



REstoring rivers FOR effective catchment Management



REFORM: Towards the development of tools to support cost-effective implementation of restoration measures and monitoring

IAIN GUNN (CEH Edinburgh)

COLLABORATIVE PROJECT
LARGE SCALE INTEGRATING PROJECT

ENV.2011.2.1.2-1
HYDROMORPHOLOGY AND ECOLOGICAL OBJECTIVES OF WFD

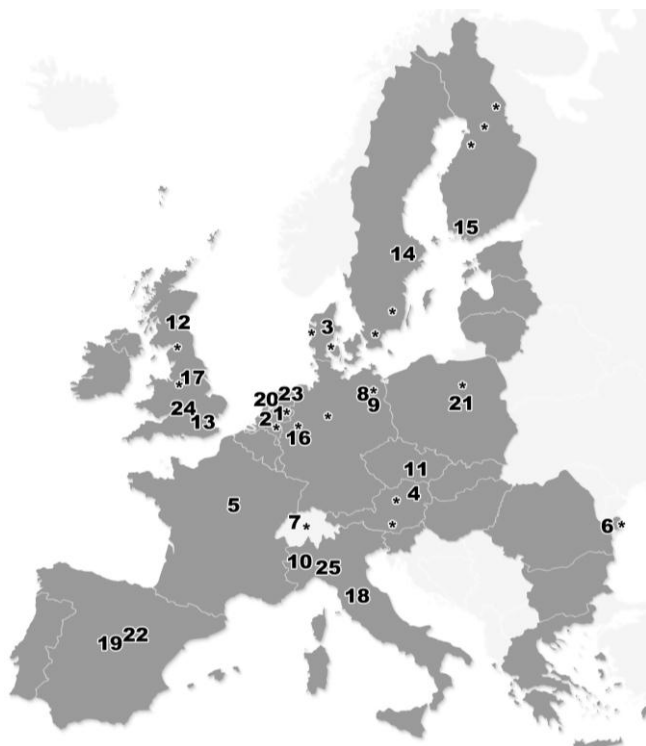
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Contact: Tom Buijse (e-mail: tom.buijse@deltares.nl)

Contents

- Background
- Overall aims of REFORM
- Research aims
- Application of research
- Dissemination of research
- Links with RESTORE and other projects

Partners



**25 partners from 14
European countries**

No.	Participant organisation name	Short name	Country
1	Stichting Deltares (Coordinator)	Deltares	Netherlands
2	Stichting Dienst Landbouwkundig Onderzoek B.V. – Alterra	Alterra	Netherlands
3	Aarhus University – National Environmental Research Institute	AU-NERI	Denmark
4	Universitaet fuer Bodenkultur Wien	BOKU	Austria
5	French Research Institute for agricultural and environmental engineering	Cemagref	France
6	Danube Delta National Institute for Research & Development	DDNI	Romania
7	Swiss Federal Institute of Aquatic Science and Technology	Eawag	Switzerland
8	Ecologic Institut gGmbH	Ecologic	Germany
9	Leibniz-Institute of Freshwater Ecology and Inland Fisheries	IGB	Germany
10	European Commission Joint Research Centre	JRC	Italy
11	Masaryk University	MU	Czech Republic
12	Natural Environment Research Council – Centre for Ecology & Hydrology	NERC-CEH	UK
13	Queen Mary, University of London	QMUL	UK
14	Swedish University of Agricultural Sciences	SLU	Sweden
15	Finnish Environment Institute	SYKE	Finland
16	University of Duisburg-Essen	UDE	Germany
17	University of Hull	UHULL	UK
18	Università di Firenze	UNIFI	Italy
19	Universidad Politécnica de Madrid	UPM	Spain
20	VU University Amsterdam, Institute of Environmental Studies	VU-IVM	Netherlands
21	Warsaw University of Life Sciences	WULS	Poland
22	Centro de Estudios y Experimentacion de Obras Publicas	CEDEX	Spain
23	Dutch Government Service for Land and Water Management	DLG	Netherlands
24	Environment Agency of England and Wales	EA	UK
25	Istituto Superiore per la Protezione e la Ricerca Ambientale	ISPRA	Italy

Kick – off meeting (Florence, 28 Nov – 1 Dec 2011)



67 participants

Overall aims of REFORM

To provide a framework

- improve success of HYMO restoration measures
- to reach cost-effective ecological targets of rivers

Success = HYMO sustainable, Ecol effective, and Socio-Economic potential

Cost-effective = optimisation of ecosystem health, goods and services

Thus REFORM will develop protocols and procedures

- to monitor biological response to HYMO change with greater precision
- to support the design of PoM for the WFD, in particular the 2nd RMBPs (2015)
- to integrate restoration better with socio-economic activities.

**Natural
processes**

Degradation

**Restoration &
Mitigation**

WP 1 Meta-analysis

Review existing information on river degradation and restoration

Understand how disturbed sediment dynamics and multiple stress constrain restoration

WP 2

Hydromorphological and ecological processes and interactions

WP 3

Effects of hydromorphological changes on rivers and floodplain ecosystems

Effects of river restoration

Assess the importance of scaling and catchment conditions on the effectiveness of restoration

Develop a process-based and ecologically relevant hydromorphological framework

- * Translate science to practice
- * Select indicators for cost-effective monitoring
- * Improve tools and guidelines for restoration

WP 6 Applications and

Develop instruments for benchmarking end-points, risk and benefit analysis to support successful restoration

Enlarge appreciation for the benefits of restoration

WP 8 Consortium coordination and management

WP 7 Knowledge dissemination and stakeholders participation

potential and strategy

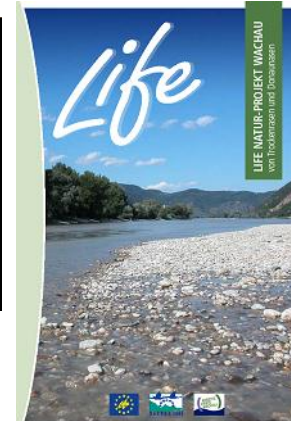
WP 1: Reviewing existing information on river degradation and restoration

Examples of EU funded River restoration projects



<http://www.life-donau-ybbsat/>

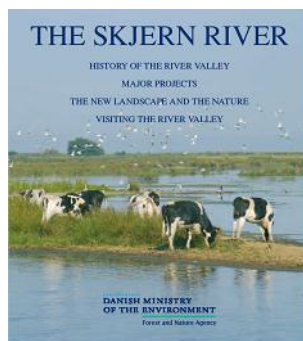
Count of ProjectName	Programme		
Global objective	INTERREG	LIFE	Grand Total
Flood management	20	1	21
Integrated River Basin Management	26	1	27
River & floodplain restoration	17	114	131
Water quality improvement	4	1	5
Species conservation and management	14	55	69
Grand Total	81	172	253



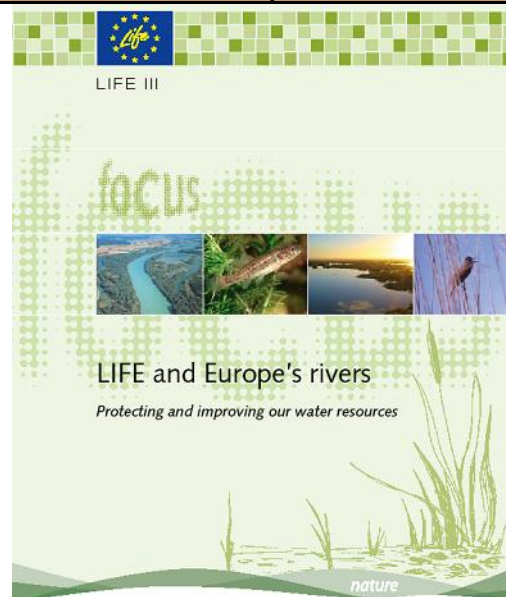
<http://www.life-wachau.at/>



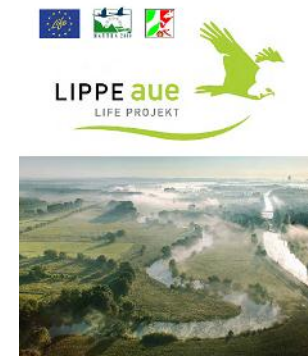
<http://webarchivenationalarchiv.esgovuk/20110303155229/http://www.streamlifeorguk/>



http://www.naturstyrelsendk/Naturoplevelser/Beskrivelser/Vestjylland/SkjernEnge/Skjern_River_Wetlandshtm



www.wwf.se/flodparlmussla



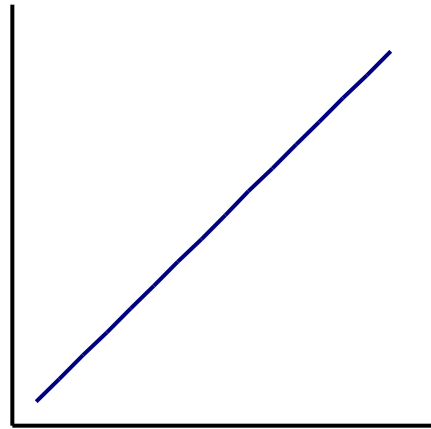
Hammt:

<http://www.hammdelifelippeauehtml>

WP 1: Review on effects of hydromorphology on biotic interactions

- Various concepts reduced to the very basics – over-simplification or way forward?

Variability of
Habitat
Depth
Width
Substrate
Structures
Flow



species, species diversity
abundance, density

= general, unspecific indicators

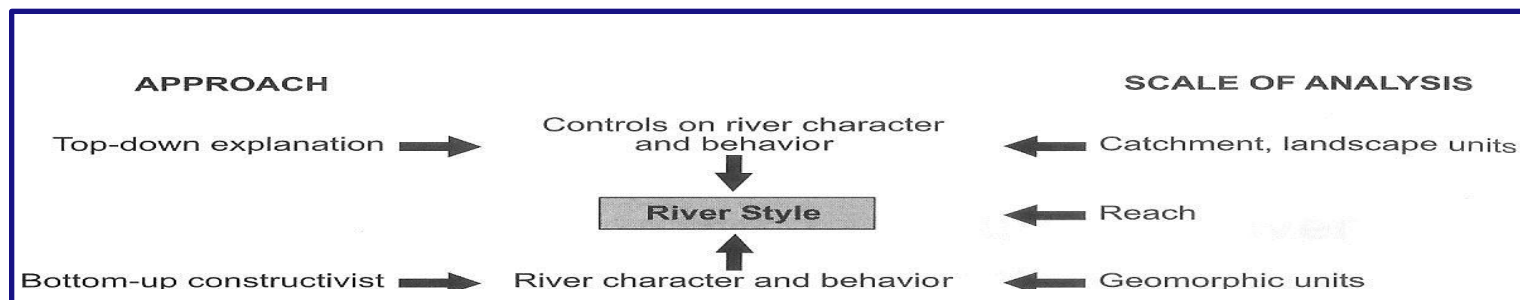
Key factor flow velocity

- limits habitat use
- sorts substrates, provides substrate for specialized species

= specific indicators
(in limited numbers)

WP2: Developing a process-based hydromorphological framework

- Set HYMO assessments into a process-based framework (process management particularly important for high energy rivers) to reflect river dynamics
- Riverine landscapes structured by interplay of HYMO processes, geology & vegetation structure
- Processes essential to rejuvenate channels, riparian zones and floodplains
- Distinguish spatial and temporal scales to explain river physical appearance & functioning



PROCESS-BASED FRAMEWORK

Region



Catchment



Landscape unit



Segment



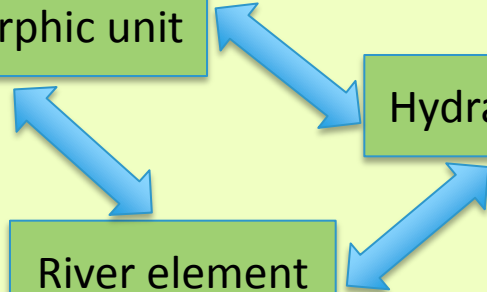
Reach



Geomorphic unit

Hydraulic unit

River element



**CONTROLS ON RIVER
BEHAVIOUR**
(affect delivery of water and
sediment to river reaches)

**RIVER AND FLOODPLAIN
TYPE, DYNAMICS,
SENSITIVITY**

**DYNAMIC SUITE OF
RIVER AND FLOODPLAIN
FEATURES
(PHYSICAL HABITATS)**

**SPATIAL
SCALES**

**REACH
SCALE IS
KEY**

WP2: Process-based framework for hydromorphology

The Framework will:

- Guide users on information required at different spatial scales
 - How to collect or estimate
 - How to describe and explain variation in river character and behaviour.
- Predict how a reach might react to changes
 - e.g. Removal of engineering modifications
 - Flow regime re-naturalisation
 - Reinstatement of sediment supply
- Form the basis to define site-specific, “reference” conditions
 - Against which present-day hydromorphological condition can be assessed

WP 3: Effects of HYMO change on river & floodplain ecosystems

- Assessing the impact of HYMO pressures on river biota
 - Including altered sediment dynamics
 - Analysing existing data sets from across Europe
- Better understanding of how biotic indicators of HYMO pressures respond in multiple-pressure environments
 - Experimental and water quality modelling work

WP 4: Case studies: “Flagship” restoration vs. “normal” restoration

Catchment with large
restoration measure(s)

Catchment without large
restoration measure(s)

(Long) restored
reach



Degraded reach
upstream



Short restored
reach



Degraded reach
upstream

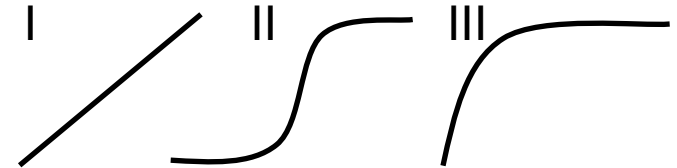


REFORM makes use of existing data.

Besides additional new data will be collected in 9 catchments

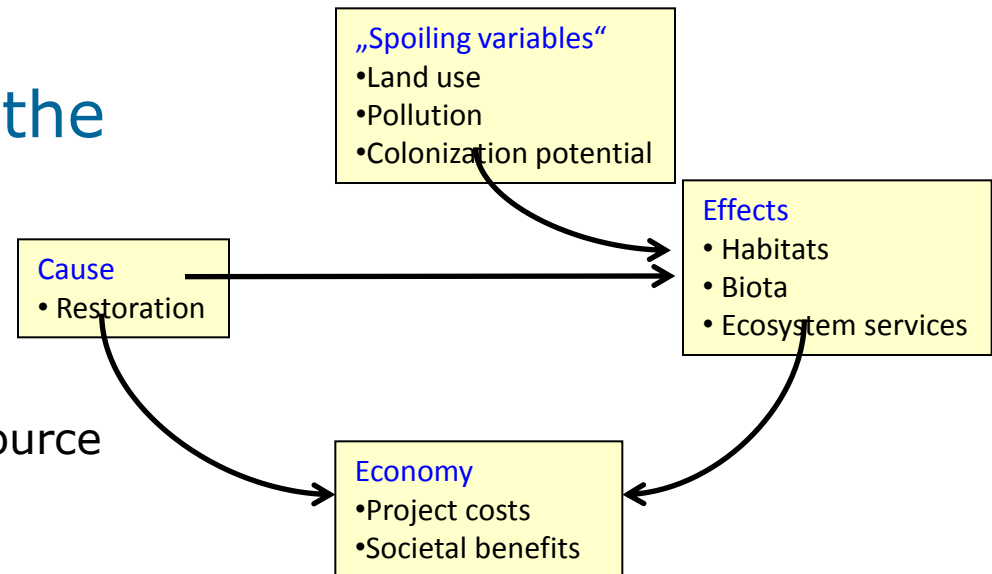
WP 4: Restoration scale and catchment conditions

Do dimensions influence restoration success?



Do catchment conditions support or constrain restoration and direct the choice of measures?

- Flow regimes of water and sediments
- Barriers
- Colonisation potential from source populations
- Water and sediment quality (nutrients, micropollutants)



WP 5: Benchmarking, end-points

There is a need to benchmark when restoration is successful.

There is a need to set realistic end-points for restoration

...

This is however often not done

THE CHALLENGE OF PROVIDING ENVIRONMENTAL FLOW RULES TO SUSTAIN RIVER ECOSYSTEMS

Angela H. Arthington, Stuart E. Bunn, N. LeRoy Poff, and Robert J. Naiman

Ecological Applications 2006 16:4, 1311-1318

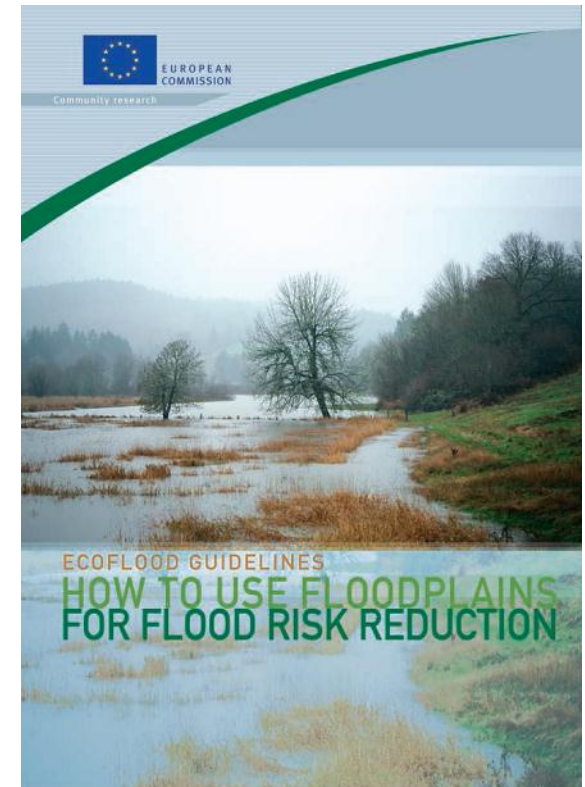


WP 5: Synergy between ecological restoration and

- Flood protection (Room for Rivers, Ecoflood)
- Navigation (parallel dams; wave action)
- Agriculture (land use of riparian zones; sediment dynamics)
- Hydropower (Environmental flows; hydropeaking)

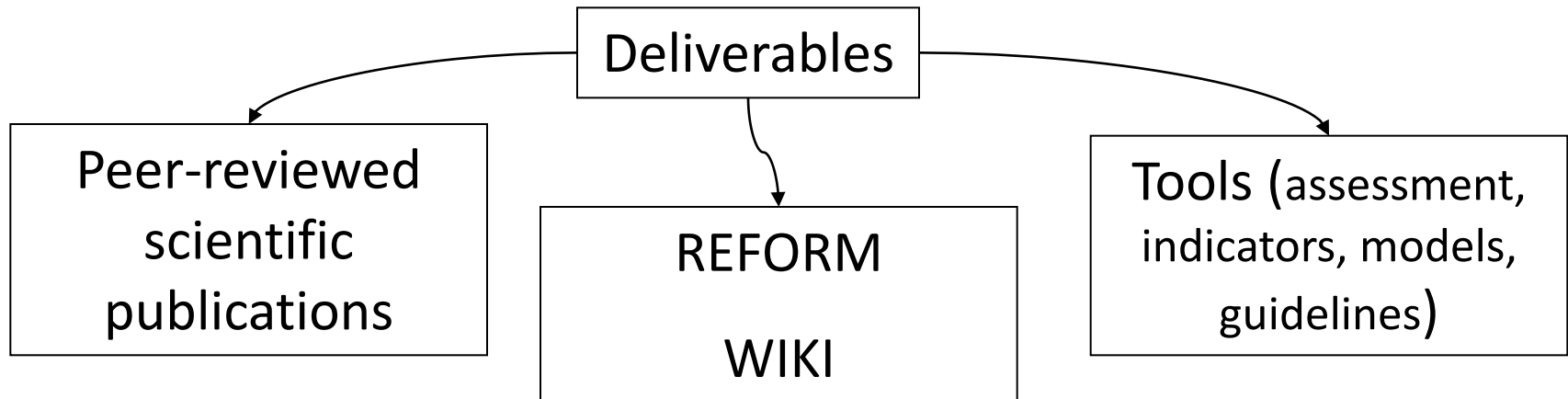
To ...

Expand the potential for restoration
Support the intercalibration of Good
Ecological Potential of heavily modified
and artificial water bodies (ECOSTAT)



Deliverables - >publications, WIKI & Tools

- Deliverables = formal reporting of results
- Accessible and Ready for Use = publications, WIKI & tools



REFORM WIKI

**Open Access
Web-based
Knowledge
Management System**

**Expansion of the
FORECASTER WIKI
(2008 – 2010)**

**WIKI to give end-users
access to results of
REFORM**

REFORM
REstoring rivers FOR effective catchment Management

GerjanG | My talk | M

Go Search

Forecaster

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- Pressures
- Measures
- BQE
- HYMOQE
- Database
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Main Page
Home (edit)

Welcome to the REFORM WIKI! This is a knowledge and information system relating hydromorphology and ecology of European rivers and has been developed as part of the projects REFORM and FORECASTER funded by the European Commission FP7, IWRM-Net and Delft Cluster.

The system presents a compilation of case studies describing the output from restoration and rehabilitation projects and is intended to help practitioners by presenting experiences about success or failure of the application of different measures.

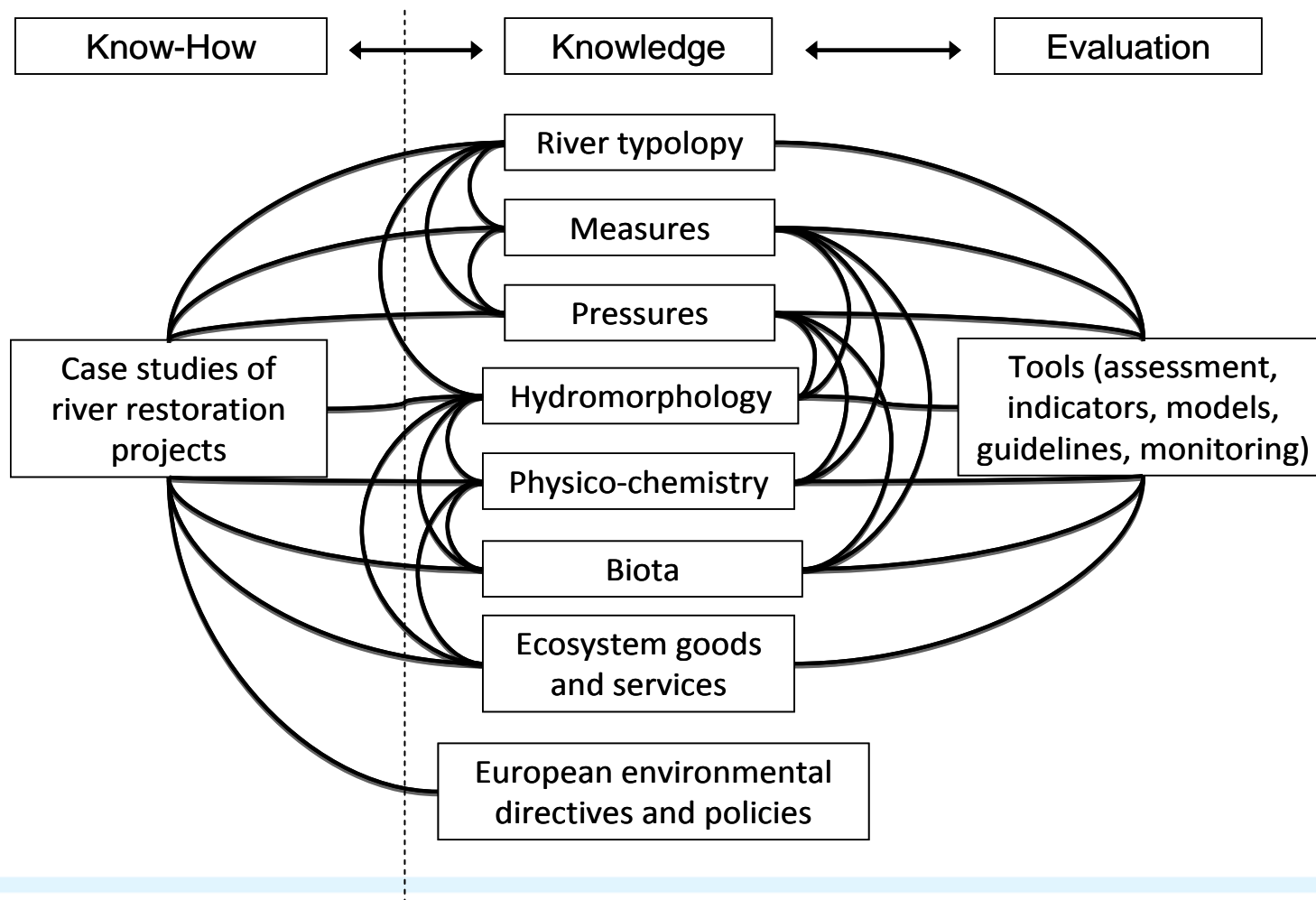
The system is set up as a GEO-WIKI. Google maps are used as a gateway to the case studies and wiki pages are used to present relevant information about the implementation of the projects. Users can consult the tool either geographically or by theme using filter or free search options. Moreover, they can contribute to improve the information in the system by adding or updating relevant information in the wiki pages

IWRM-net **Delft Cluster**

At the core of the web-based tool are the Case studies. These are examples of restoration and

REFORM WIKI

Open source web-based knowledge management system



WP 7: Interaction with end-users

Communication & Dissemination Strategy (March 2012)

End-user groups: policy makers, practitioners, scientists

Standard

- Website, Newsletters (2/yr), Policy Briefs (3)

Advanced

- WIKI linking theory to practice and experience
- Interactive preparation of end-user workshop
- Interaction with ECOSTAT

Events

- interactive end-user workshop (Feb/Mar 2013)
- local workshops in case study catchments (tbd)
- summer school (2015)
- final conference (2015)



REFORM

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Cooperation with ...



make use of earlier research projects
(e.g. REBECCA, WISER,
FORECASTER)



RESTORE (LIFE+ Information &
Communication)



European Centre for River Restoration
(ECRR)



WFD Implementation: ECOSTAT
common implementation strategy
(CIS)

Gary Brierley, Johan Kling, Margaret Palmer,
Hervé Piégay, Peter Pollard,
Ursula Schmedtje, Bas van der Wal

Advisory Board of REFORM

Thank you for your attention



www.reformrivers.eu

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