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REstoring rivers FOR effective catchment Management

Setting the scene: the EU CIS Guidance on e-flows

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Context

Balance between demand and availability has reached a critical level in many areas of Europe (water scarcity)

Climate change will almost certainly make the situation worse

Total water abstraction in EU *247* billion m³/year

- 44% for energy production,
- 24% for agriculture,
- 17% for public water supply
- 15% for industry

Business as usual scenario:

Total abstraction will increase by 16% by 2030

Henriette Faergemann, 2014

Review of 1 RBMPs**: 40% RW+TW affected by hymo pressures!!!**

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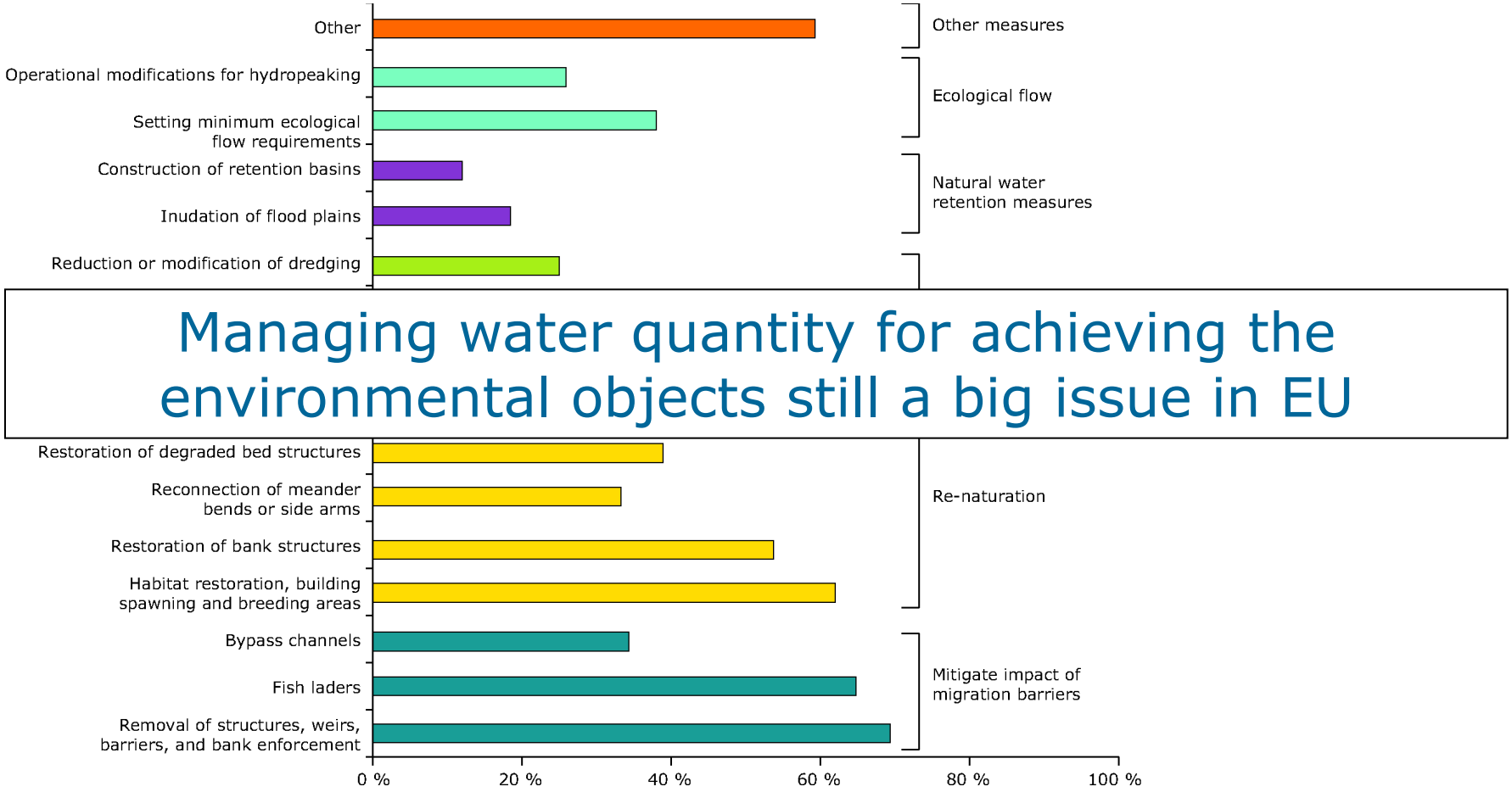
1° RBMPs: Hymo measures on EU water bodies



Managing water quantity for achieving the environmental objects still a big issue in EU

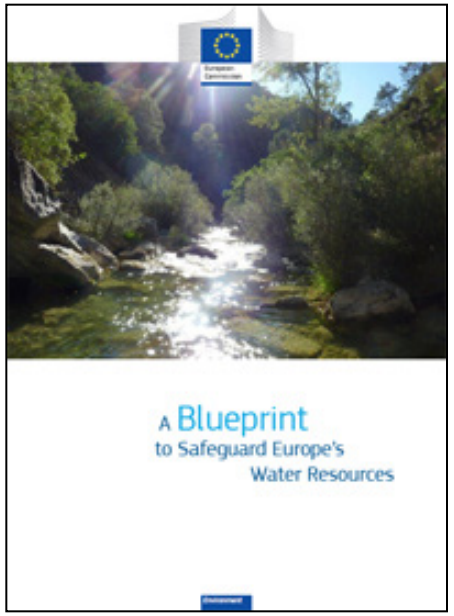
(source: EEA, 2012)

The Blueprint "strategy"

Ensuring good quality water in sufficient quantities for all legitimate uses.

Actions for:

- better implementation of current water legislation
- integration of water policy objectives into other policies
- filling the gaps in particular as regards water quantity and efficiency



E-flows & Blueprint

Quantitative water management issues to be addressed to reach GES

Need to identify and implement the e-flows…

No EU definition of e-flows nor common understanding of how they should be estimated

>>>preconditions for application in the next RBMPs !!!!

EU Guidance to be elaborated in a WG on e-flows

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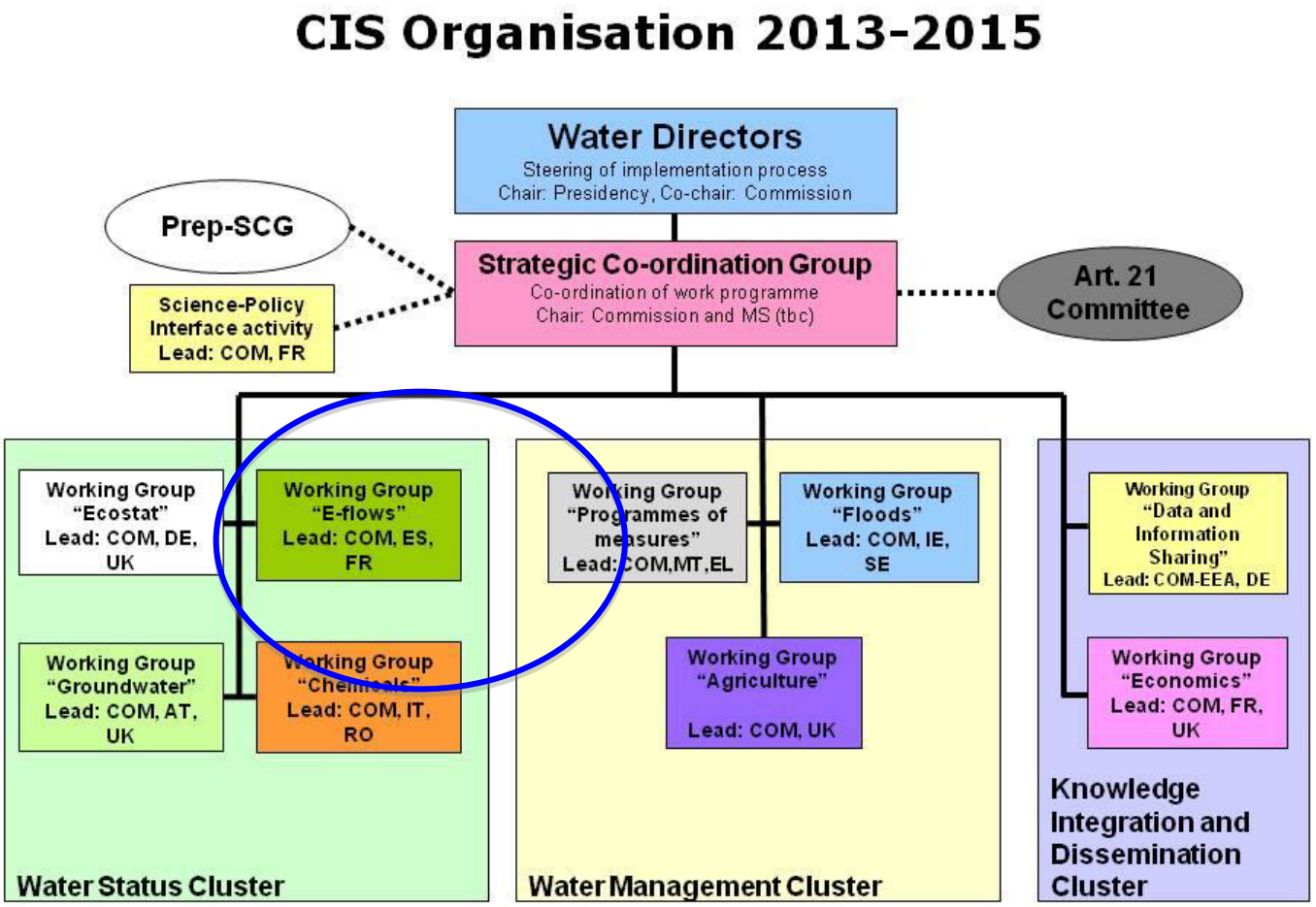
CIS Working Group on E-flows



WG participants

- 28 MS + CH, IS, NO, ME
- 11 ORGANIZATIONS FROM THE INDUSTRY
- 3 ORGANIZATIONS FROM CIVIL SOCIETY
- ICPDR
- WMO
- DG ENV, JRC, EEA

Mandate

Common comprehension of e-flows and of how to use them in the RBMPs

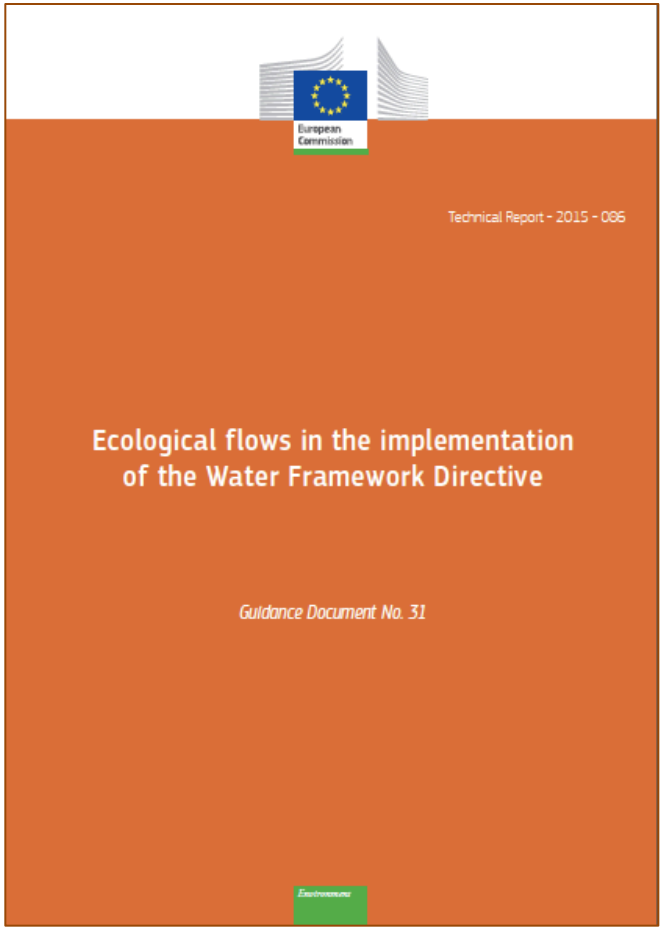
Deliverable: EU guidance on e-flows

Time: ott 2013 – ott 2014

Implementation field: natural water bodies

(reduced implementation not to interphere with ongoing work in the GEP group)

E-flows Guidance - 1



https://circabc.europa.eu

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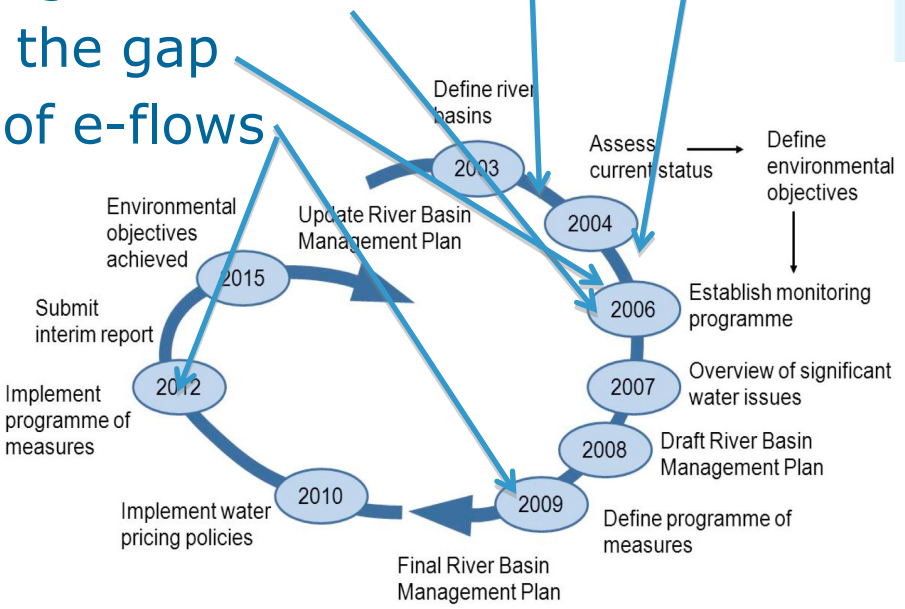
E-flows Guidance - 2

How e-flows are considered in each WFD implementation step.

- Assessment of hydrological pressures and impacts
- Eflows in status assessment and environmental objectives
- Establishment of monitoring programmes
- Defining e-flows and analysing the gap
- Measures for the achievement of e-flows
- Heavily modified water bodies and exemptions
- Public Participation
- Appendix
- Case Studies



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E-flows in Europe: an ad hoc survey

Fig. 1. Statistics of application of eflows components in European RBDs

Source: previous and own assessments

According to these analysis, up to 88 River Basin Districts [RBDs] (47%) either have already implemented MEF (or similar tools)[3] or have planned it in the framework of the Programme of Measures [PoM], while other 69 (34%) show no explicit intention in this regard. Finally, in 29 RBDs (16%), available information is not sufficient to assess.

On the other hand, some kind of hydro-peaking conditioning scheme is considered in 48 RBDs (26%), while this is not so in 101 RBDs (54%) with 37 RBDs (20%) with unclear assessment. It must be pointed out that 45 RBDs (24%) have both measures either implemented or planned, 35 RBDs only MEF (19%) and 3 only HP (3%), while 66 have included neither of the two (35%).

Source: Intecsa-Inarsa 2013

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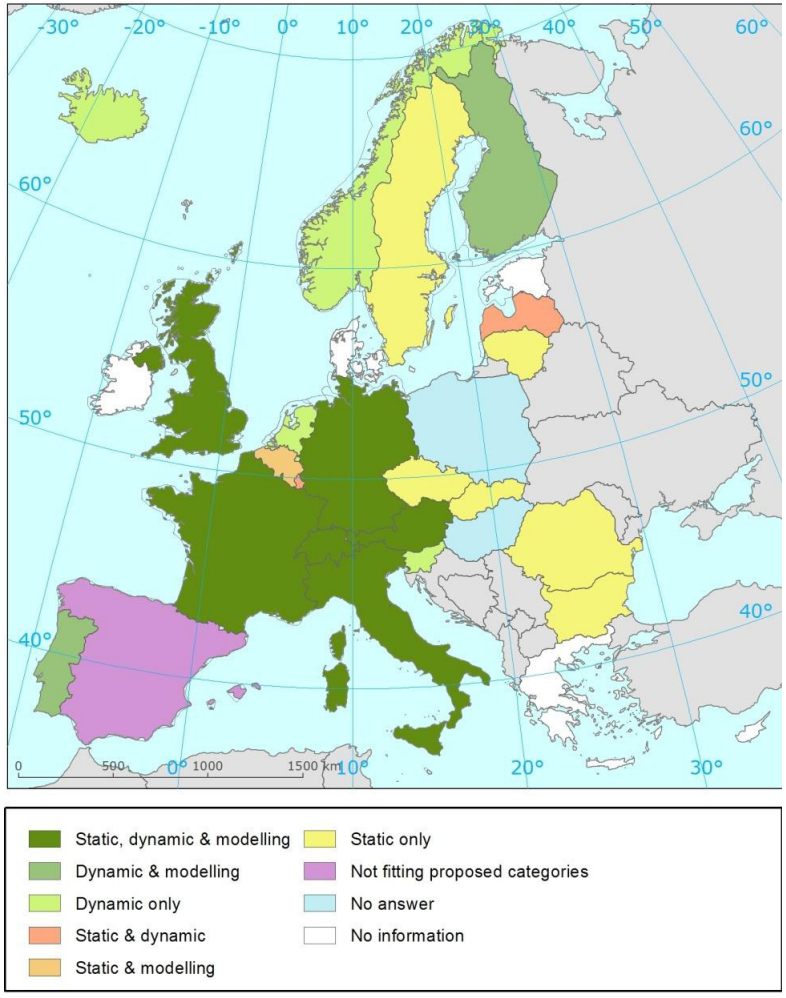
What are these e-flows?!?



What method(s) is(are) applied to define MEF in your country?

Static definition (e.g. 5% of annual mean flow)

Dynamic definition: different fixed minimum flow values distributed over the year

Determination by modelling

Confusion on terminology!

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Environmental Flows vs. Ecological Flows

>> 200 definitions of e-flows in literature

tolerable threshold on some flow regime components → hydrological /hydraulic needs of a particular species → flow regime that ensures the environmental services that Society deems most relevant, after negotiation with the different stakeholders

Our working definition**:**
ecological flows: the flow regime consistent with the achievement of good status of water bodies

Ecosystem water needs only –no socio-economic tradeoffs

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Our problem…

HYDROLOGICAL PRESSURES

REFERENCE CONDITIONS…

CURRENT ECOLOGICAL STATUS

GOOD ECOLOGICAL STATUS

GAP ANALYSIS

CURRENT HYDROLOGICAL REGIME

E-FLOWS

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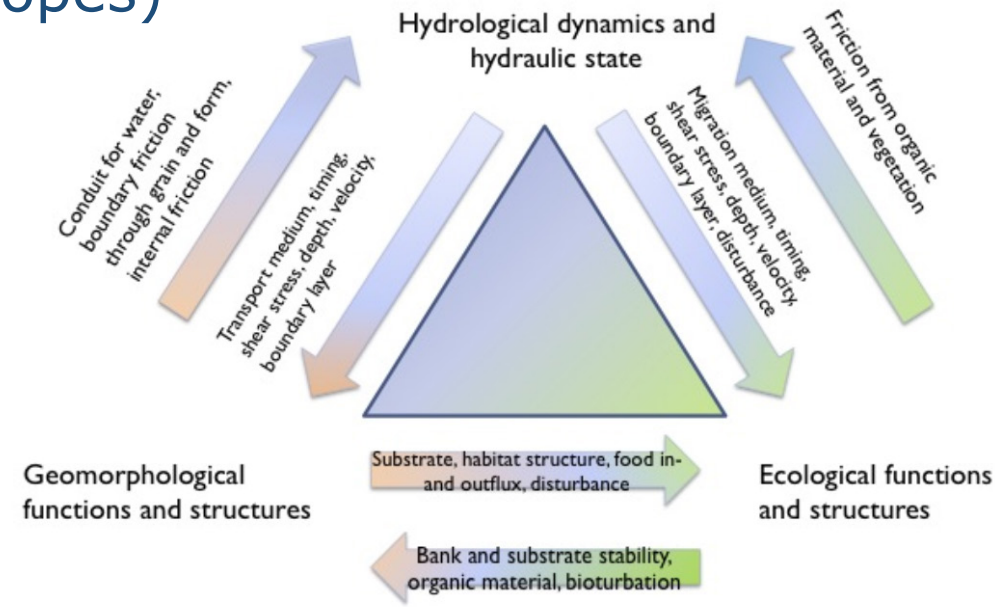
Hydrologic regime – Sediment transport - Morphology – Habitat - Biota

Hydrologic regime, in all its components, plays a primary role for the structure and the functioning of aquatic ecosytems, promoting morphological processes and so the creation and maintainance of physical environments ((habitats/biotopes)



1. Hydrologic regime, sediment regime, habitat, biota

Significant alterations of Qs lead to different channel

- Target hydrologic regime linked to the new morphology
- Need to know geomorphic processes:past evolution, future trends
- Need to form knoledge basis to evaluate the correlations among water, sediments and biota necessary to determine e-flows and related strategies

(Rinaldi 2012)

PRESSURE AND IMPACTS ON HYDROLOGY

Term	Definition
Driver	An anthropogenic activity creating a water demand that may affect the hydrology such as agriculture (irrigation), industry, water supply, electricity production, etc.
Pressure	The direct effect of the driver such as abstraction and impoundment of water to satisfy the water demand: • steady abstraction (e.g. groundwater and surface water abstraction, and run-of-river hydropower dam); • seasonally varying abstractions (e.g. spray irrigation); • direct supply reservoirs for water supply; • regulating reservoirs for water supply, hydroelectric power generation, other water uses of flood mitigation; • water transfers to other water bodies, subcatchments, river basins or river basin districts; • pumped storage reservoirs.
State	Effects of the pressures on the physical environment: • direct hydrological effects that result from the pressures; • hydraulic effects that result from hydrological changes; • direct or indirect geomorphological effects (incl. erosion-sedimentation); • changes in water quality (e.g. temperature, nutrient and sediment loads); • combination of these (alongside other physical-chemical properties), creating the habitat state in which aquatic organisms live which is the principal link between the pressures exerted by human water use and aquatic organisms.
Impact	Responses of individual organisms, populations and communities and ecosystem functions; Impacts on other water or water body uses (abstractions, recreational, navigation, angling, etc.); Changes in landscape (and its perception), and associated secondary effects.
Response	The measures taken to improve the state of the water body, such as e-flows, overall water allocation and specific abstractions rules, dam flow/sediment management rules, or other non-hydrological measures, such as habitat improvement)

Hydrological Monitoring

Always!

- Surveillance: it supports long term trends assessment (eg. CC impacts)
- Operational: it supports the evaluation of alterations and the effects of measures

Need of (quasi) real time hydrological monitoring (including withdrawals) for a flexible management of water resources

4. Methods for the estimation of e-flows

Methodology category	General purpose	Scale	Duration of assessment (months)	Relative costs	Relative frequency of use
Idrologici	Examination of historic flow data to find flow levels that naturally occur in a river and can be considered "safe" thresholds for flow abstraction	Whole rivers, applicable for regional assessments	1-6	€	+++
Idraulici-Habitat	Examination of change in the amount of physical habitat for a selected set of target species or communities as a function of discharge	Applied at a study site / river segment scale, upscaling to whole river basin based on the assumption of "representative" site conditions	6-18	€€	++
Olistici	Examination of flows in an expert opinion workshop leading to recommendation of flows for all components of the river ecosystem, including societal and recreational uses	Whole rivers, applicable for regional or river specific scales	12-36	€€ - €€€	+(increasing)

NATURAL WB

Macroregion

HMWB

WB

Need of good and consistent hydrological, hydraulic and geomorphological datasets in order to produce results with an acceptable degree of uncertainty

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2. How to ensure consistency of flow regime and environmental obj_s (or the efficiency of flow related measures) ?

ENV. OBJs measured by the status of BQE

Most status assessment methods designed to detect overall wb quality impairment often insensitive to flow regime/hymo alterations (Friberg et al. 2013) - also for mismatch of scales
Some biological communities composition not driven by hymo alteration but by restocking (fish)

Many bio/eco methods/indicators not so adequate to measure consistency/ efficiency

2. How to ensure consistency of flow regime and environmental obj_s (or the efficiency of flow related measures) ?

River flows main controls on habitat and so on biota

Hymo variations usable as indicators of flow alteration impact on biotic communities

Hymo indicators usable to estimate e-flows and the efficiency of e-flows related measures and support the current ecological assessment methods.

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Problems up to now..

Lack of hydro-morphological data affects e-flows estimation → need of monitoring

Neglecting sediment dynamics in estimation of e-flows and implementation of measures may hinder the achievement of env obj → no decoupling on hymo

Lack of sufficient knowledge on quantitative relationships between hydromorphology pressures/measures and biological response → more hymo and bio monitoring!!!! See outcomes from FP7 REFORM!!)

Ecological flo
of the Wate

Gui

European Commission

Ecological flow
in the implementatio
Water Framework D

Compilation of case st
referenced in CIS guidance doc

December 2014

THEME: Environment (including climate change)
TOPIC: ENV.2011.2.1.2-1 Hydromorphology and ecological objectives of WFD
Collaborative project (large-scale integrating project)
Grant Agreement 282656
Duration: November 1, 2011 – October 31, 2015

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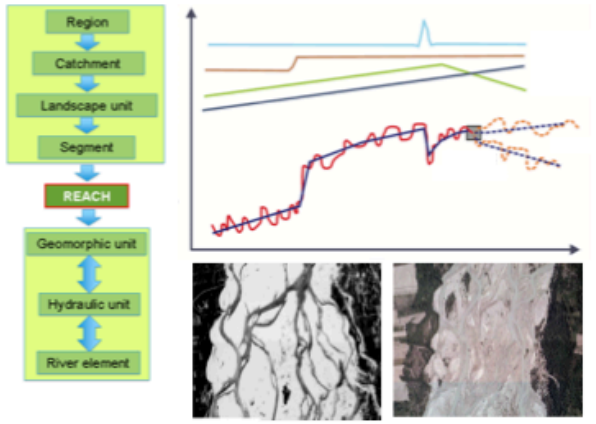

Deliverable D6.2 Part 1
Title Final report on methods, models, tools to assess the hydromorphology of rivers
Authors (authors of D6.2 Part 1*) M. Rinaldi[1], A.M. Gurnell[2], B. Belletti[1], S. Bizzi[3], M. Bussettini[4], M. Gonzalez del Tanago[5], R. Grabowski[2], E. Mosselman[6] P.Vezza[7]
[1]UNIFI, [2]QMUL, [3]JRC, [4]ISPRA, [5]UPM, [6]Deltares, [7]Politecnico di Torino (voluntary contribution)

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Actual submission date:

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RE Restricted to a group specified by the consortium (including the Commission Services)
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