

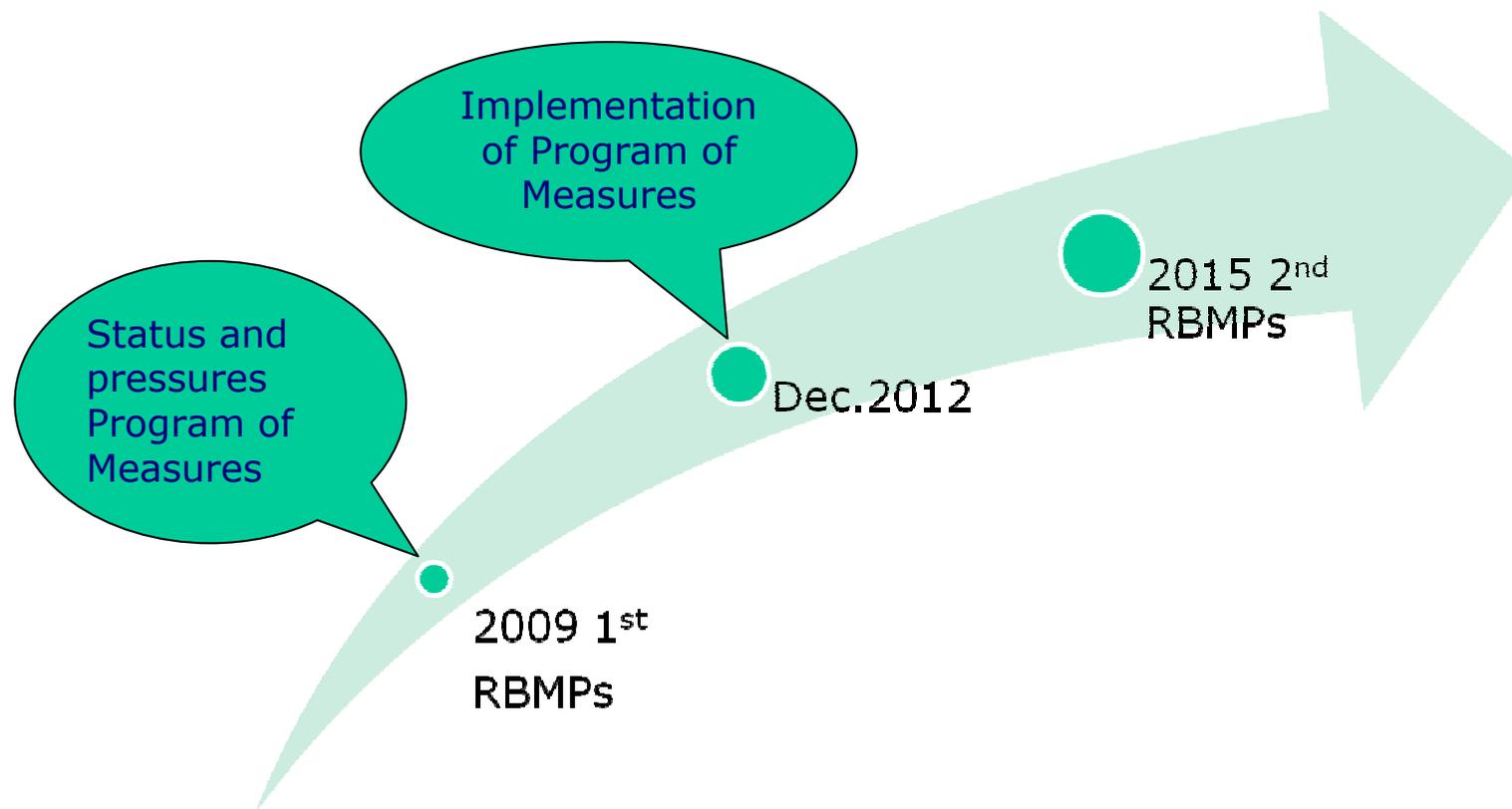
Session: Progress in implementation of the Water Framework Directive and towards the second River Basin Management Plans.

## **Hydromorphological pressures, progress in implementing measures and river restoration**

**Peter Kristensen**

*European Environment Agency, EEA*



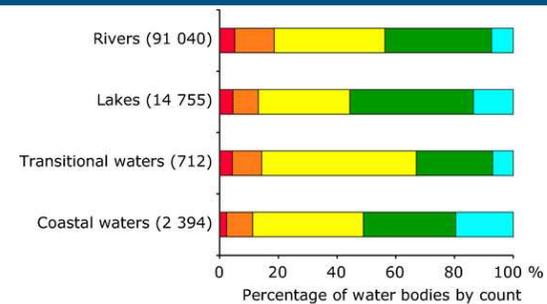


In the first RBMPs more than half of the river water bodies in Europe were reported to hold less than good ecological status, with hydromorphological pressures being a major pressure.

To meet the objectives of the WFD (i.e. all water bodies to have good status by 2015), river basin authorities will have to address the pressures affecting water bodies.

My presentation will present and discuss the status and pressures from the first RBMPs and the challenges for the second RBMPs.

# From 160 RBMPs to European overviews



Hydromorphological pressures are causing altered habitats and affecting the ecological status.



Barriers and transverse structure

Morphological changes

Abstraction and flow regulation  
and water level regulation

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## Driving forces

**Agriculture**  
**Urban**  
**Hydropower**  
**Navigation**  
**Flood protection and defence**  
**Mineral extraction**  
**Fishing**

## Physical modifications

Pressures and activities

Water storage, transfers and abstraction  
Cross-profile constructions (dams, weirs, locks/slucices, culverts, impoundments)  
Longitudinal profile construction (dykes and levees)  
Bank reinforcement and embankments  
Deepening and mineral extraction (channel maintenance, dredging)  
Channelisation and straightening  
Land drainage and sealing

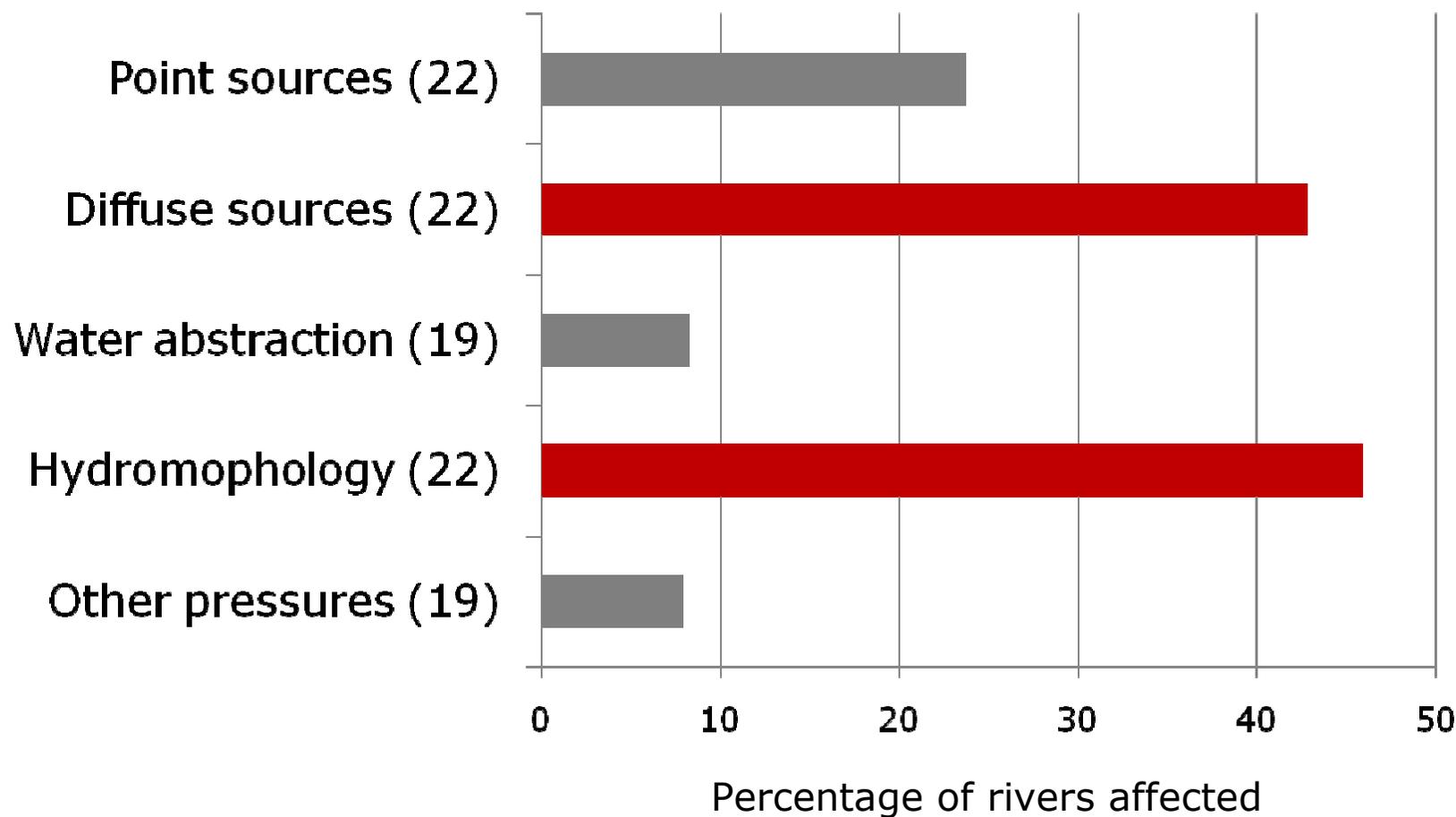
## Habitat alteration

Impacts on hydromorphology

Change in flow (+/-), regime, seasonality, and hydropeaking  
River and habitat continuity interruption  
Change in sediment transport and erosion  
Change in lateral connectivity, loss of floodplains or intertidal area, disconnection of wetlands and oxbow lakes  
Change in river profile and estuaries (length and transverse profile)  
Change in connection with groundwater

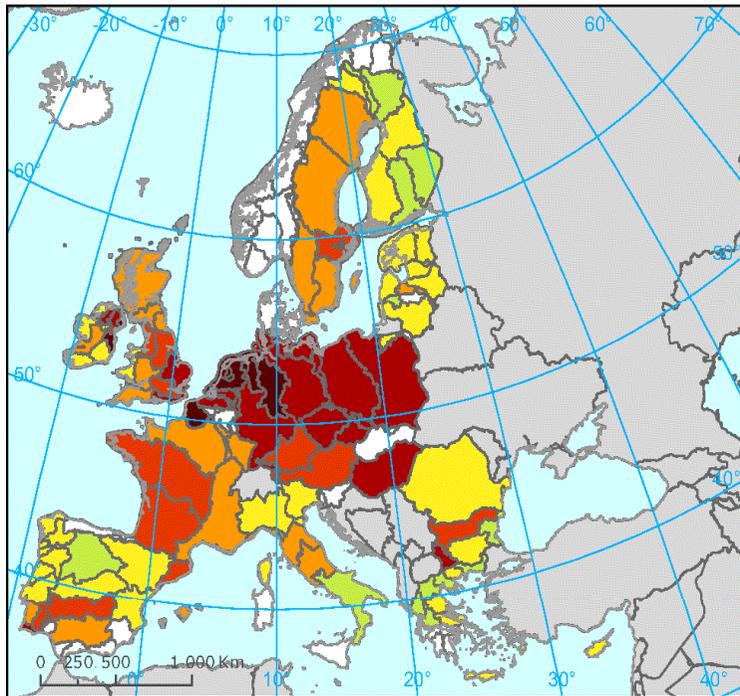


# Pressures on Europe's rivers

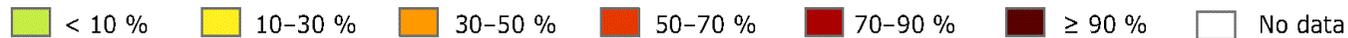


( ) = Number of EU Member States that reported the pressure, out of 22.

# Percentage of water bodies affected by hydromorphological pressures



**Percent of classified water bodies affected by hydromorphological pressures**





# There are **several hundred thousand of barriers and transverse structures** in European rivers.

In **France**, more than **60 000 structures** - dams, locks, weirs and mills – have been recorded on rivers and are potential obstacles to river continuity. In total, it is estimated that the river networks are affected by **120 000 transversal structures** (ONEMA 2011).

There are currently thought to be some **200 000 transverse structures** in **Germany**. In relation to the overall length of Germany's network of watercourses of around 400 000 km, the continuity of rivers is therefore interrupted around every second kilometre by a technical structure (BMU/UBA, 2010).

In **Austria**, there are around **33 000 barriers** in river networks resulting in 45% of water to a risk of missing the target. On average, the river continuity is interrupted every kilometre (BLFUW, 2014)

In the **Czech Republic**, around **6 000 barriers** above 1 m have been identified: 2 153 in the Danube RBD, 2 805 in the Elbe RBD, and 1 065 in the Odra RBD (Environmental indicators).

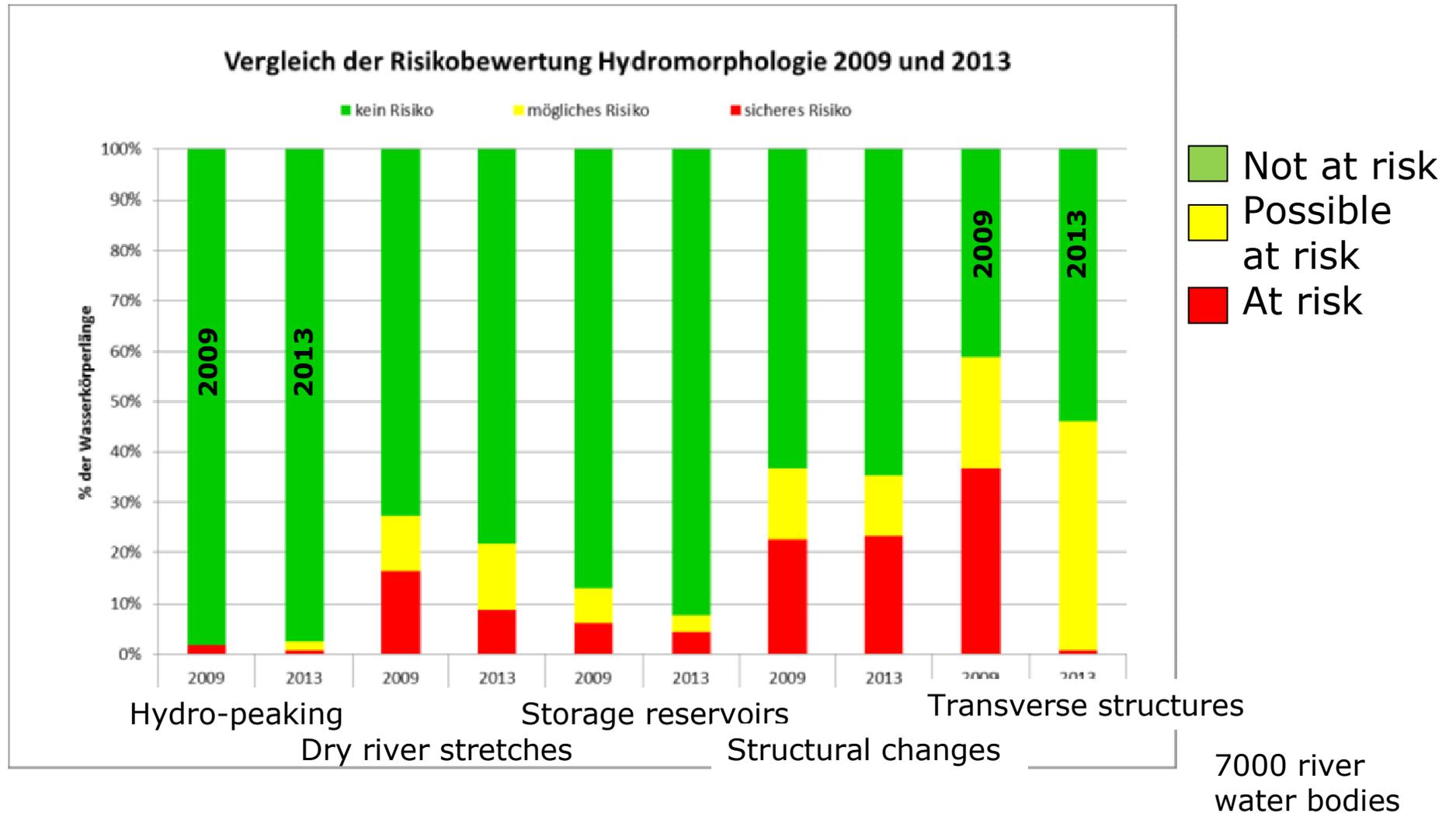
The **Dutch** Rhine RBMP identified over **9 000 dams**, including over 700 in flowing waters. The Dutch Meuse RBMP identified more than **2 000 dams**, half of them in flowing waters. Only a small part is made passable for fish (VROM et al. 2009a and 2009b).

In **Belgium**, **779 barriers** have been identified on a 3 000 km long priority network of rivers. In addition, many barriers are found on other rivers (Biodiversity Indicators, 2011).

There are over **2 500 weirs and impoundments**, and 5 000 culverts on **Scottish** rivers (SEPA, 2007).

In **Switzerland**, there are approximately **100 000 artificial barriers** over 50 cm high, and several hundred thousand barriers under 50 cm high (FOEN 2010b).

# Austria – Hydromorphological pressures 2009/2013



# Hydromorphological pressures by countries

## Spain

### Douro RBD

Some 3600 barriers have been documented with various degrees of permeability for the fish population, along with more than 1100 canalized sections and some 600 bank reinforcement actions.

### Minõ-Limia RBD

There are 59 dams higher than 10 meters and 2166 dams between 2 and 10 meters. There are only 10 with fish bypass.

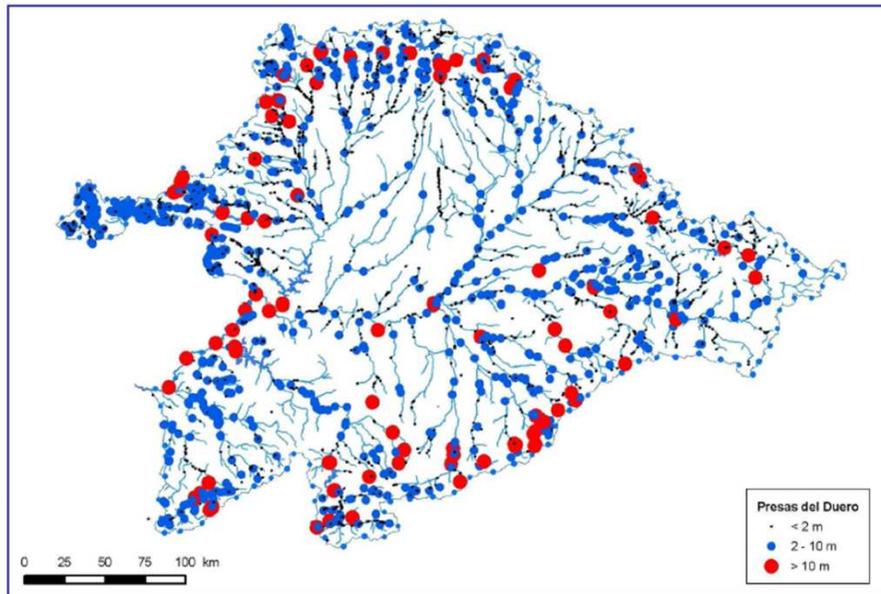


Figura 94. Presas clasificadas según su altura sobre cimientos, (Mapa 84).

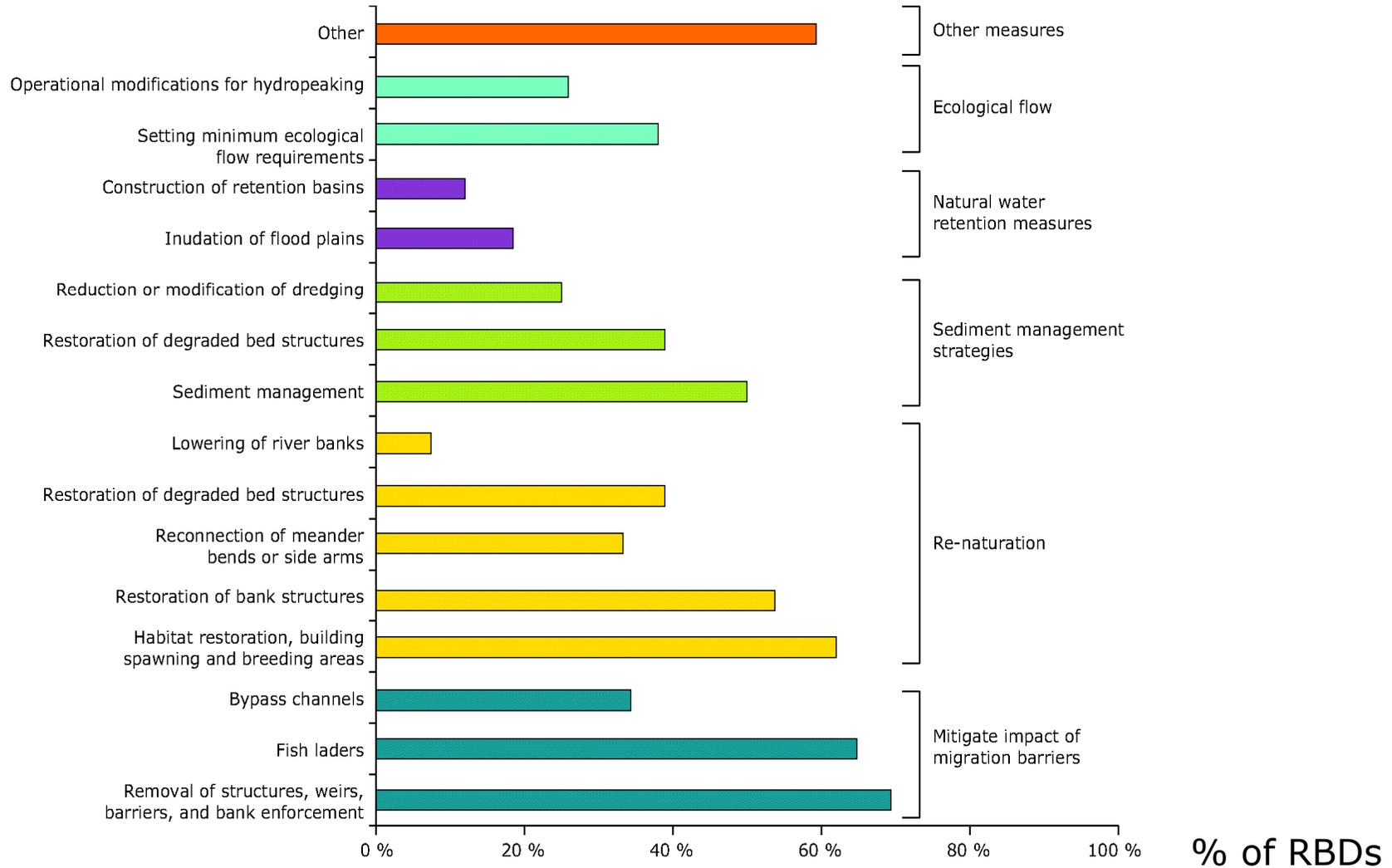
## Sweden

- 2101 Hydropower plants
- 1670 Storage reservoirs
- 5000 Other dams
- 200 000 Road crossings - Estimations show that a natural watercourse is crossed by a road approximately every (2) third kilometre, and inventories taken show that many (one-third) road-water crossings constitute migratory barriers for aquatic animals.
- 1 million km drainage canals
- Many water bodies regulated for timber flooding
- 4322 water bodies being regulated or canalised
- 4448 water bodies subject to regular weed cutting or dredging of accumulated fine sediments (rensade).

Johann Kling, 2012: [Link](#)  
REMIBAR - LIFE04/01/SE/00003 - Remediation of migratory barriers in stream crossings [Link](#)



# Hydromorphological measures in RBMPs



Based on EC 2012: WFD Staff Working Document Vol. 2 – Section 8.14

[http://ec.europa.eu/environment/water/water-framework/pdf/CWD-2012-375\\_en\\_Vol2.pdf](http://ec.europa.eu/environment/water/water-framework/pdf/CWD-2012-375_en_Vol2.pdf)

European Environment Agency



# Hydromorphological measures by countries

## Denmark

Recommendations for physical improvements in Danish lowland streams (total 22.000 km)

Source: Kristensen et al. 2012

- Changed weed cutting or dredging practices - 9484 km
- Physical in-stream improvements - 7128 km
- Opening of piped streams - 2778 km
- Removal of barriers - 3539 barriers

Numbers represent recommendations given in an early version of the River Basin Management Plans and reflect the mitigation measures needed to improve habitats in all streams with poor physical conditions. The actual kilometres of streams to be restored are lower due to financial limitations.

## The Netherlands

For the first planning period (2009 – 2015), a comprehensive program has been established that includes the following measures:

- construction of 1,734 km of nature-friendly banks along standing waters;
- construction of 806 km of nature-friendly banks along flowing waters, and re-meandering streams;
- widening over 1,100 hectare of watercourses and constructing them as wetlands;
- modifying 628 structures to improve fish migration.

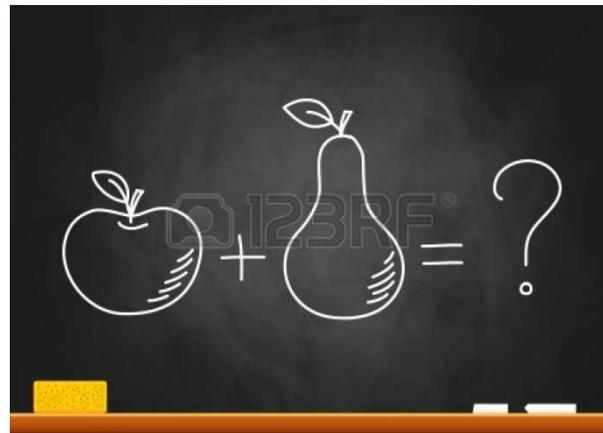
Source: RBMP 2009-2015 Summary Ems, Meuse, Rhine and Scheldt (en)

<http://cdr.eionet.europa.eu/nl/eu/wfdart13/nlem/envt/asvqg/>





# Progress in implementing HYMO Measures

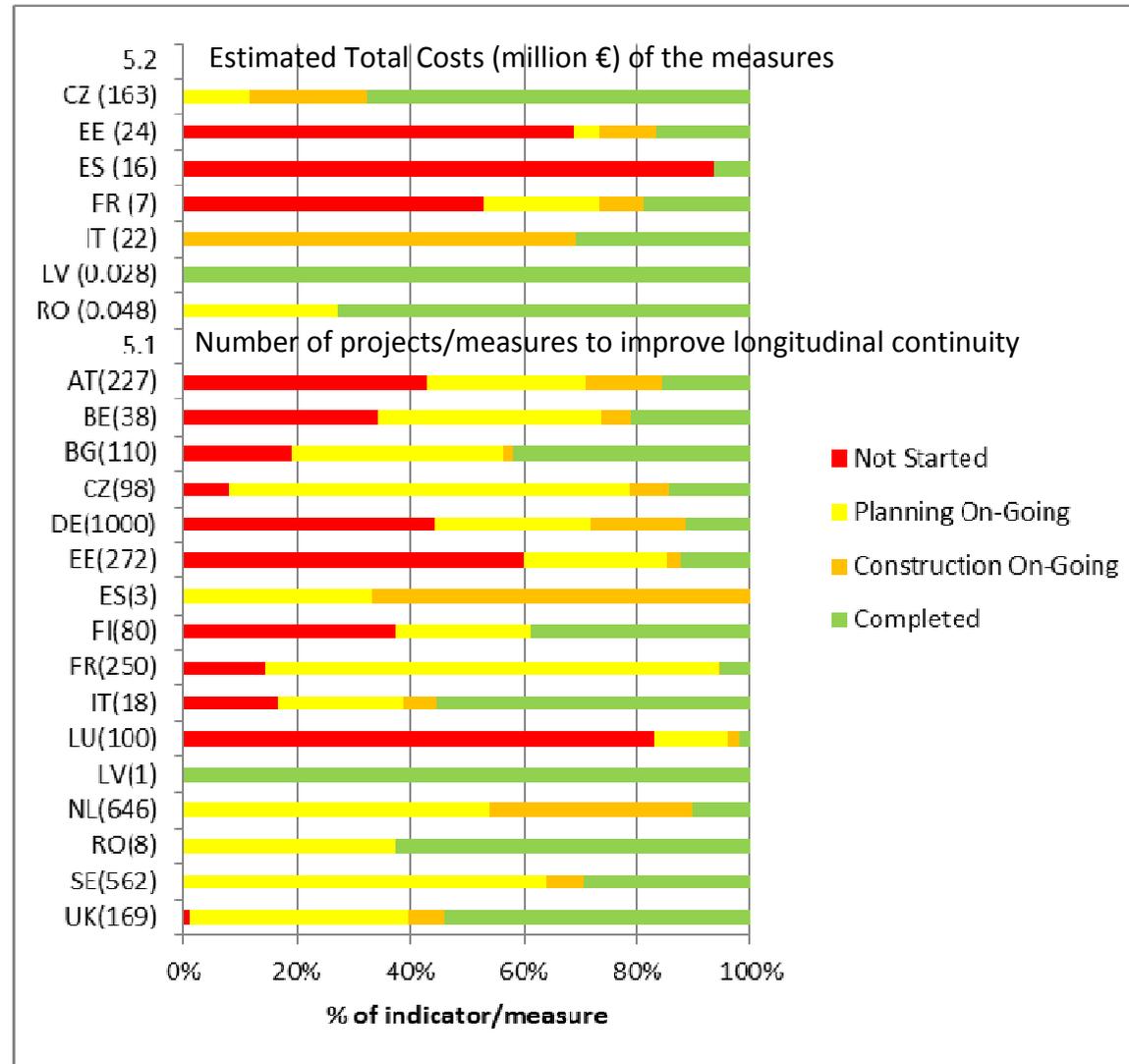


The Blueprint and Council Conclusions:  
Member States were urged to "improve implementation of the WFD and other relevant EU legislation and reduce hydro-morphological pressures in river basins using whenever possible green infrastructure, best available techniques and mitigation measures, thus reducing the EU's vulnerability to floods and droughts, supporting biodiversity and soil fertility as well as improving the status of waters."

# Key type of measures

- Key Type of Measure 5: **Improving longitudinal continuity** (e.g. establishing fish passes, demolishing old dams).
- Key Type of Measure 6: **Improving hydromorphological conditions of water bodies** other than longitudinal continuity (e.g. river restoration, improvement of riparian areas, removal of hard embankments, reconnecting rivers to floodplains, improvement of hydromorphological condition of transitional waters, etc.).
- Key Type of Measure 7: **Improvements in flow regime and/or establishment of minimum ecological flow.**

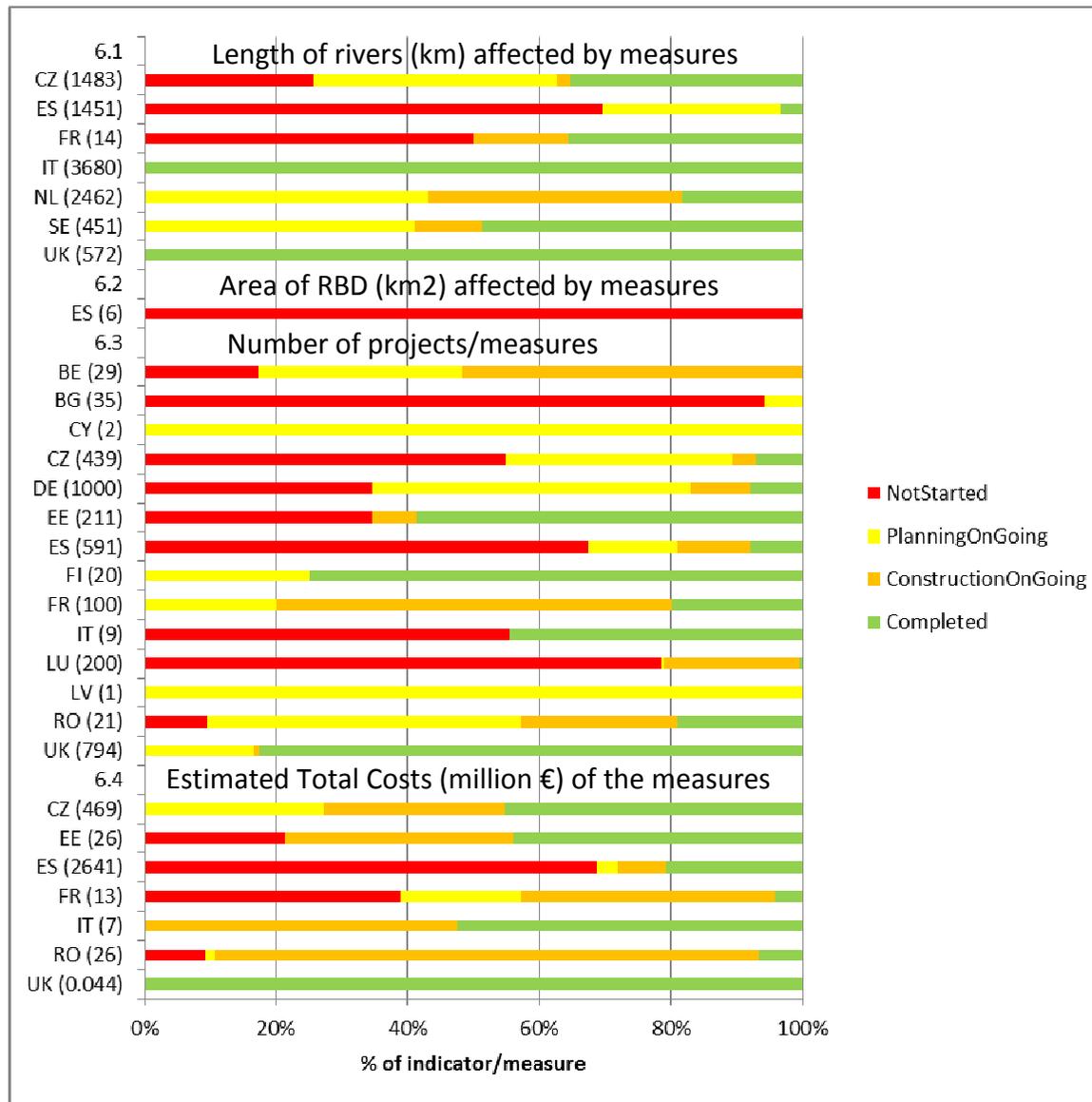
## KTM 5: Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams).



16 out of  
22 MS

Source: Preliminary results State of implementation of measures in 2012 (WFD art. 12)

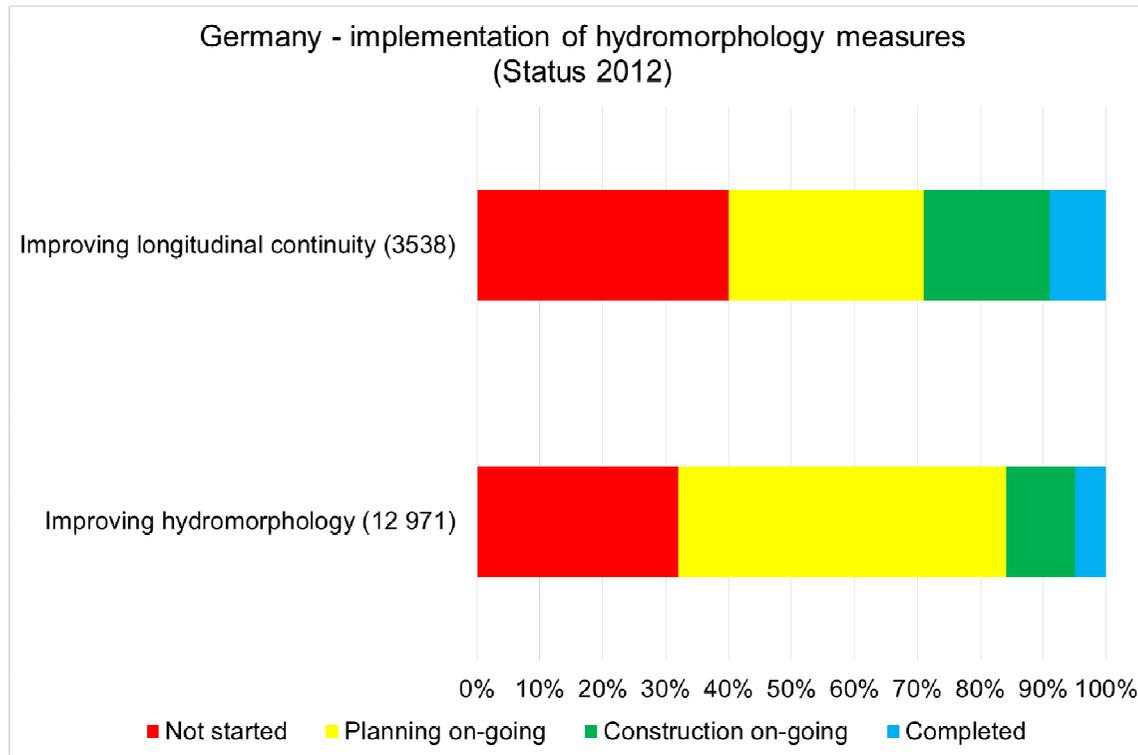
**KTM 6: : Improving hydromorphological conditions of water bodies other than longitudinal continuity**  
 (e.g. river restoration, improvement of riparian areas, removal of hard embankments, reconnecting rivers to floodplains)



16 out of  
22 MS

Source: Preliminary results State of implementation of measures in 2012 (WFD art. 12)

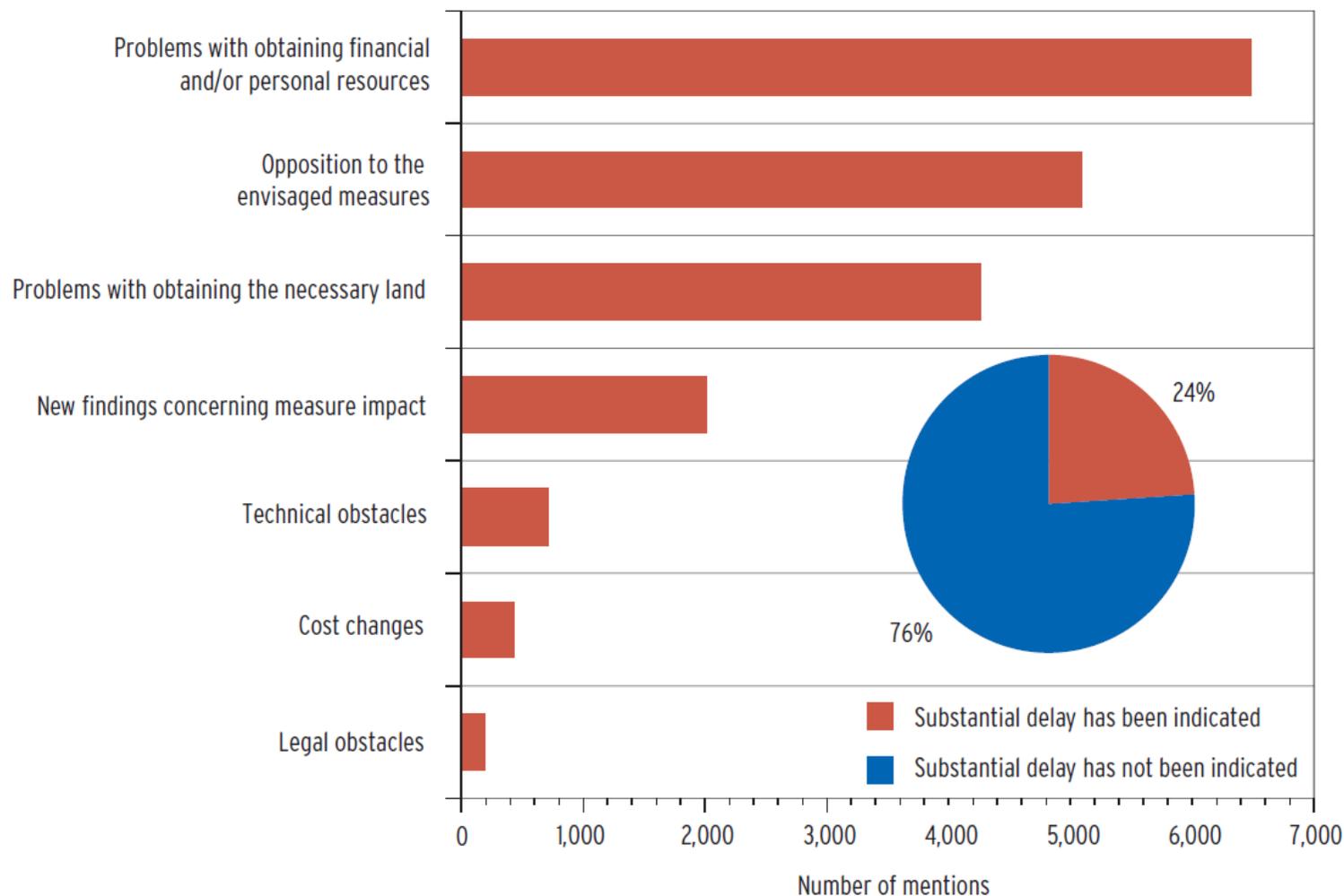
# Germany



## Improving hydromorphology (12 971 measures envisaged)

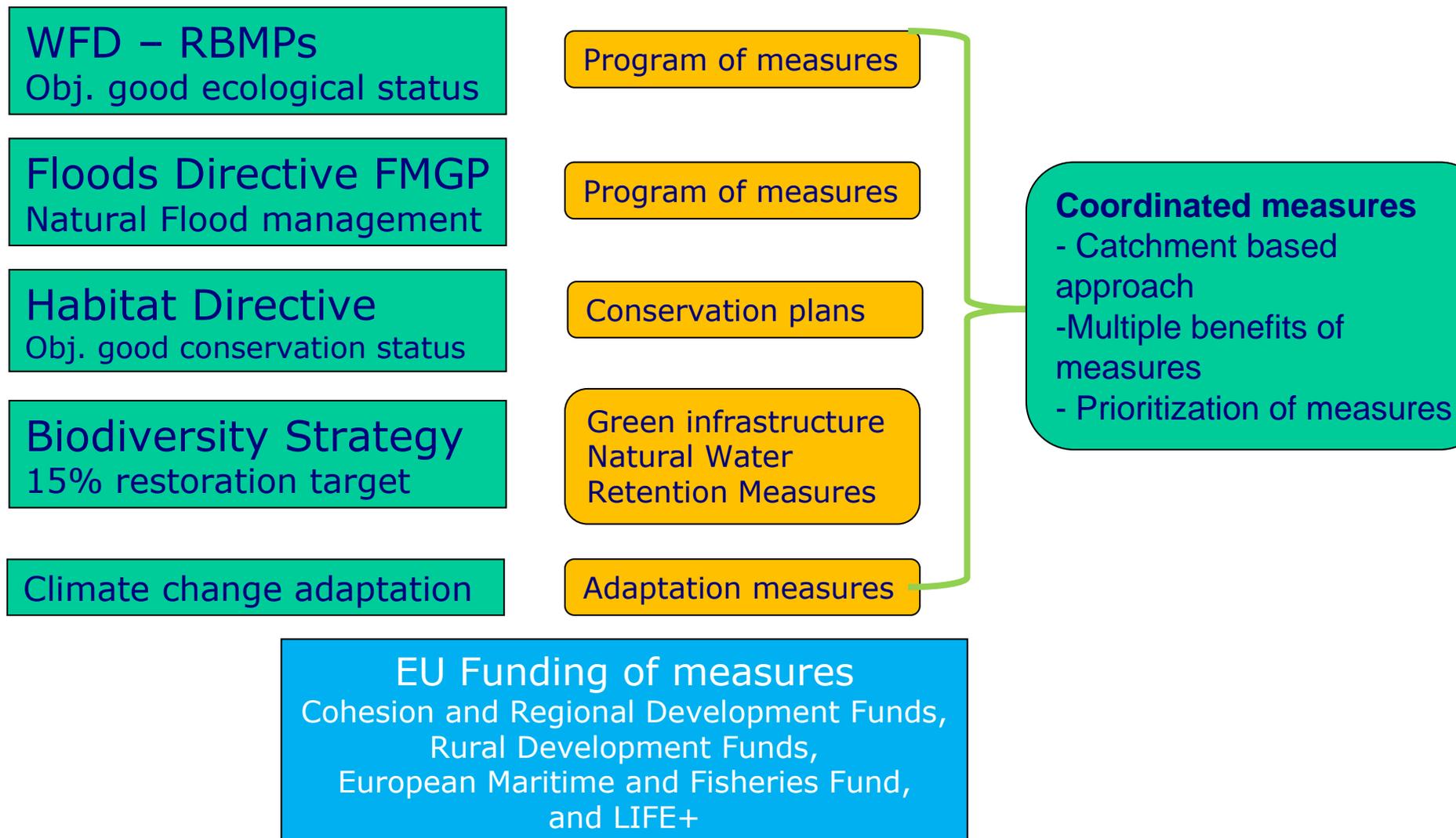
- 2300 measures involving optimization of water body maintenance
- 2000 measures involving riverbank habitat improvement
- 1775 measures involving water body habitat improvement through watercourse and/or bank/river bottom modification
- 1600 measures involving initiation of or allowing dynamic water body development
- 1500 measures involving habitat improvement in developing corridors including floodplain development
- 1400 measures involving water body vitalization within the existing profile

# Germany - Delays in the implementation of measures for 2015 objectives, and reasons for these delays





# Coordinated policies to promote river restoration



RDPs water priorities are to achieve WFD objectives

In order to protect and develop aquatic fauna and flora, the EMFF may support: *the rehabilitation of inland waters in accordance with WFD, including spawning grounds and migration routes for migratory species,*

# National programs to coordinate and fund hydromorphological measures

The first RBMPs were in many countries a primer for coordinated programs for funding hydromorphological measures – some examples below

- Austria – Different WFD amendments to the Water Act – including a program for making transverse structures passable
  - 27/06/14 - €55 million in federal funding for drinking water and wastewater, flood control and water ecology were approved... In aquatic ecology, there are 124 projects with a federal subsidy of about €13 million.
- Denmark
  - Funding of stream restoration in the period 2012-15 - €10 million per year
  - 08/04/14 – €93 million euros reserved for funding PoMs in 2<sup>nd</sup> RBMPs (around 250 € per kilometer water course)
- Finland - National Fish Pass Strategy [Link](#) & Regulated Rivers Research Programme [Link](#)
- Ireland
  - Environmental River Enhancement Programme [Link](#) - The programme focuses on the enhancement of drained salmonid rivers in Ireland and is related to RBMP and PoM
  - PoMs were focused on ensuring good conservation status of pearl mussel (*Margaritifera margaritifera* – Habitat Directive Annex II species)
- England: Catchment Restoration Fund (2012-2015 - A fund of up to £28 million)
- Scotland - Water Environment Fund (£2 million – 2013/14)

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Source: [AT](#), [DK1](#), [DK](#), [England](#), [Scotland](#)

# Towards next RBMPs cycle

Better reporting of

- Hydromorphological pressures
- Hydromorphological measures

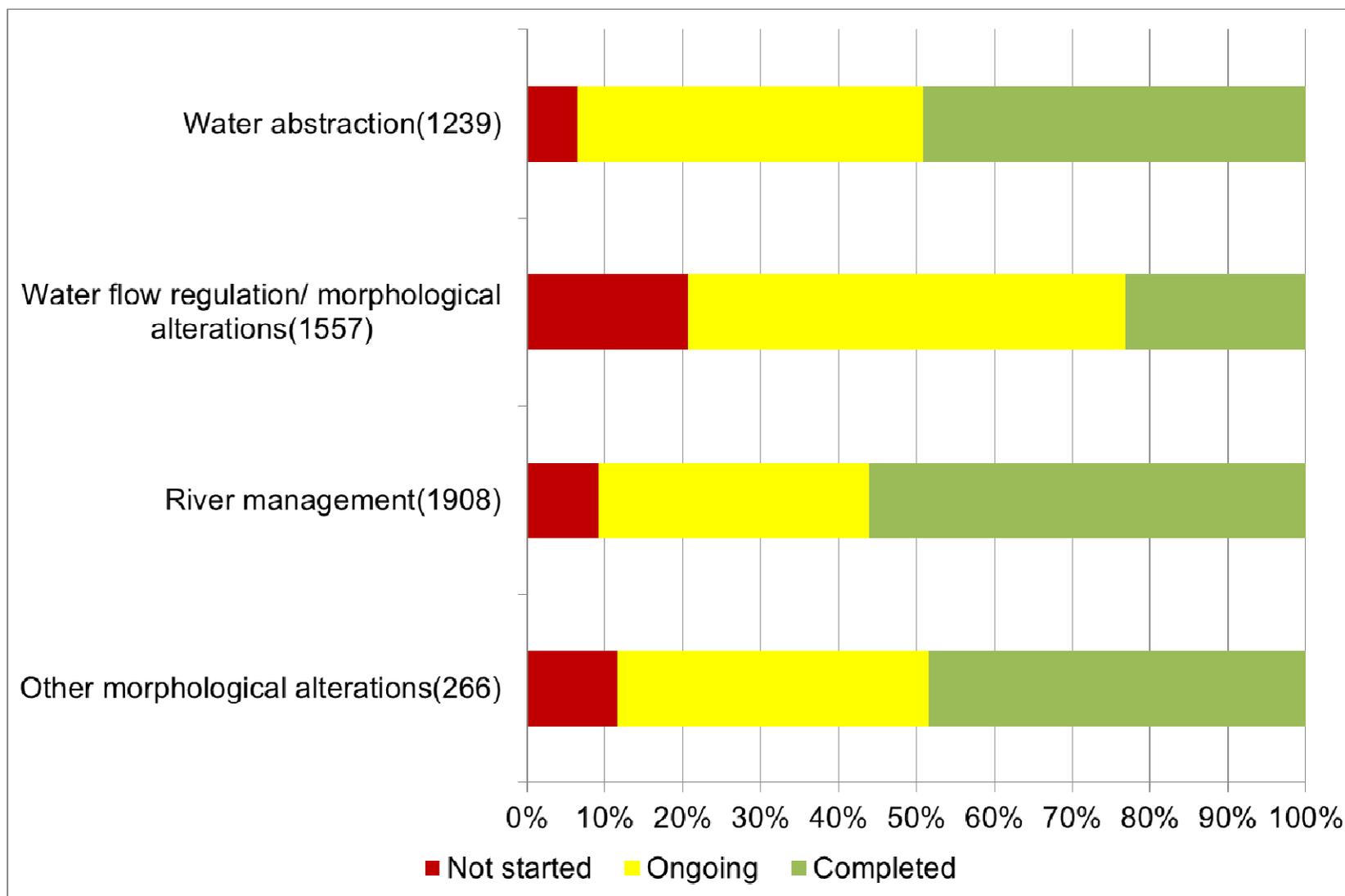
*(WFD Reporting Guidance 2016)*

- Better linkage of pressure, status and measures
  - Are the measures identified sufficient to achieve good status?
- Coordination of measures between Nature Directives and WFD
  - Restoring and preserving aquatic ecosystems has multiple benefits for the WFD and Habitat Directive: this includes activities such as 'making room for the river', river restoration or floodplain rehabilitation.
- EU biodiversity strategy, by 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15 % of degraded ecosystems.



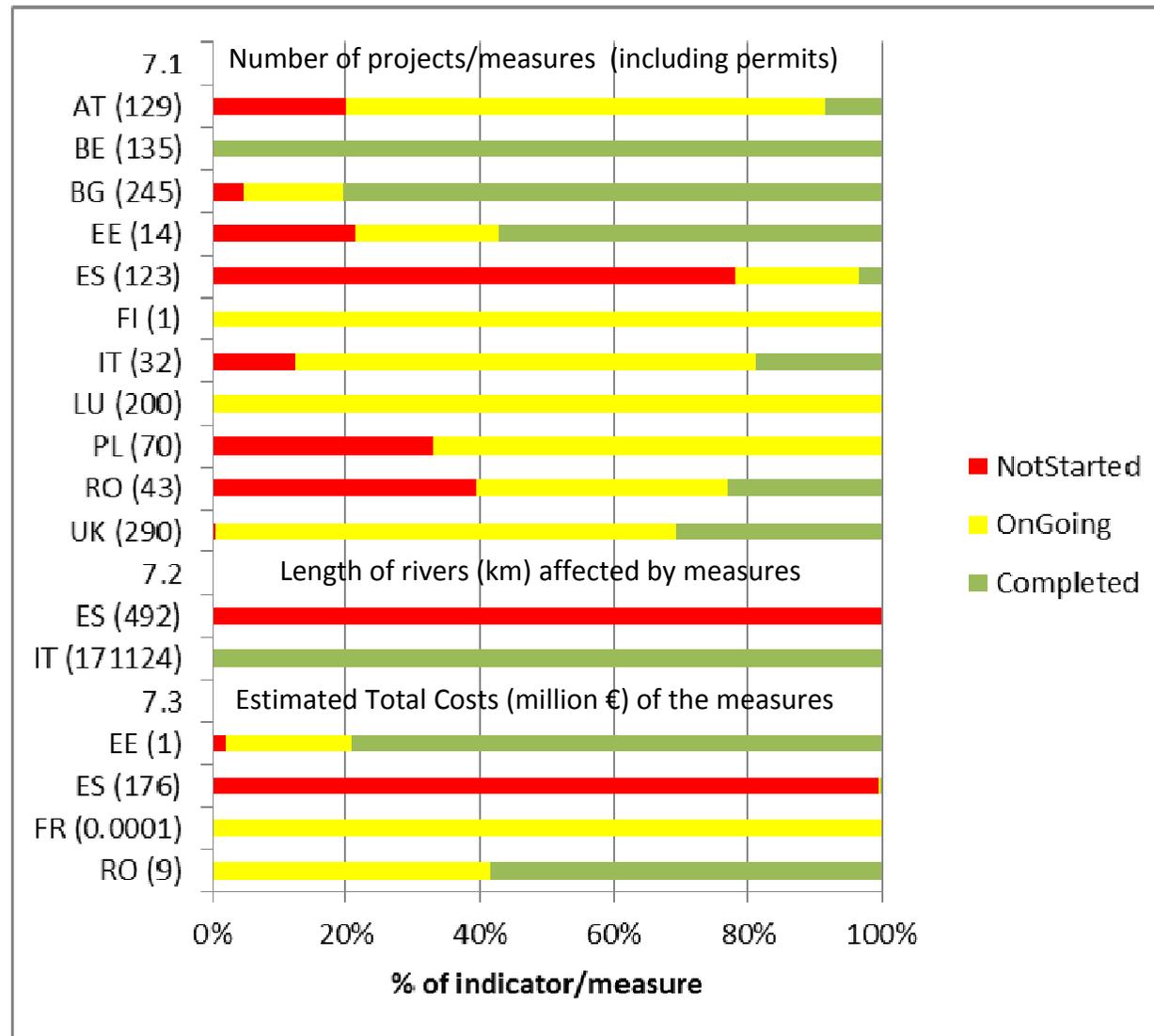


## State of implementation of hydromorphological measures in 2012 by pressures on surface waters (22 MS)



Source: WRc presentation at WG PoM November 2013

## KTM 7: Improvements in flow regime and/or establishment of minimum ecological flow.



12 out of  
22 MS

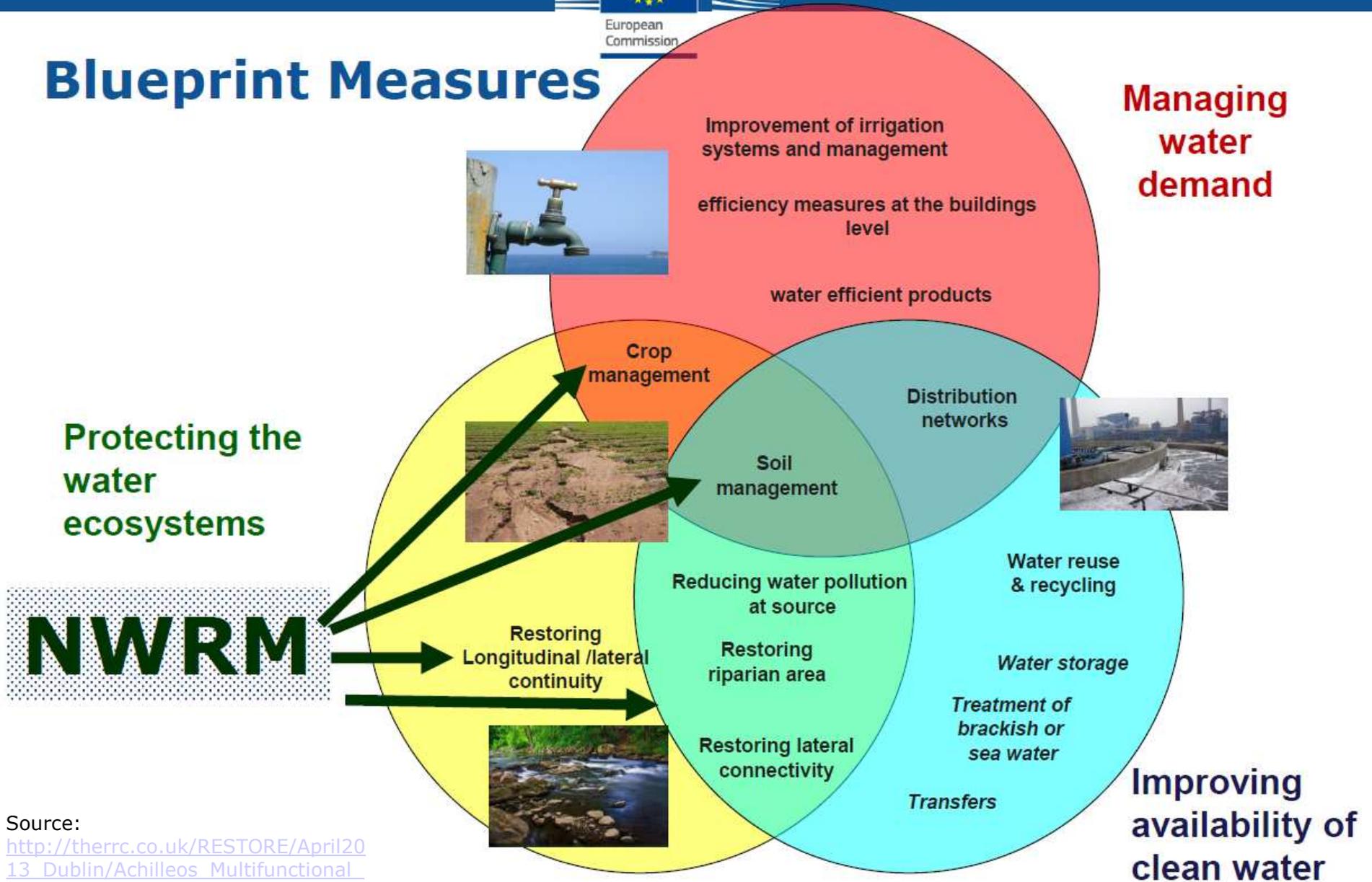
DRAFT Guidance document  
on Ecological Flows

Source: Preliminary results State of implementation of measures in 2012 (WFD art. 12)

Tabell 4. Antalet tilläggsåtgärder för Byggnad i vattendrag, restaurering och vattenreglering (planeringsobjekt och genomförandeobjekt) i vattenvården för planeringsperioden (2010–2015) fördelat på olika år.

Åtgärdsklass	2010–2012		2013–2015		Sammanlagt	
	Plan.	Utf.	Plan.	Utf.	Plan.	Utf.
Restaurering av eutrofierade sjöar och havsvikar (objekt)	95	61	47	104	142	165
Restaurering av livsmiljön i strömvattendrag (vattenförekomster)	43	14	17	32	60	45
Åtgärder som underlättar fiskars vandring (st.)	46	9	32	22	78	31
Restaurering av små vattendrag (objekt)	138	38	61	92	199	130
Utvecklande av regleringsförfarande (antal)	18	6	11	8	29	14
Förbättrande av förmågan att uppta vatten hos avrinningsområden (antal)	6	0	5	2	11	2
Restaurering av Natura-områden som försetts med beteckningen särskilda områden (ha)	62	1 085	62	1 085	124	2 170
Övriga restaureringsåtgärder (objekt)	19	8	10	15	29	23

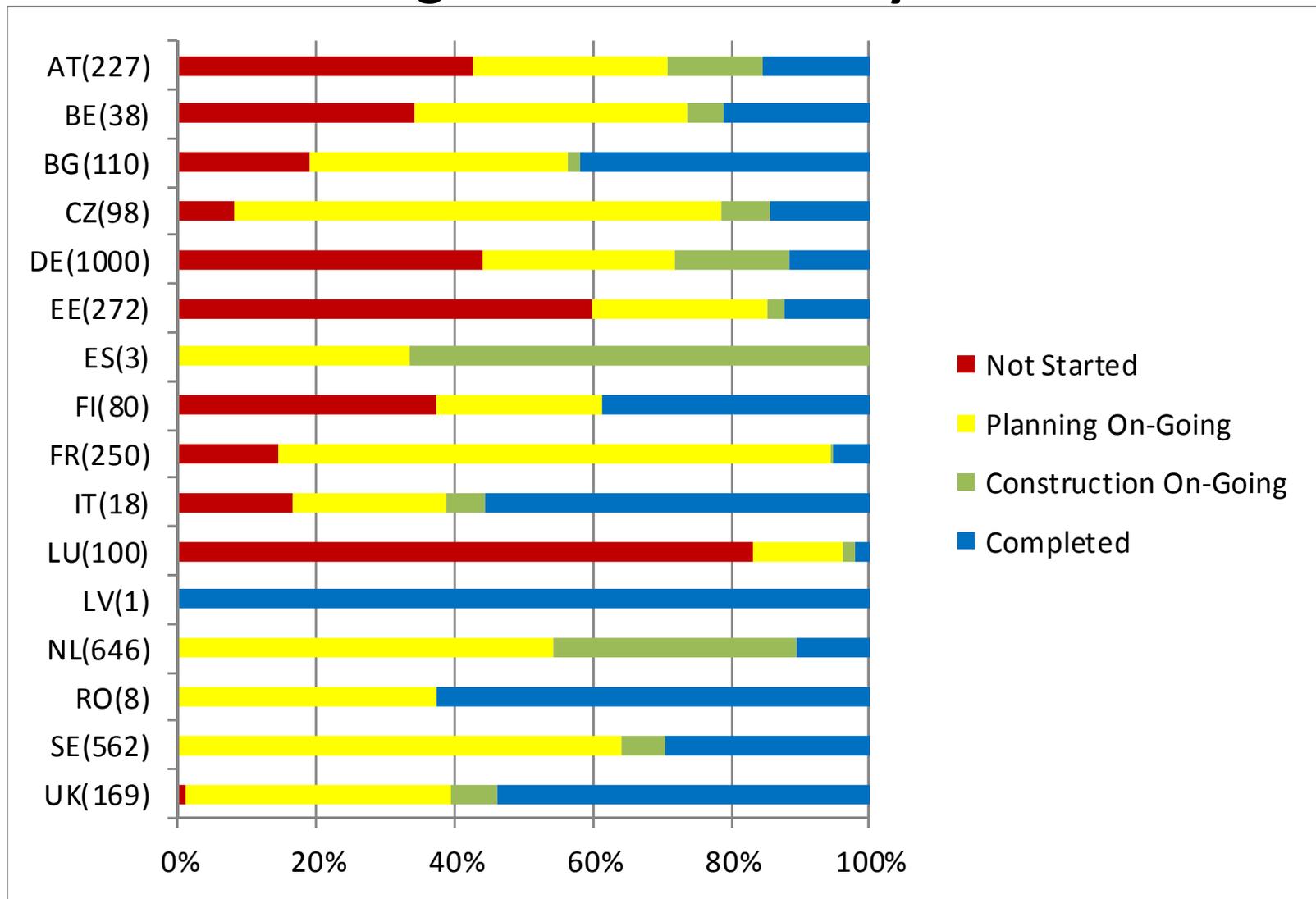
# Blueprint Measures



Source:  
[http://therrc.co.uk/RESTORE/April2013\\_Dublin/Achilleos\\_Multifunctional\\_measures\\_for\\_WFD\\_FD.pdf](http://therrc.co.uk/RESTORE/April2013_Dublin/Achilleos_Multifunctional_measures_for_WFD_FD.pdf)

# KTM 5: Improving longitudinal continuity

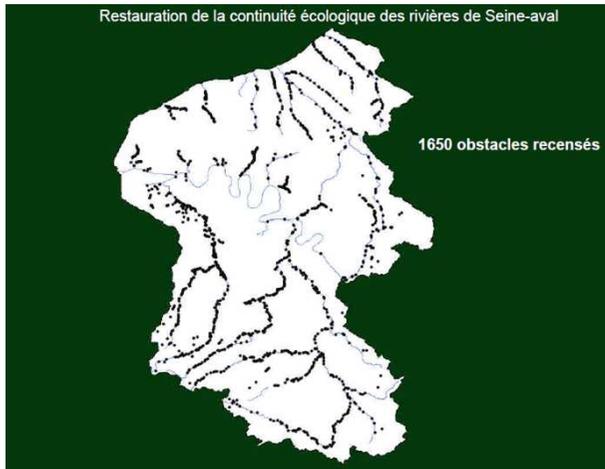
## Indicator 5.1: Number of projects/measures to improve longitudinal continuity



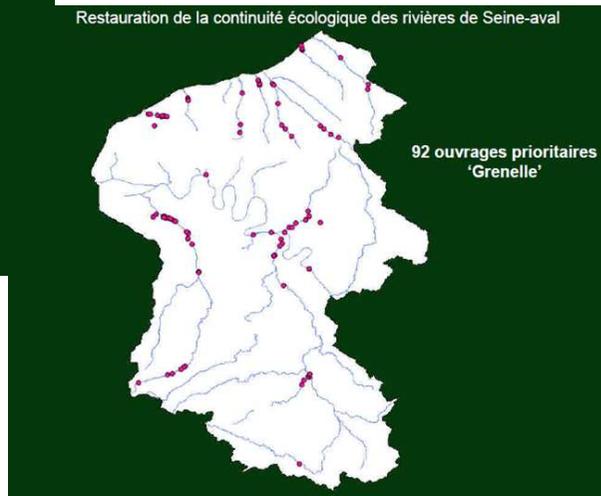
Source: WRc presentation at WG PoM November 2013

# Seine-aval (sub-unit) River Basin District

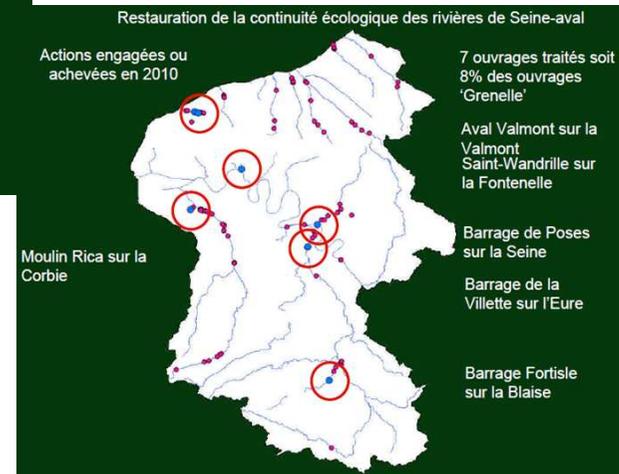
1650 transverse structures



92 priorities transverse structures



Status 2010 – 7 projects completed



Source: [http://www.eau-seine-normandie.fr/fileadmin/mediatheque/seine-aval/COMITER/20110609/EXPOSE-4\\_OUVRAGES\\_FC.pdf](http://www.eau-seine-normandie.fr/fileadmin/mediatheque/seine-aval/COMITER/20110609/EXPOSE-4_OUVRAGES_FC.pdf)

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