is needed like groundwaters, including karstic, shallow phreatic, and deep confined, surface inland waters, rivers lakes, reservoirs, coastal waters and seas.

Notes on the items of this summary	First the site/region and type(s) of water resources affected are mentioned for each reference. Next some essential short statements of the reference are given, followed by short explanation of the processes. References are given on the end of the study. Classification of the Impact according to the DPSIR approach can be given (whenever appropriate). Adaptation strategy should be included (if any). Notes of the person making the summary may be added (on adaptation strategy and other). More details of the original processed documents are also attached in the relevant annexes.

Impact from ref [1] (Discussion Paper: Water Supply and Sanitation Services within: Time to Adapt **-** Climate Change and the European Water Dimension international

This report is 72 pages and most or many of the mentioned 15 reports are of similar size. They contain all inputs by all project partners and will only be annexed to the final report on digital form (CD, DVD)

WP2 illustration continued with the major problems revealed

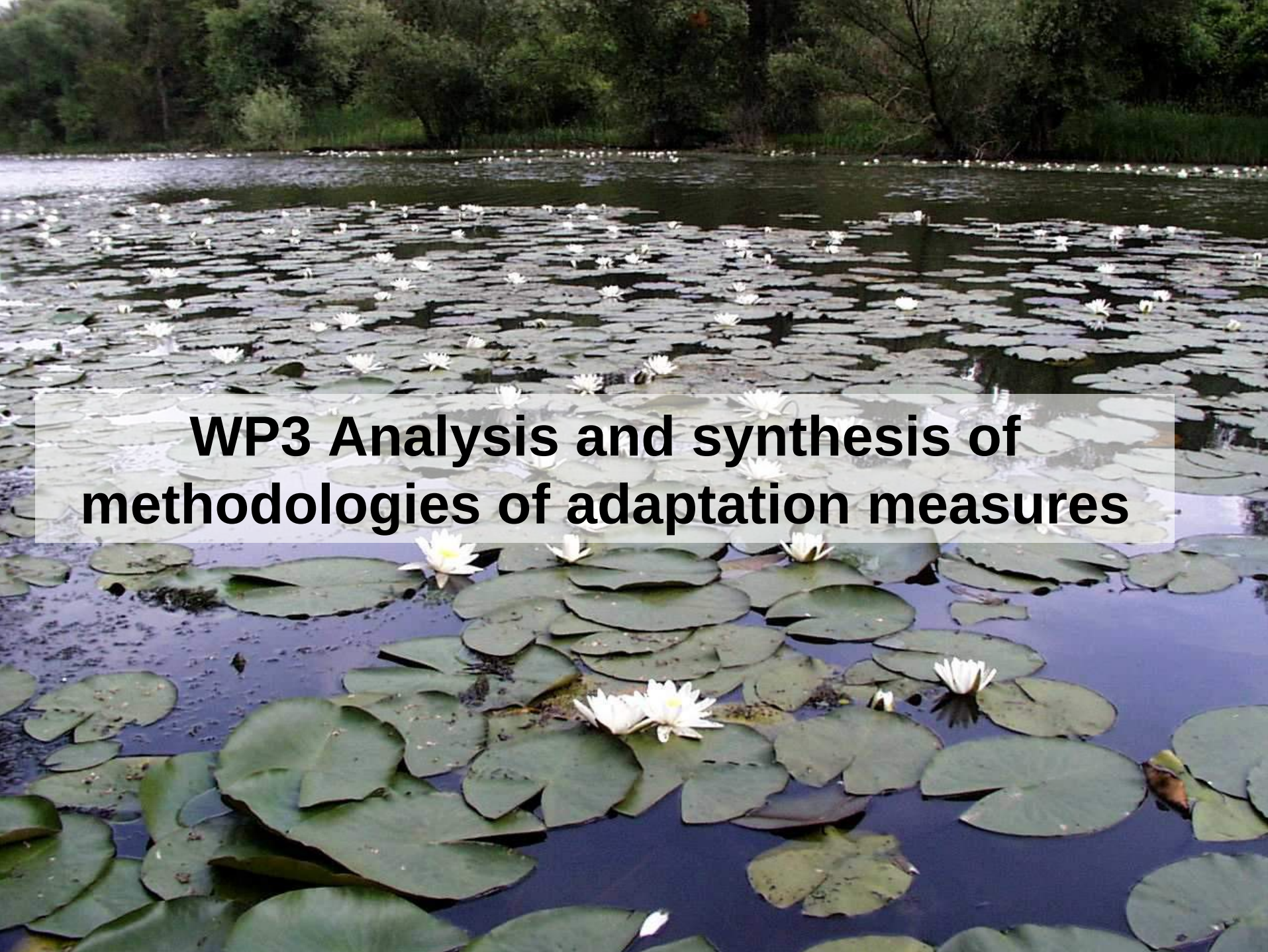
The most sever water quality problems are caused by the floods (we come back to this in other WPs) and the ecological disasters of aquatic and terrestrial ecosystems and their ecotones!!

One of the major problems is flood especially the flash floods and the dam breaks. Many of the other topics of WP2 are related to floods

WP2 illustration continued with the major problems revealed

The second largest problem (probably the first in importance!?) is drought, occuring sometimes at the same place where there were catastrophic floods in the same year-This mostly explains the importance of other topics of WP2, such as agriculture, land-use planning etc

At the time of making the slides Hungary did not get a rainfall for several months, while Austria and Slovakia got all the rains. Earlier this year the Hortobágy Puszta got the ever highest excess inland water. So the borderline of Climate change is here!!?



WP3 Analysis and synthesis of methodologies of adaptation measures

WP3 Analysis and synthesis of methodologies of adaptation measures

CONTENT

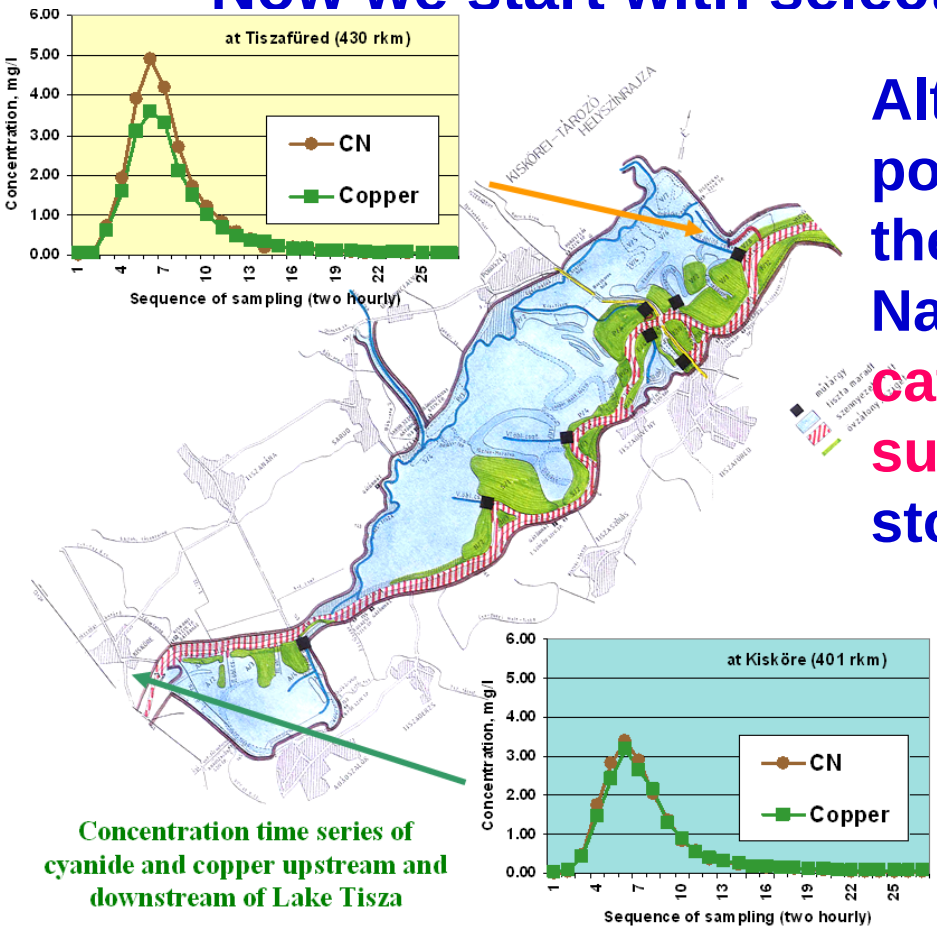
WP 3.1 Adaptation strategies aimed at the water demand side (P11, MRA)
People and the Society; Agriculture; Industries
WP 3.2 Adaptation strategies aimed at the water supply side (P9, SHMU)
People and the Society; Agriculture; Industries, Nature conservation
WP 3.3 Damage prevention and mitigation strategies in water management (P6, GEONARDO)
Flood control and defence
Protection against rising sea water levels and surges:
Snow and mud avalanches
Fighting inland excess waters (moved to flood defence)
WP 3.4 Adaptation strategies of strongly water related economic activities, (P10, SOGREAH),
Navigation; hydropower; other industries
WP 3.5 Building adaptive capacities (P4, USF)

WP3 Analysis and synthesis of methodologies of adaptation measures

CONTENT, continued

WP 3.6 Strategies to combat climate change induced water pollution (P1, VITUKI)

Now we start with selected important stategies



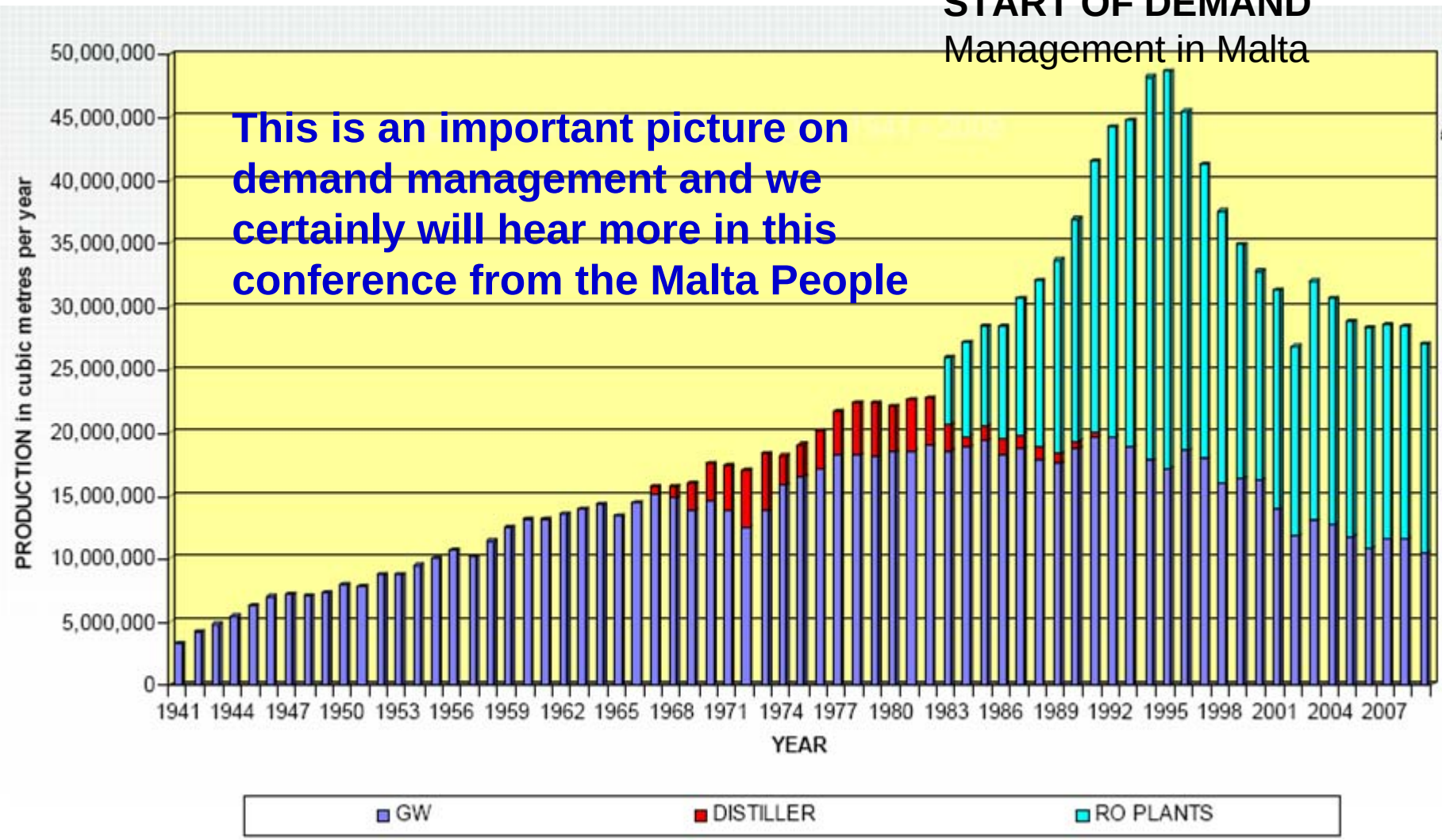
Concentration time series of cyanide and copper upstream and downstream of Lake Tisza

Although „dilution is not solution for pollution" there are exceptions, like the one shown in this figure, The Nagybánya / Bai Marew, cyanide catastrophe's pollution wave diluted successfully, by the multipurpose storage lake Tisza Tó.

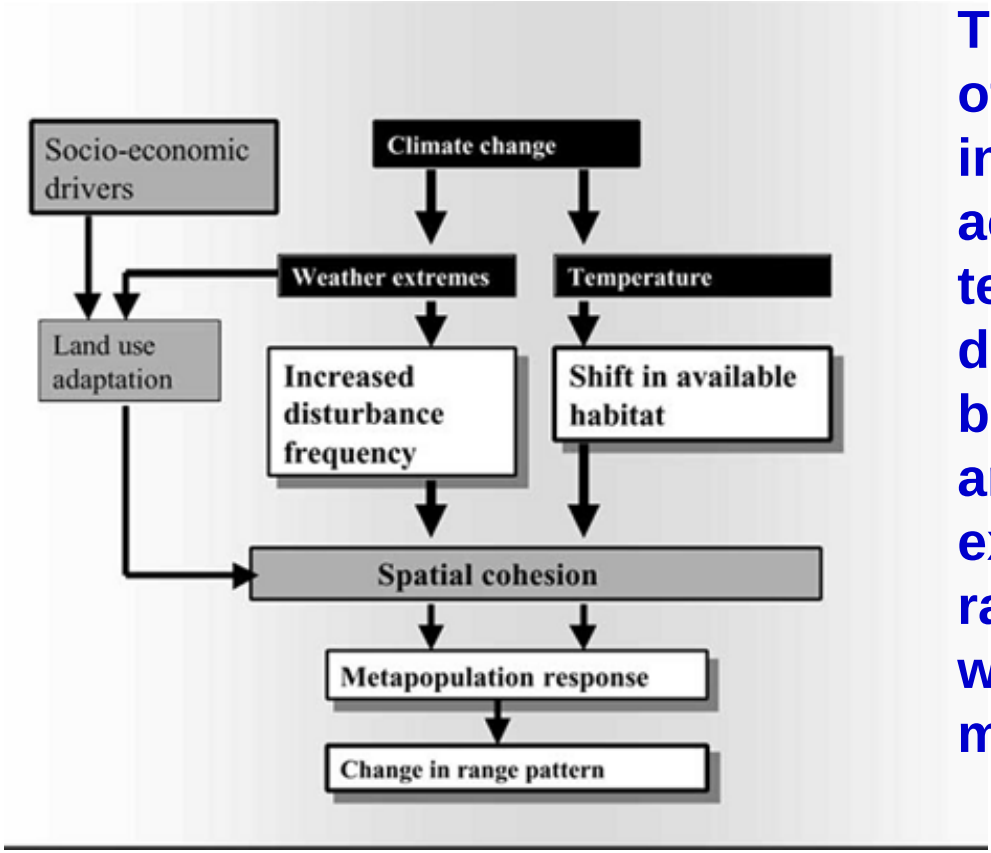
Other solutions are: Tailoring waste - and sewage-water treatment technologies to the altered climate change induced situation and Application of diffuse or non point source pollution control techniques

WP 3.1 Adaptation strategies aimed at the water demand side (P11, MRA)

START OF DEMAND
Management in Malta



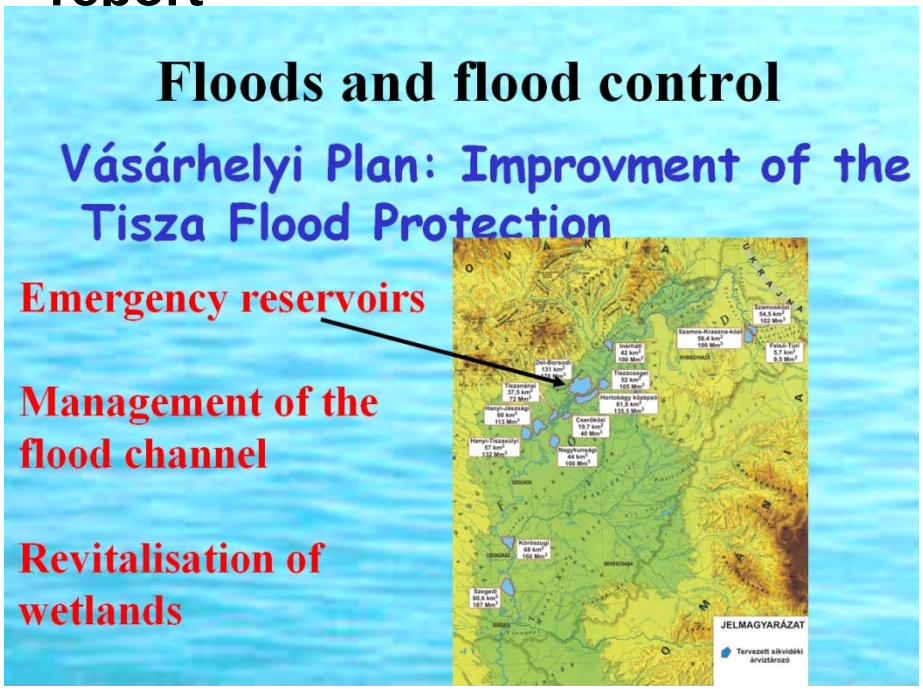
Further pictures from the WP3 report



This is a good picture of WP3.2 report indicating that landuse activities and temperature are the deterministic factors, but I would add the annual ever experienced highest rainfall and the so far worst drought are the main problems

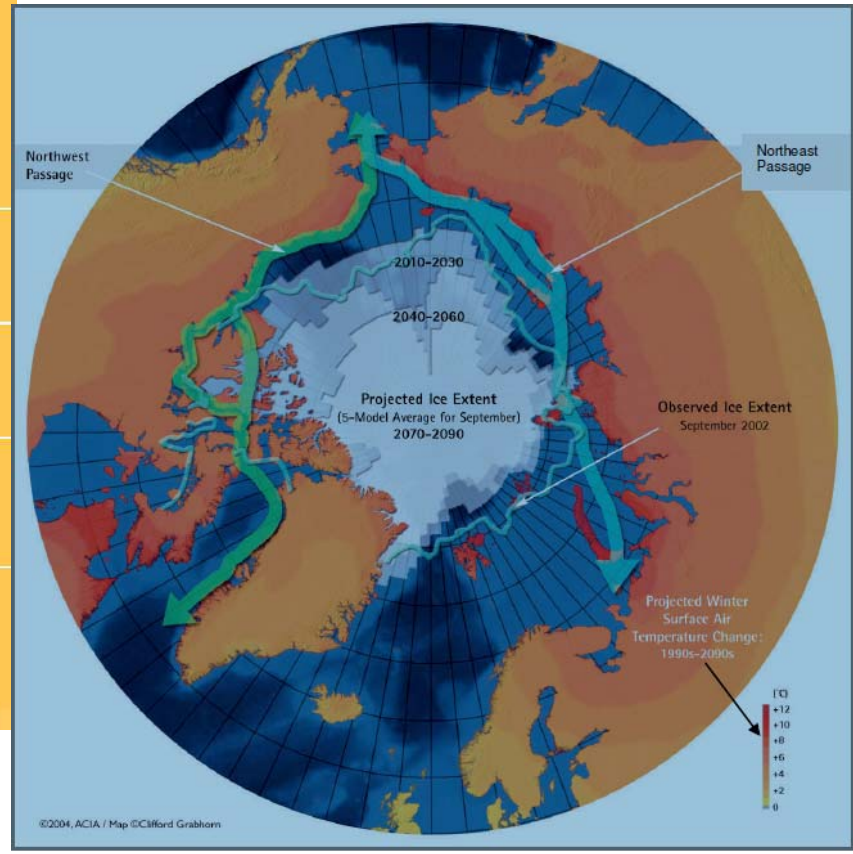
The response chain from climate change to distribution pattern is mediated by landscape cohesion. (Opdam/Wascher 2004 p. 288). Two levels of spatial scale interact. The response is established by two mechanisms: increased disturbance and increased temperature. Spatial cohesion is also affected by land use, partly in response to climate change."

WP 3.3 Damage prevention and mitigation strategies in water management would be the most important strategies: flood and excess water control. Snow and mud avalanches, Protection against rising sea water levels and surges, but no picture in the report



The illustrations above are (to the left) the flood control strategies of the new flood control plan of Hungary while to the right the dam break of the red slurry-catastrophe of Hungary is seen that was also related to climate change (as many people reasoned)

WP 3.4 Adaptation strategies of strongly water related economic activities, (P10, SOGREAH), Illustrations



Transporation navigation cost comparison and (right) Observed and projected Arctic sea ice extent (from PIANC, 2008

Inland navigation faces even more serious problems! Adaptation strategies might include the changes of freighter fleets, or overall river canalisation (a drastic solution), while flow diversion canals (an ecological handicap) are also considered by many and opposed also by large-many others

WP 3.5 Building adaptive capacities (P4, USF), Illustrations

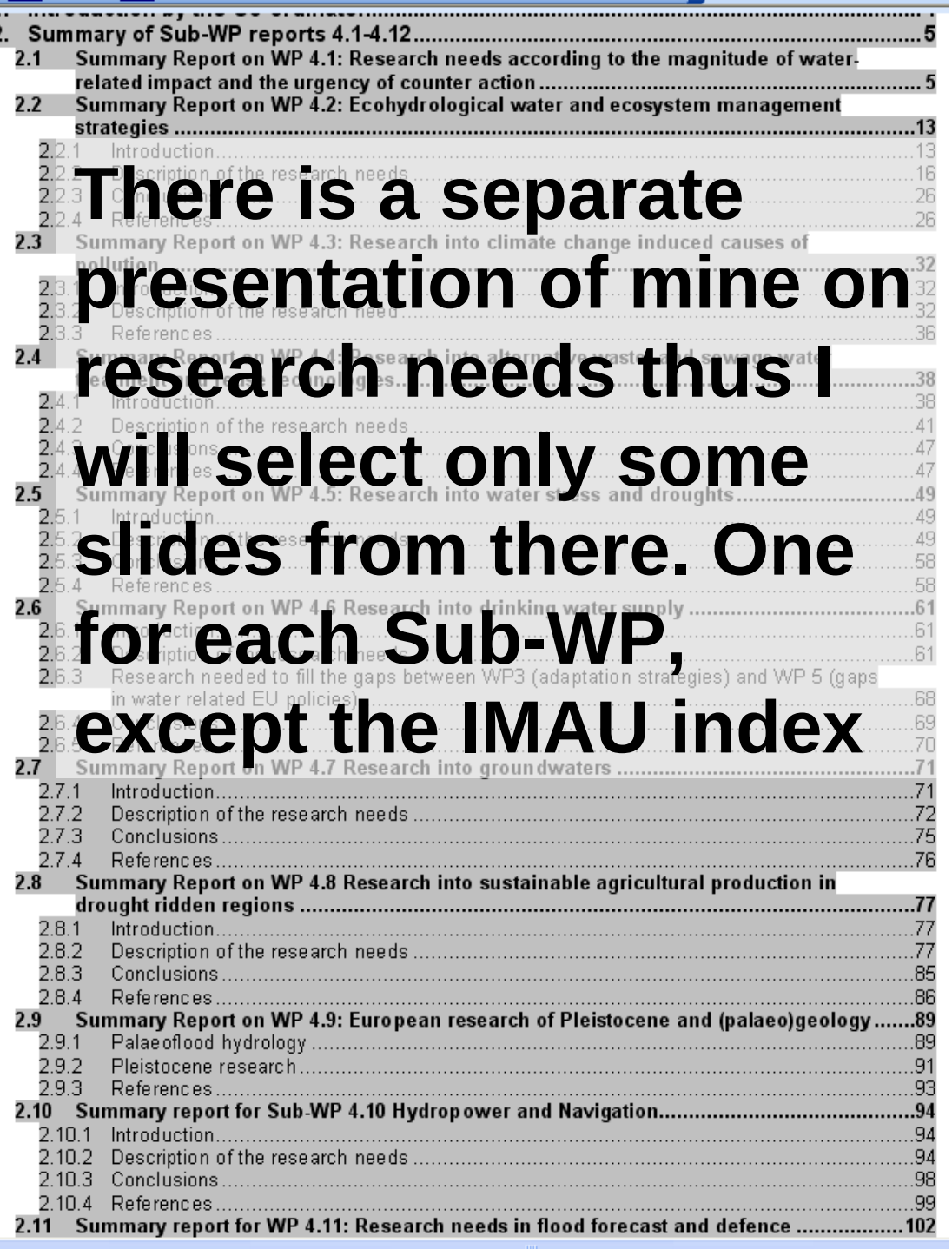
Legend:	Drivers & faciltating factors	Science-policy interface	Role of communi-cation	Multi-level governance	Integration with sectoral policies	Monitoring & review
	Broad stakeholder involvement (1) (from the beginning throughout the whole project)	Research programme for adaptation and well-organised interface (2) (aiming and transforming knowledge into information)	Communi-cation strategy exists; Communi-cation tools are developed to facilitate communicatio n between demand and supply side of the science-policy	Explicit multi-level governance and coordination for adaptation measures is established (4) (coordination for implementing adaptation measures is	Adaptation measures are dealt with in an integrated way policies (5) (adaptation is considered in different project themes)	Explicit monitoring and review mechanisms for strategy (6) (review of measures and learning from outcomes)
	Average stakeholder involvement (only at the begnning or at the end of the project)	Some research on adaptation; interface partially organised (focussing on demand or supply-side; aimed at informing policy makers))	Communicati on strategy exists; Communi-cation tools are developed to facilitate communi-cation either at the demand and supply side of the science-policy interface	Explicit multi-level governance and coordination for adaptation measures is planned (coordination for implementing adaptation measures is planned)	Adaptation measures are dealt with in a fragmented way (adaptation is considered in one project theme e.g. shipping and floods not droughts)	Implicit monitoring and review mechanisms for strategy (review of measures without adjusing Adaptation Strategies/ no learning effect)
	Limited stakeholder involvement (demand driven stakeholder consultation	Interface not transparent or non existent (main project aim is to produce knowledge without distribution, refinement of the research agenda)	No explicit communi-cation strategy exist, no communi-cation tools are developed to facilitate communi-cation	Only implicit multi-level governance and coordination for adaptation measures (coordination and levels where coordination should take	Adaptation measures are dealt with in isolation (no integration of other sectors)	No monitoring and review mechanisms for strategy

1: The ordinal scores for each indicator

Expanding the adaptive capacity of all people involved (and who is not!!!??) is really one of the most important issues.

Nevertheless some people think that it is the main strategy that all levels of people (stakeholders) from lay citizens to high state administrators (Financial gurus and policy makers!!??) will learn what to do. To the type of people like me (say water-environmental engineers), the most important is to design technical-ecological strategies

WP4: Identification of research needs



There is a separate presentation of mine on research needs thus I will select only some slides from there. One for each Sub-WP, except the IMAU index

Content of the Report on Research Needs:

WP 4.1 the simplified IMAU

WP 4.2 Ecohydrological strategies

WP4.3 Climate Change induced Pollution

WP4.4 Alternative waste water strategies

WP 4.5 Water stress and drought

WP 4.6 Drinking Water Supply

WP 4.7 Groundwater

WP 4.8 Sustainable agriculture

WP 4.9 Paleogeology

WP 4.10 Hydropower and navigation

4.11 Flood forecast and defence

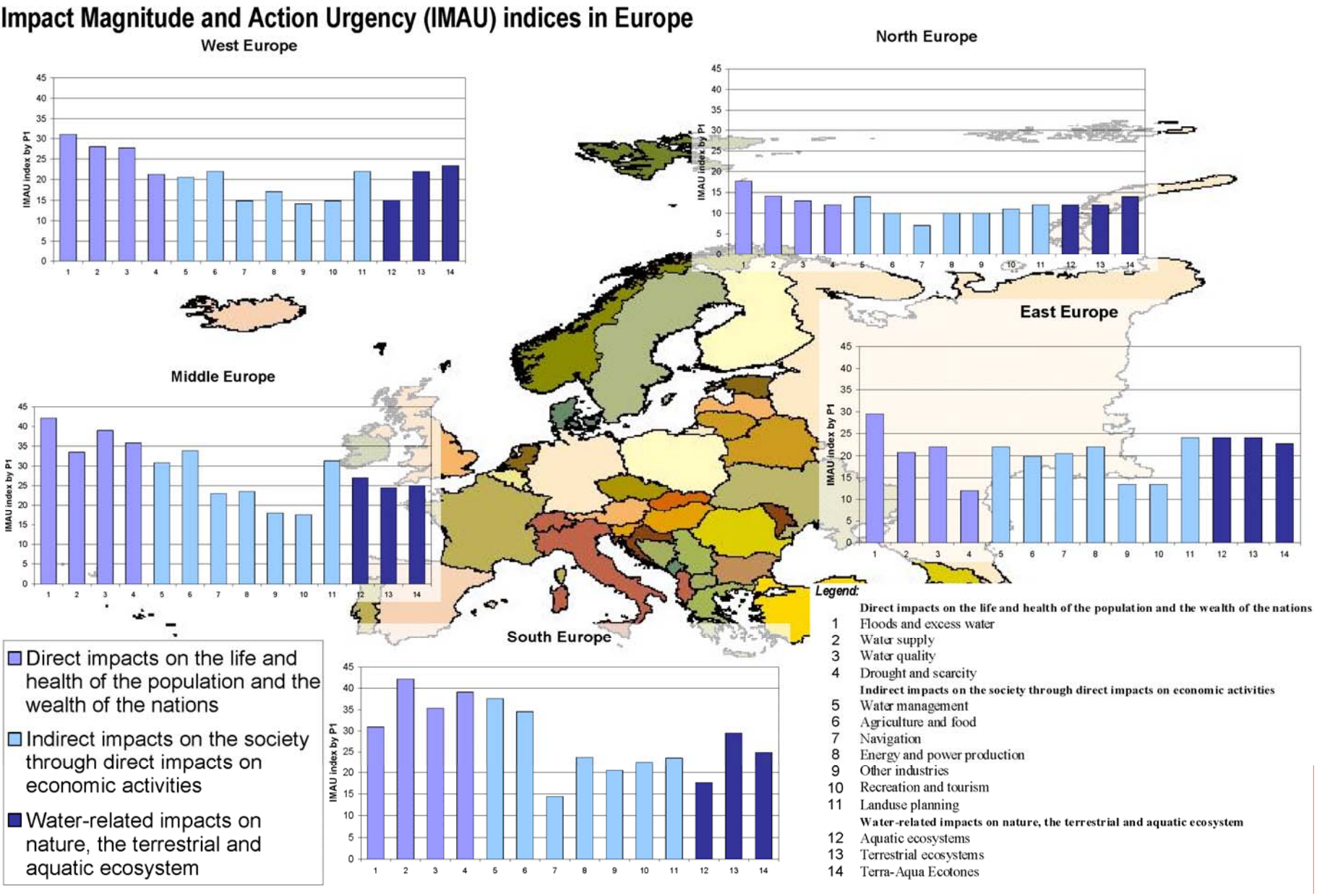
A scoring matrix was developed to be filled by each Project partner. The simplified scoring matrix is shown in the Table

Table for the simplified scoring for the estimation of the index of "Impact Magnitude and Action Urgency [IMAU]"

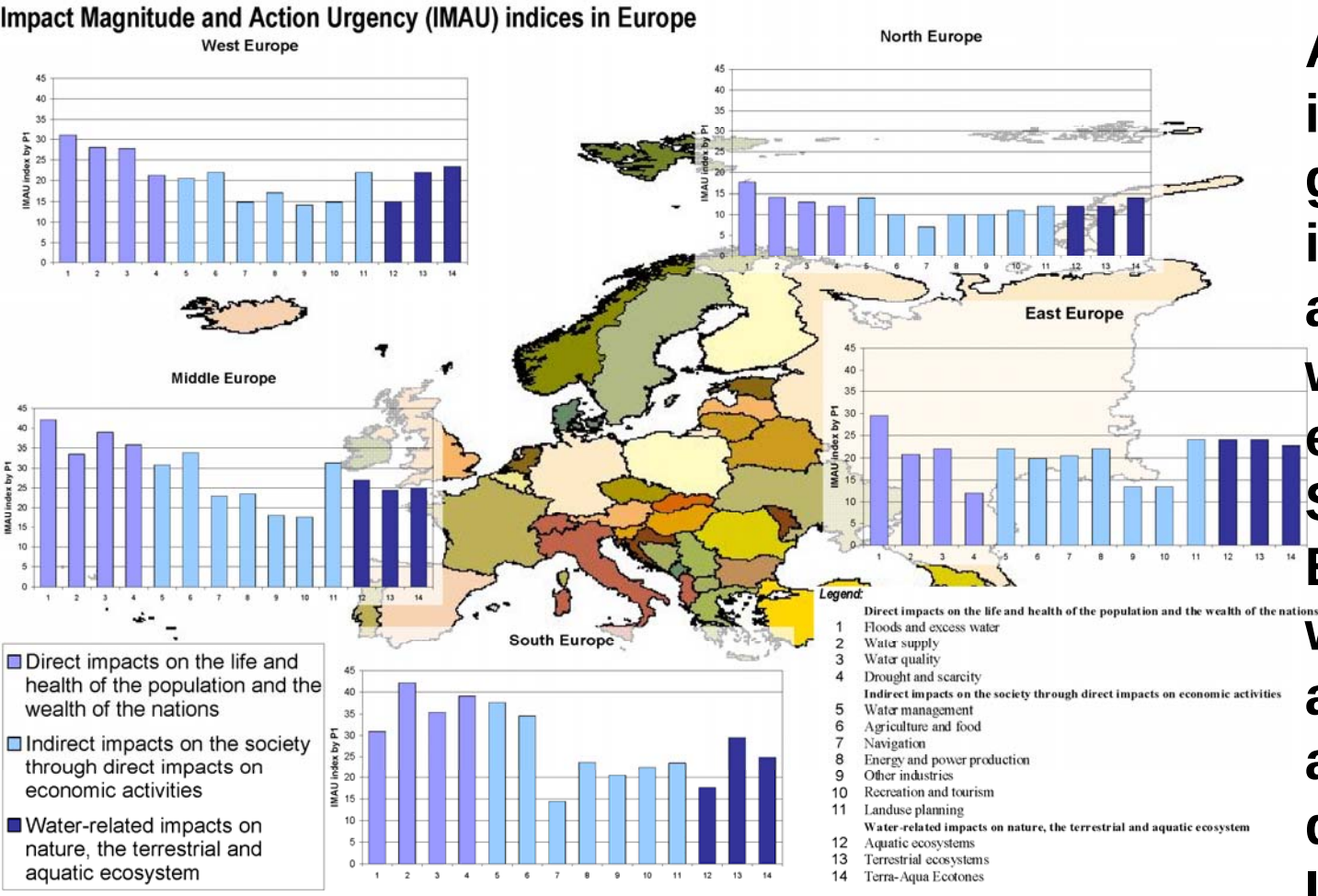
Impact as of WP2	West Europe		Middle Europe		East Europe		North Europe		South Europe		Remark
	magnitude	urgency	magnitude	urgency	magnitude	urgency	magnitude	urgency	magnitude	urgency	
WP 2.1.1: Direct impacts on the life and health of the population and the wealth of the nations											
Floods and excess water											
Water supply											
Water quality											
Drought and scarcity											
WP 2.1.2 Indirect impacts on the society through direct impacts on economic activities											
Water management											
Agriculture and food											
Navigation											
Energy and power prod											
Other industries											
Recreation and tourism											
Landuse planning											
WP2.2 Water-related impacts on nature, the terrestrial and aquatic ecosystem											
Aquatic ecosystems											
Terrestrial ecosystems											
Terra-Aqua Ecotones											

WP 4.1: IMAU, Research needs according to the magnitude of water-related impact and the urgency of counter action, by P1 VITUKI

Impact Magnitude and Action Urgency (IMAU) indices in Europe

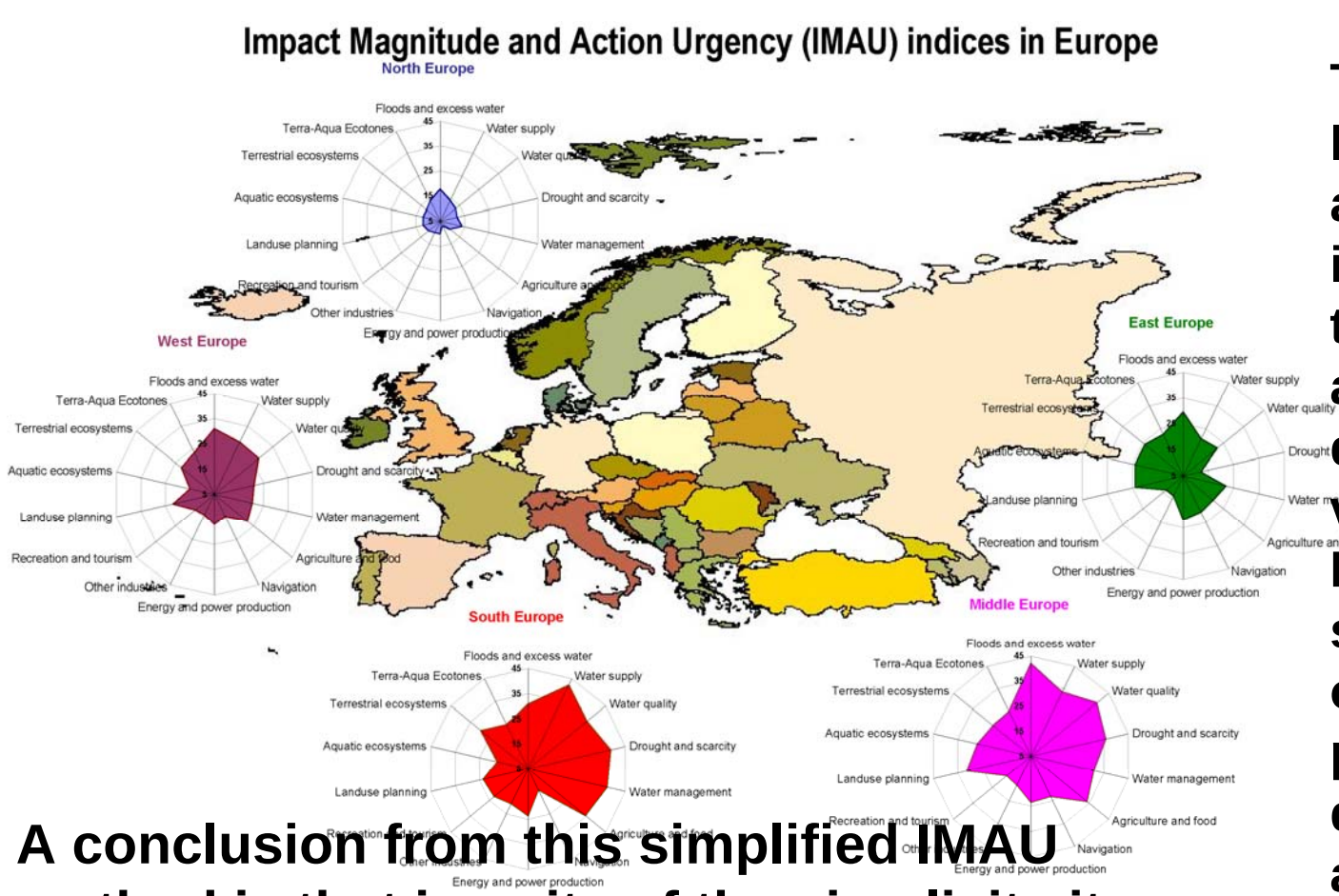


Some conclusions may be drawn from another way of data processing shown in the Figures (The figures illustrate quite well the major conclusions that are well known to all scientists and managers (policy makers?)



Among direct impacts flood got the highest indicator value all over Europe with the exception of Southern Europe where water supply and drought are the dominating IMAU values.

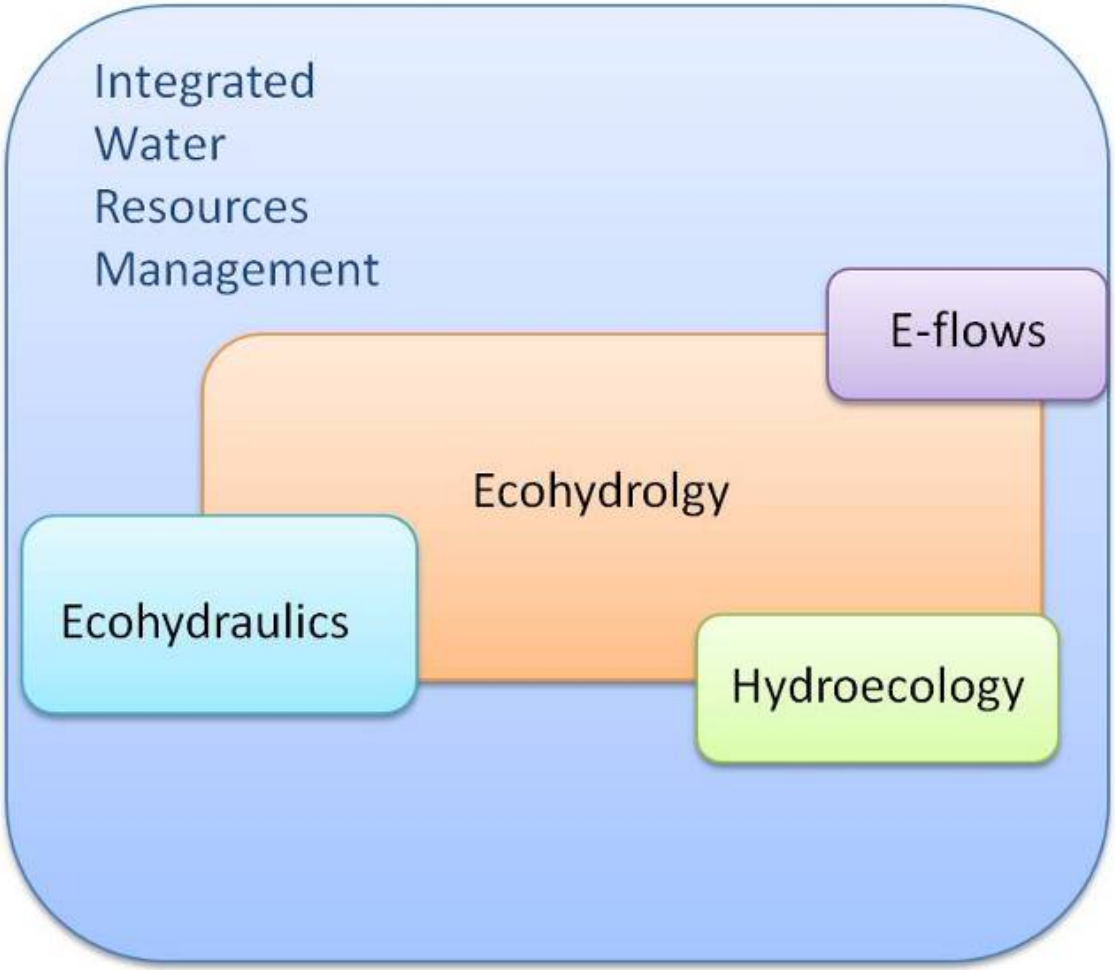
In among the indirect impacts agriculture and food production values are high, while landuse planning seems to need urgent development. Impact magnitude and action urgency in the terrestrial and aquatic ecosystems and their ecotones got rather uniform values with the exception of Southern Europe, where terrestrial ecosystem got the highest value



A conclusion from this simplified IMAU method is that in spite of the simplicity it yields the expectable action urgency in the investigated CC impact fields. Nevertheless we also might approve the Consortium decision made in the first Rome meeting, namely that no index can give much real help to solve the problems they were created for.

The high flood IMAU values are also clear in this illustration, while the water supply and drought dominating IMAU values of Southern Europe can also be seen. The urgency of landuse planning development is also clear. The small values of North Europe indicate the lack of scores for this region

WP 4.2: Ecohydrological water and ecosystem management strategies by P7 UVIEN



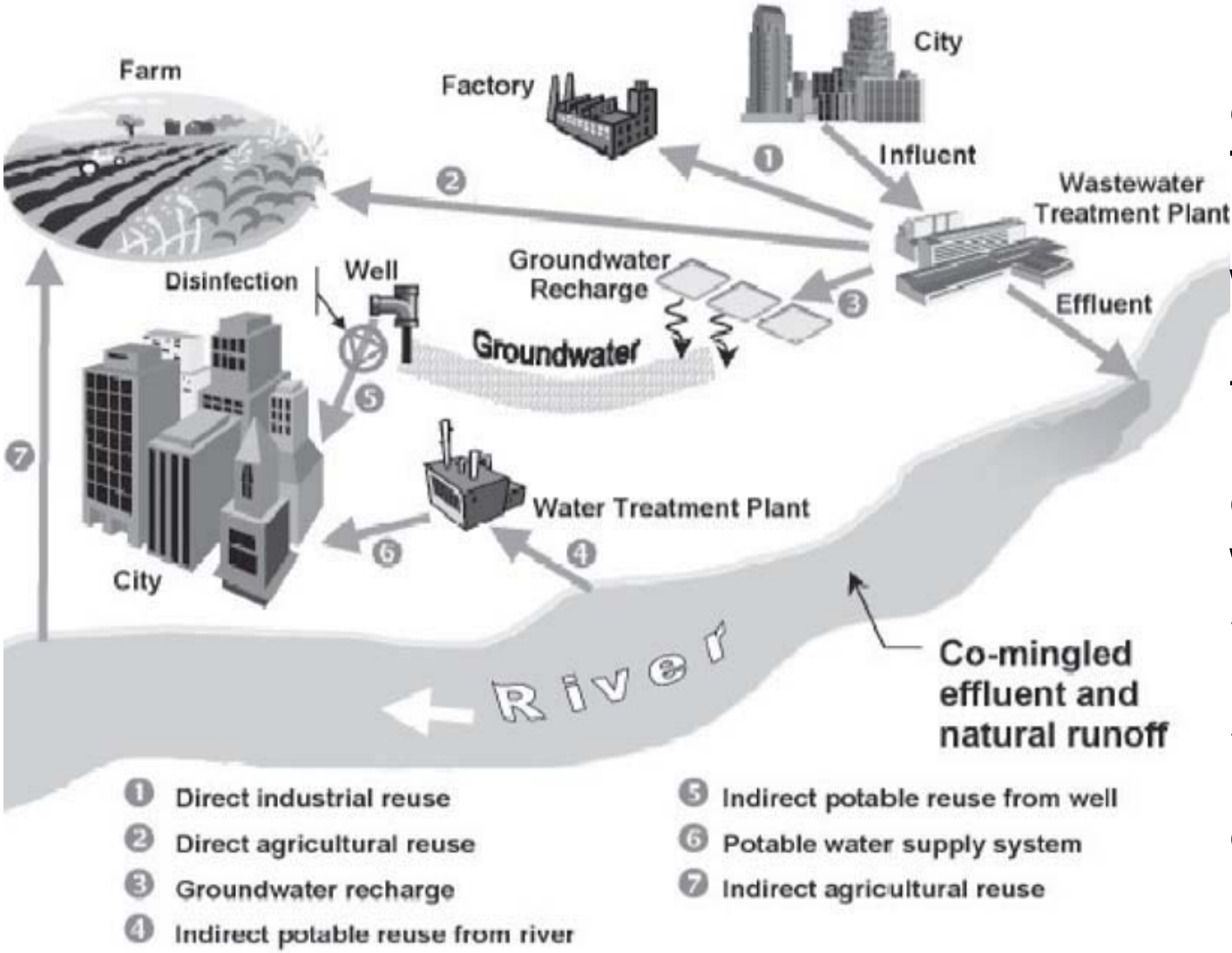
The authors surly will explain the source of the figure and what E-flow means

The authors wrote that: An ecohydrological approach in water management postulates detailed knowledge of ecosystem interactions and site specific hydrology. Other concepts in the field of water management are Integrated Water Resources Management (IWRM), hydroecology, Environmental Flow and ecohydraulics. These concepts are closely interconnected as shown in the Figure

WP 4.3: Research into climate change induced causes of pollution by P8 UNILEI

An important paragraph from the authors: A general conclusion from the analysis of many of the Climate-Water project documents and publications, is that the increasing frequency and intensity of rainstorms and the accelerated melting of snow cover will result in additional pollutant loads of runoff-induced non-point source origin. Another very general conclusion is that the weight of non-point sources is increasing with the increase of sewage and wastewater treatment investments (a prerequisite in complying with the Water Framework Directive). It is also a well-known general conclusion in the field of water pollution control, that non-point sources have dominated the overall pollutant budgets for many parameters (e.g. nutrients, BOD, COD, many micropollutants) in practically all densely-populated catchments of the world for many decades.
The overriding research need for non point-source pollution is the need for models which can be accurately calibrated and verified through extensive field work studies and continuous monitoring at the catchment scale.

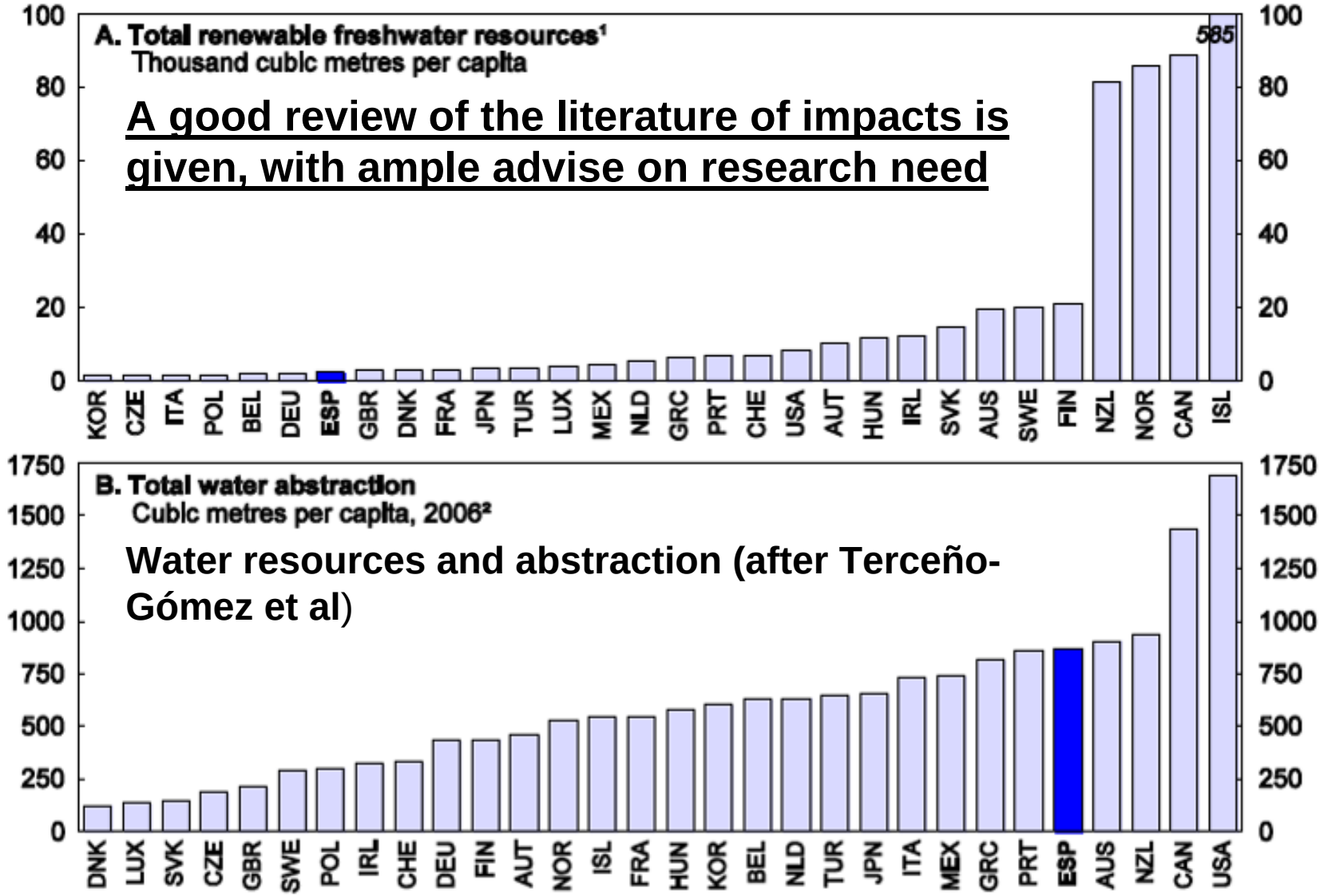
WP 4.4: Research into alternative waste- and sewage water treatment and reuse technologies by P3 CNR-IRSA



From conclusions:
To solve these problems, wastewater managers and the public must begin to consider wastewater as a source of water besides that as a source of products that can be treated, recycled.

Water cycle with included wastewater treatment and reuse (after Angelakis and Durham, 2008).

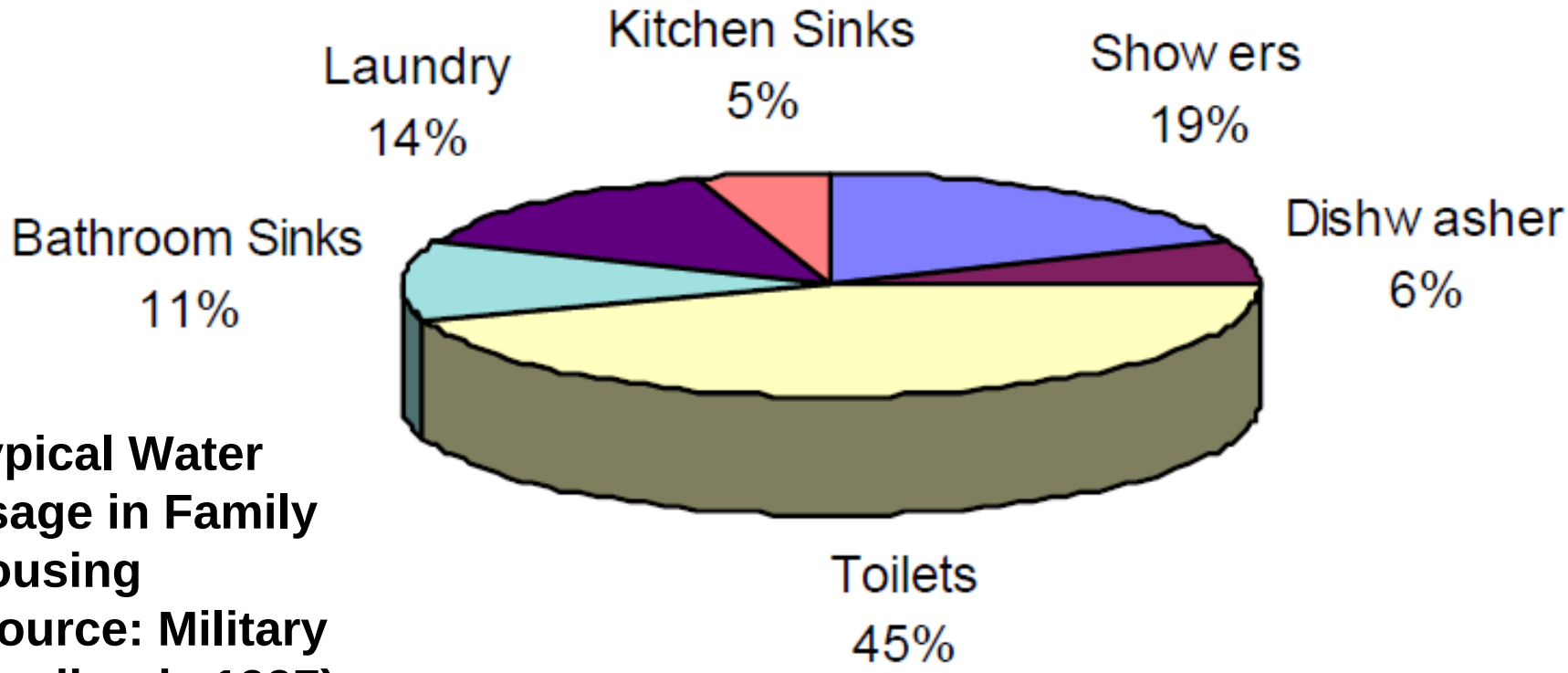
WP 4.5: Research into water stress and droughts, by P2 UNIDEB



A good review of the literature of impacts is given, with ample advise on research need

Water resources and abstraction (after Terceño-Gómez et al)

WP 4.6 Research into drinking water supply by P2 UNIDEB

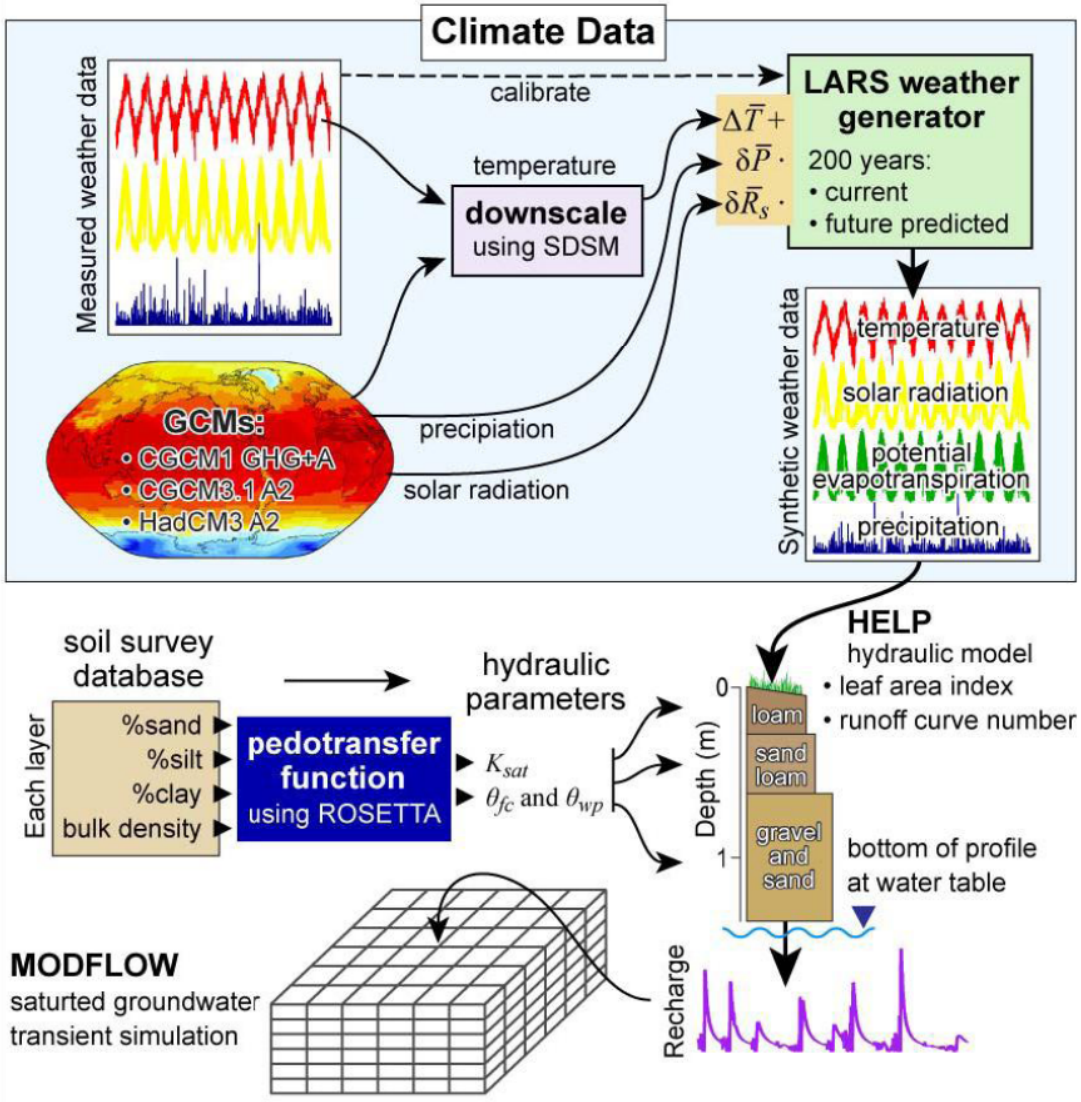


Typical Water Usage in Family Housing (Source: Military Handbook, 1997)

A good review of the literature of impacts is given, with ample literature advise on research needs

More concrete advises on research needs would be required

WP 4.7 Research into groundwater by Partner 9 SHMU



Flow Chart of Tasks (Toews et al., 2007)

Samples of the research needs related to impact of climate change on groundwater are:

Changes in precipitation and evaporation on groundwater recharge, water levels, and base flow in shallow and deep aquifer systems;

Assessment of hydrologic interactions between ground water and surface water systems

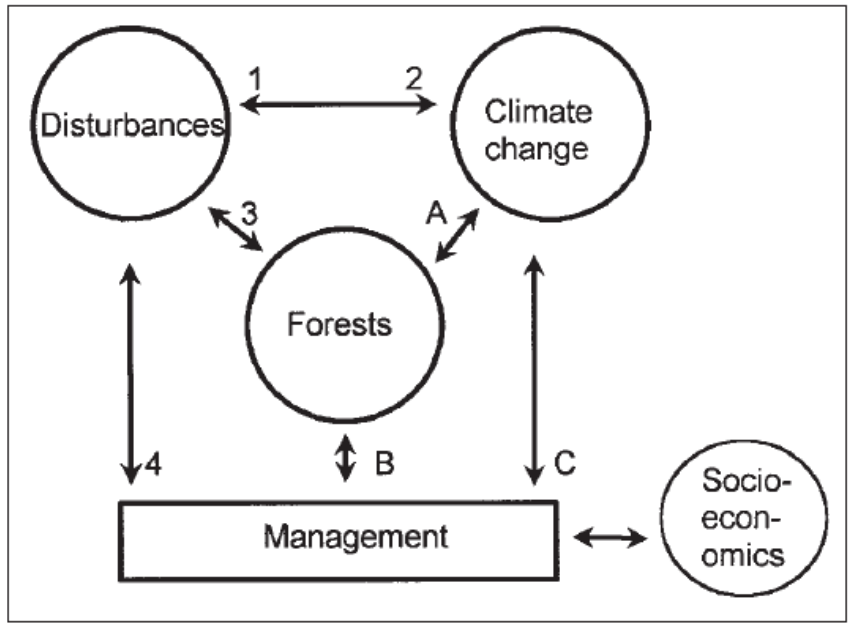
Assessment of the impact of increased demand for ground water on sustainability of groundwater supply and groundwater quality;

Assessment of activities at the land surface may affect ground water recharge rates and water quality;

Assessment of monitoring needs

WP 4.8 Research into sustainable agricultural production in drought ridden regions, by P2 UNIDEB

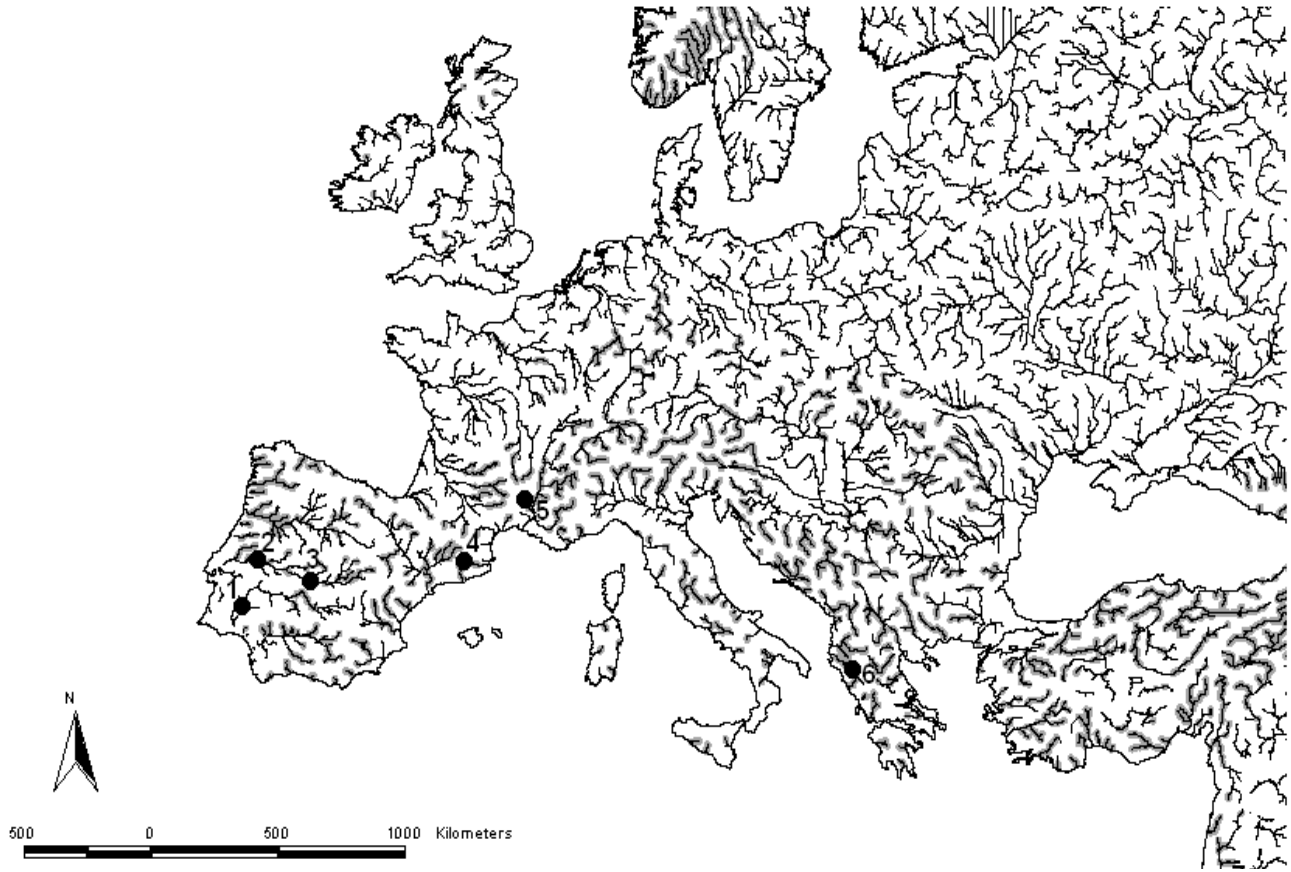
Pepper cultivation in perlite substrate that reduce the risk of salt accumulation
(Source: Zayed et al., 1989)



Interactions among disturbances, climate change, forests, and management strategies, The numbered arrows are the focus of research questions (Source: Dale et al., 2001)

These are the two figures of the report and some of the conclusions will be quoted in the slide show on research needs

WP 4.9: European research of Pleistocene and (palaeo)geology by P6 GEONARDO



Map showing the first cut of potential reaches suitable for palaeoflood studies (grey highlight reaches, versus the distribution representative actual SWD-PSI palaeoflood sites in the region. (Benito, 2003)

Search for rivers in Europe, where palaeoflood methods are applicable and develop new methods for alluvial rivers. The EU funded SPHERE project has built a database (Casas planes, 2003), which is a good start for further studies. The figure shows rivers potentially suitable for palaeoflood studies

WP 4.10 Hydropower and Navigation. By P10 SOGREAH

Budapest at high flood (source Dr. Bakonyi), may be a real obstacle to inland navigation

JG: At drought flow either all shallow fords must be eliminated or all freighter and tourist fleets must be reduced. Construction of more river dams is a potential solution (see also Hydropower)

From Conclusions:

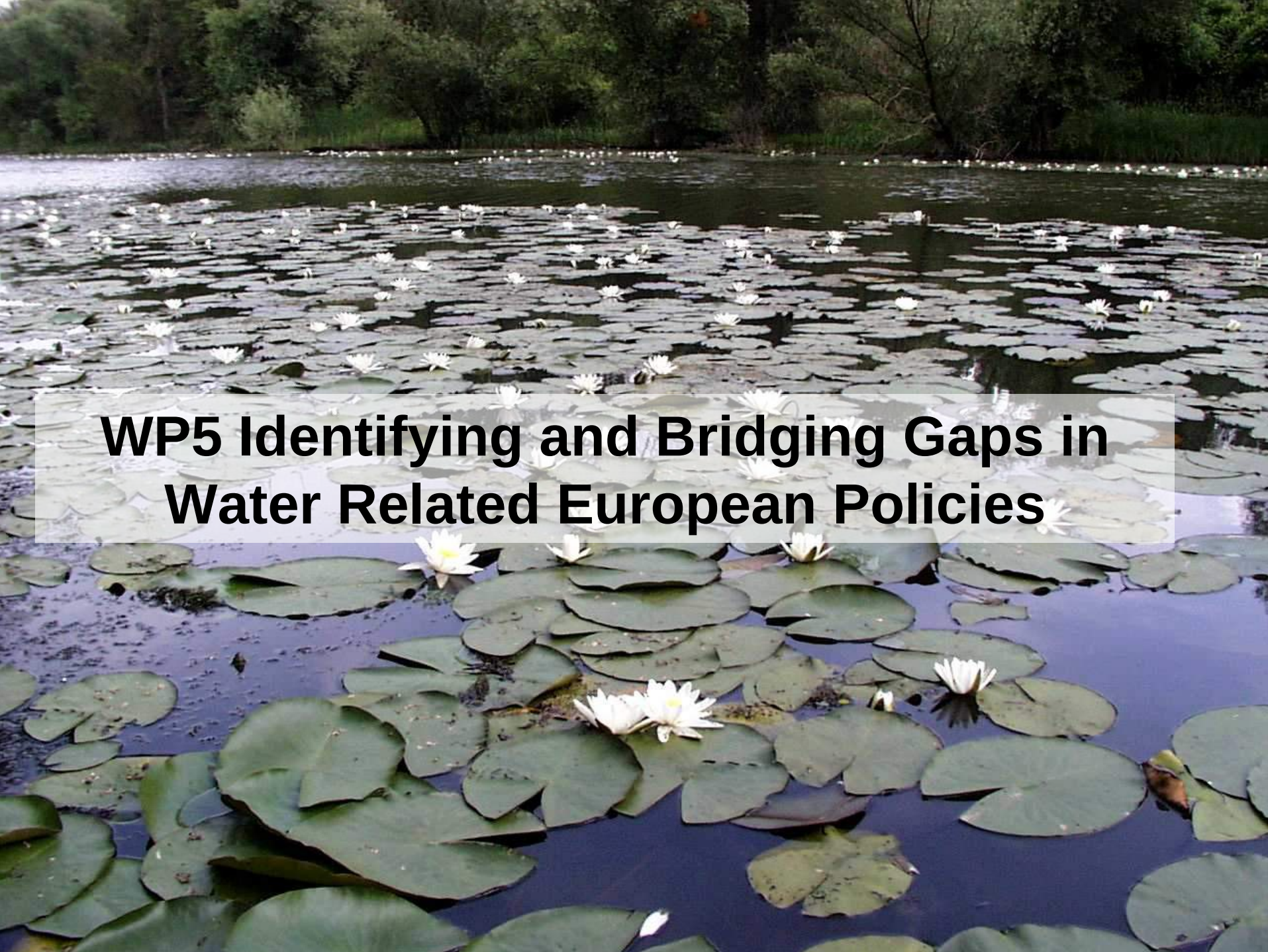
Navigation is a very old mean of transportation but new technologies are still possible and desirable. Research is needed to reduce vessel fuel consumption, to reduce water consumption in inland channels, and have navigation a very low GHG emission transportation mean Research is needed for the maintenance and development of the infrastructures to insure to be able to deliver tomorrow the expected services

WP 4.11: Research needs in flood forecast and defence by P6 GEONARDO

Bódva River Flood, Hungary

French Riviera Flood

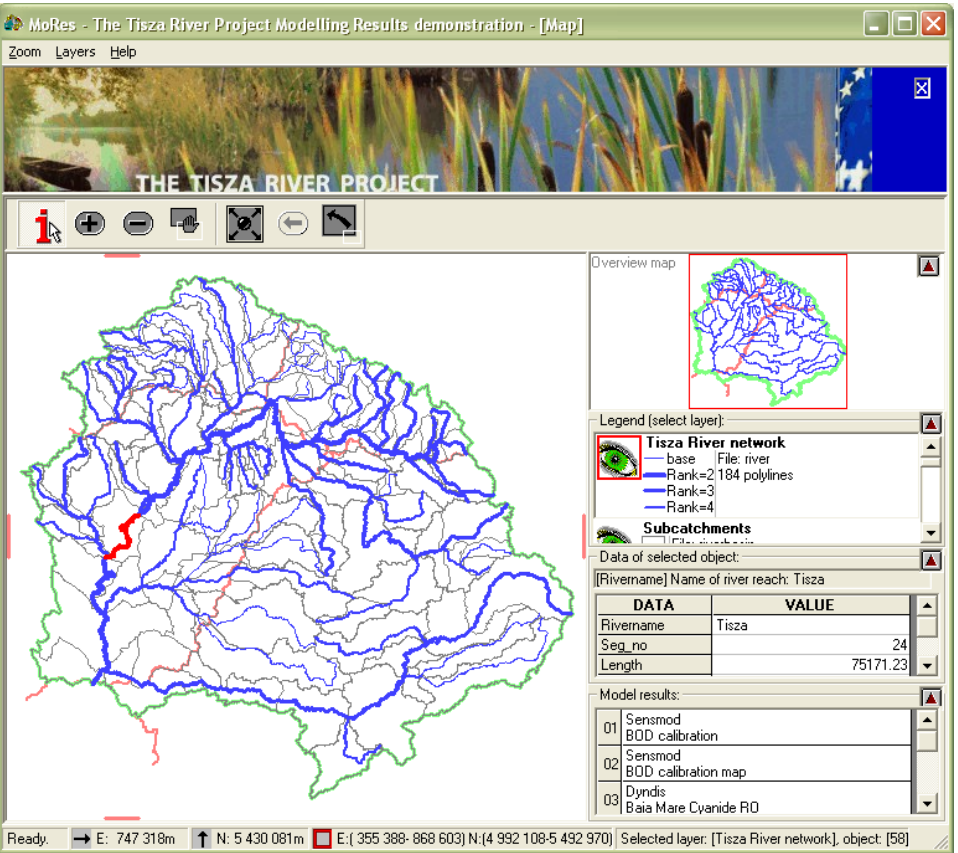
<u>Research need in flood forecast from the report</u>: Flood forecast and alert systems will play an important role in flood protection and flood loss mitigation. It is a rapidly developing field ..thanks to the numerical weather prediction systems. These systems however need to be further developed as their coarse spatial resolution is not adequate for accurate midterm forecasts. Ensemble prediction systems already proved their ability to reduce uncertainty, but their re-verification and re-forecast can be beneficial, and for the calibration of rainfall-runoff models



WP5 Identifying and Bridging Gaps in Water Related European Policies

At the time of making this slideshow, we do not yet have reports on WP5 sub-WPs . Nevertheless during the earlier WPs we –many of us- did identify the gaps and also the means, the adaptation strategies and measures, to bridge them.

Thus the Co-ordinator presents his own views in a few slides. The picture below is the demonstration software



Climate change related findings of the <u>Tisza River Project</u> is utilised with special regard to WFD and its shortcomings (like the poorly handled 'first-flush' induced diffuse pollution in RBMP and the inadequate use of catchment models).

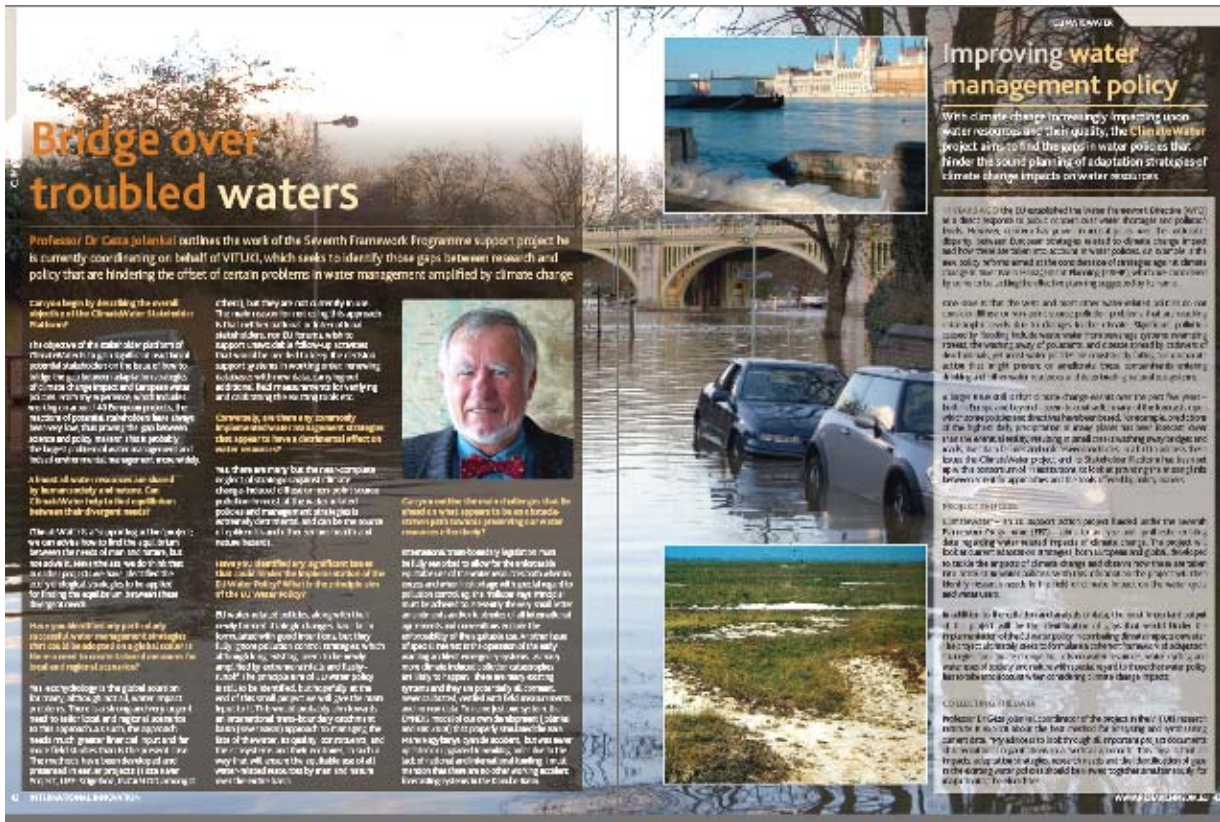
Monitoring aspects of WFD received special attention. We made an elaborate review of the monitoring requirements of WFD, adding novel aspects, with special regard to wetland monitoring, that can be well utilised in the present project.

One of the reasons is that due to WFD point sources of pollution are being rapidly eliminated (treated) all over Europe and thus the weight of non-point sources is increasing every day.

The other one is the above also mentioned climate change induced growth of the severity on NPS runoff loads both in urban and in rural-agricultural environment. The highest ever daily precipitation and rainfall intensity, measured in many regions in Europe results in catastrophic washing away of all waste disposal sites and in the bursting out of waste water from sewers, which becomes extremely hazardous when combined sewers are involved and untreated sewage water flows over the streets.

Bursting sewer in Miskolc, Hungary, 2011

The approach I offer as a tool for solving some of the climate-change adaptation issues was developed at UNESCO in the framework of the Ecohydrological Programme (managed by myself upon my official commissioning by the that time head of Science), It was carried out as a kind of continuation of the ecotone programme that was also referred above. The essence of this approach was very recently (See Figure below for the cover page and the publication) published in April 2011 and is available as hard copy publication. The publication can also be downloaded from the homepage of our project.

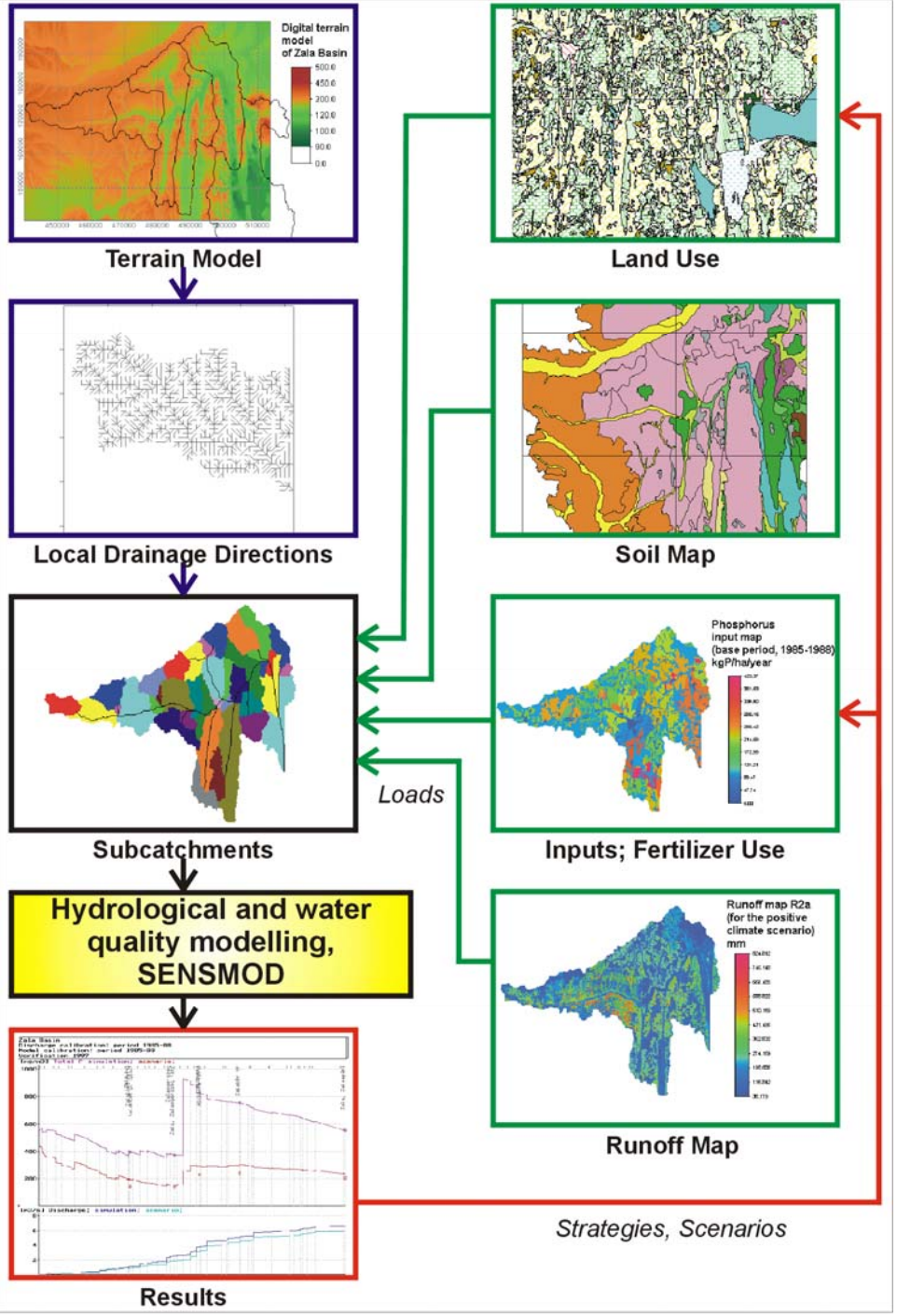


The essence of ecohydrology is:

to save aquatic ecosystems by indentifying sources of degradation problems (sedimentation, excess nutrient loads, other pollutants, too little or too much flow) and find hydrological and pollution control solution (also by modelling), while enhanced ecosystems will provide means of controlling flows and water quality.

Research needs can also be summarized as those into ecohydrology (strategies of ecology, hydrology, hydraulic construction and pollution control of point and nonpoint sources)

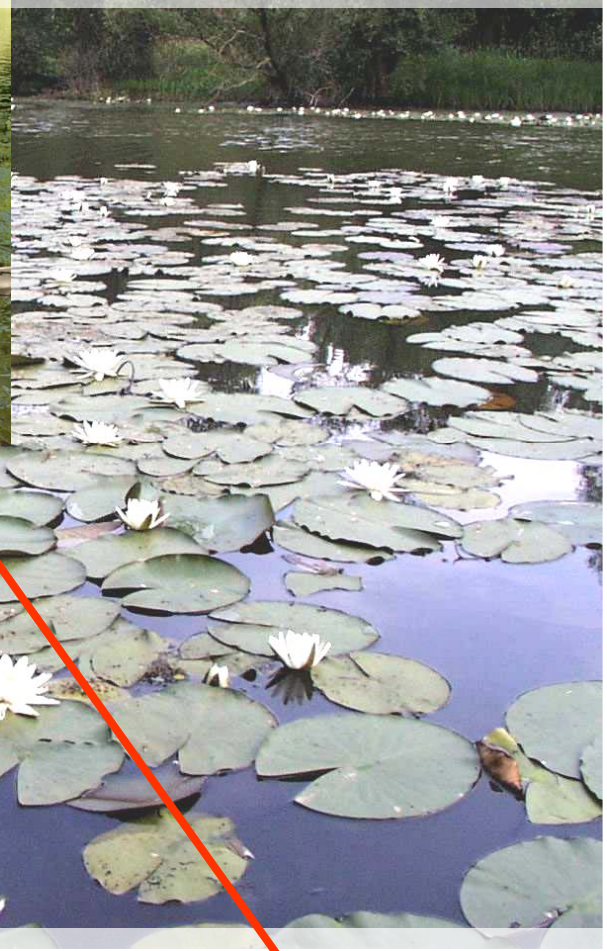
Climate ≈ water
SEVENTH FRAMEWORK PROGRAMME



Another important feature of ecohydrology is that modelling might give help for the designing of the appropriate management strategies. In earlier EU projects (*INCAMOD, The Tisza River Project, the LIFE Szigetkoz Project*) we have further developed a relatively simple modelling tool called SENSMOD (*Jolánkai, 1986, 1992*). In my publications and university lectures related to ecohydrological subjects the Figure shown here frequently appears. It is a kind of flowchart for catchment basin management and design using hydrological and ecological models. It was created from the INCAMOD project results for the Zala river catchment Hungary

Thank you for your kind attention

(This is what I would call a good environmental research, but we were sitting at computer instead. So, NEXT TIME)



Some more slides are also available behind this thanking

The evironmentally friendly sampling vessel

WATER QUALITY AND WATER POLLUTION

POLICY IMPLICATION INDENTIFIED

The River Basin Management Planning methodology (RBMP of WFD) should probably be restructured with due concern to Integrated Water Resources Management (IWRM),

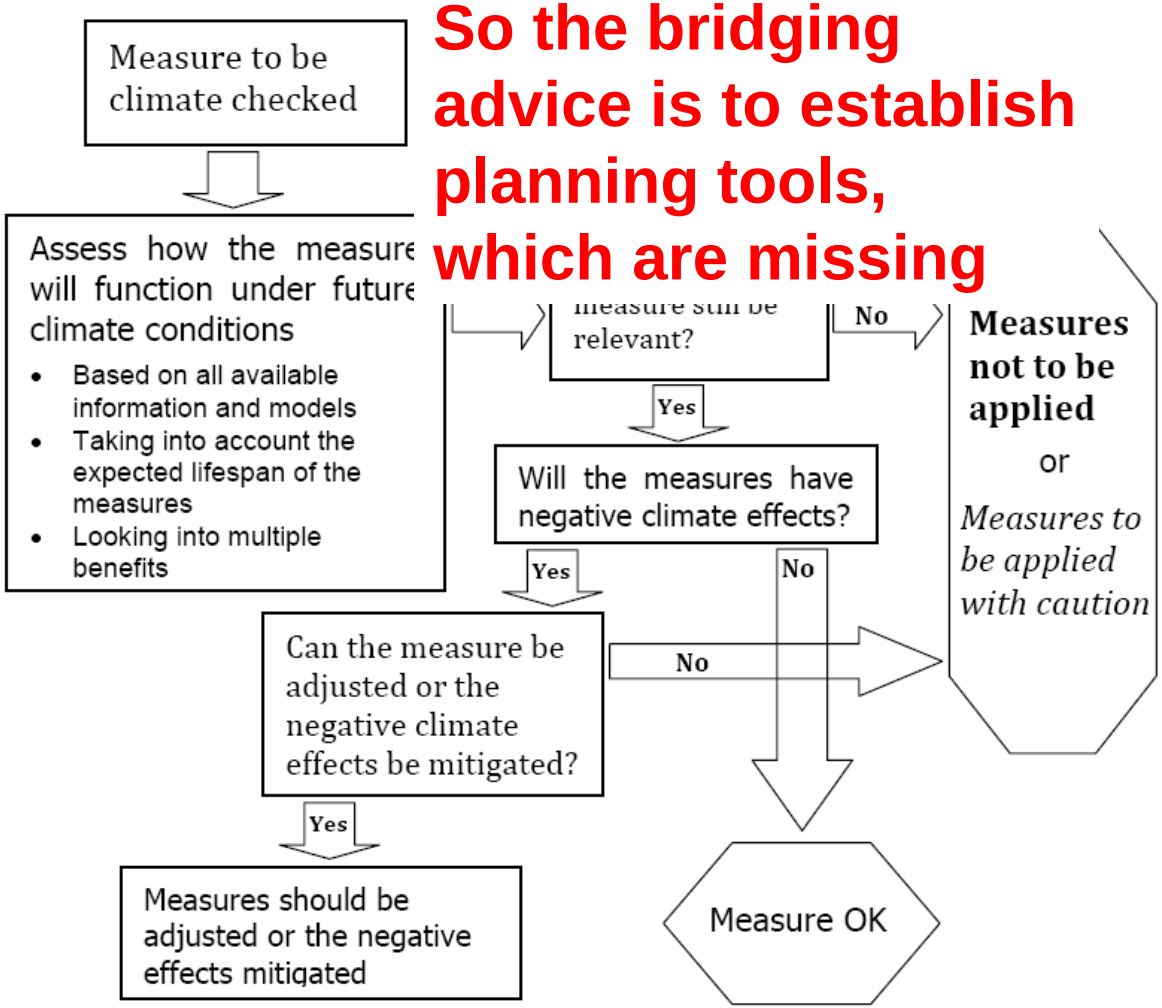
in the sense that <u>water quality, quantity and ecological management concepts be integrated</u>

at the level of assuring complete control of all point and diffuse sources of pollution, all land use practices and all hydrological runoff control measures in such a way that a decision support planning tool (modelling??) helps this planning.

There is a need for changing WFD policy towards non-point sources and their control techniques (still in baby shoes in terms of knowledge on their efficiency!!).

, Another important Gap of the many found

In among the Guiding principles of the Measures of Adaptation one finds the following texts and Figures:



So the bridging advice is to establish planning tools, which are missing

These advises seem to be good ones. Nevertheless they are a bit too general to really help upgrading WFD and RBMP to suit climate change adaptation. This flowchart should probably have a block for planning the changes that result from measures, as this is the main task in RBMP

Figure 3 Climate checking of measures

Source: EU Technical Report no 2009-40. Guidance Document No.24
River Basin Management in a Changing Climate. Chapter 5