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Catchment management of Irish rivers and the role of hydromorphology

CIEEM Irish Conference 2019: Wading into Water

28th February 2019

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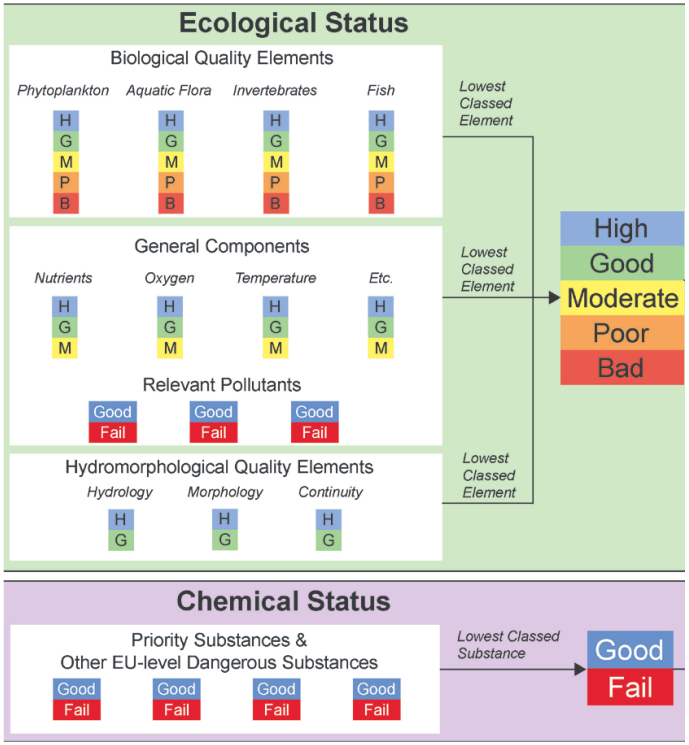
EPA Catchments Unit

Water Framework Directive

- Most important piece of water legislation to-date
  - Protect, enhance, restore, prevent deterioration
  - Ensure sustainable use of resources
  - Achieve compliance with the requirements for designated protected areas
- River Basin Planning cycle – every 6 years
- All water bodies to achieve **Good** ecological status by 2015
- Huge investment made but no overall improvement – new approach needed!



WFD: 1st cycle to 2nd cycle changes

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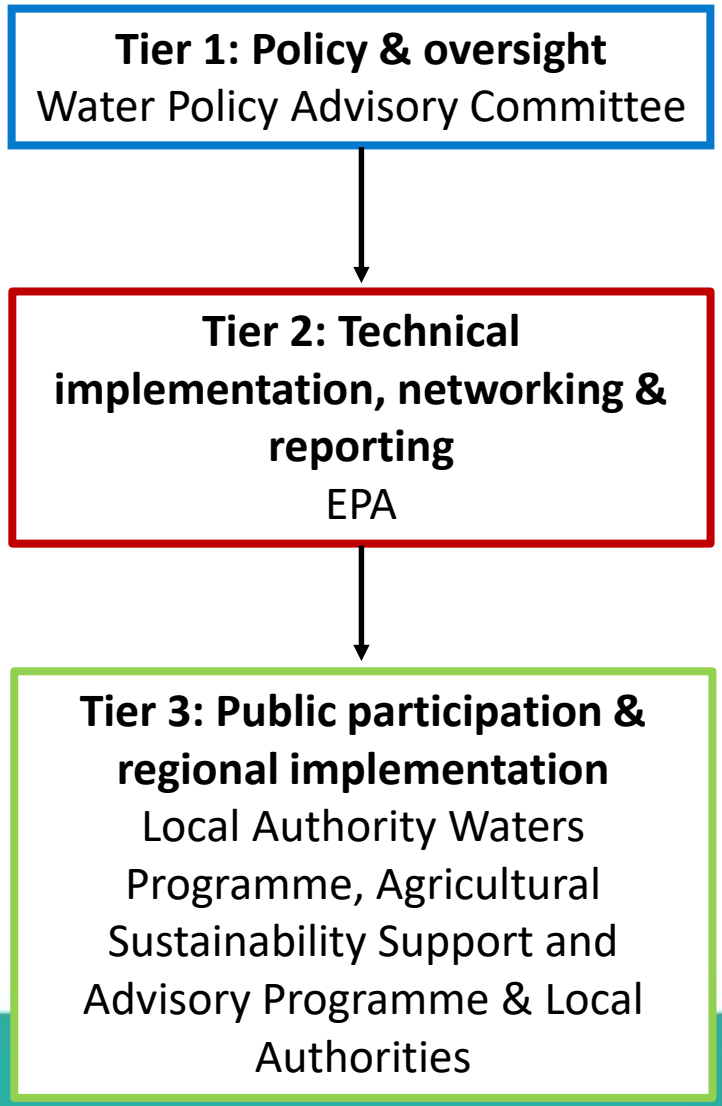
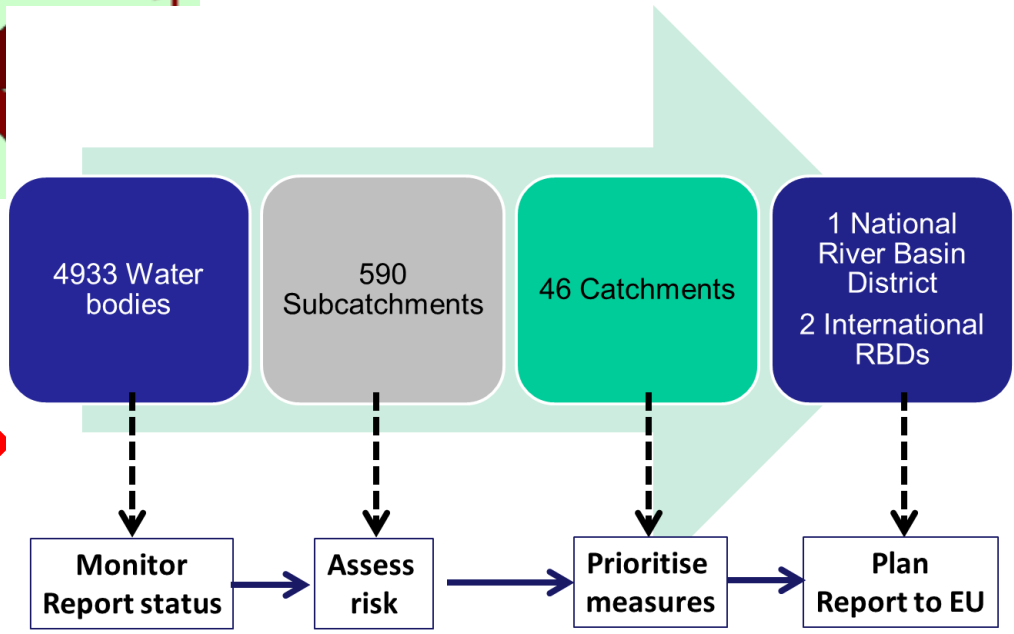
- 1 national river basin district, 2 international districts
- Plans developed by DHPLG, supported by EPA
- Promoting an Integrated Catchment Management approach
- Focus on public and community engagement and involvement
- EPA Catchments Unit established in 2014
- New governance model for implementation



Water Framework Directive



Characterisation approach - evidence based

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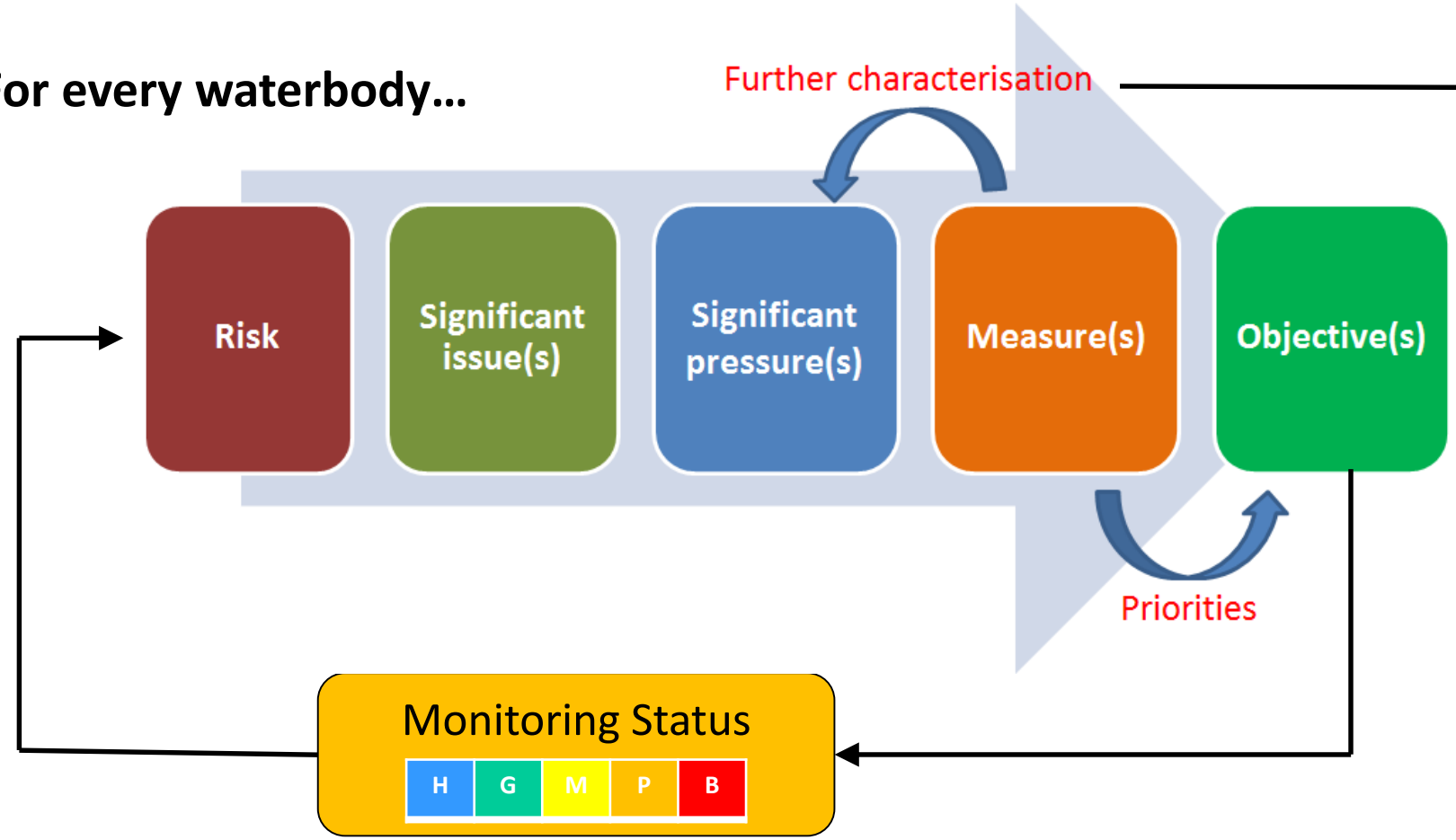
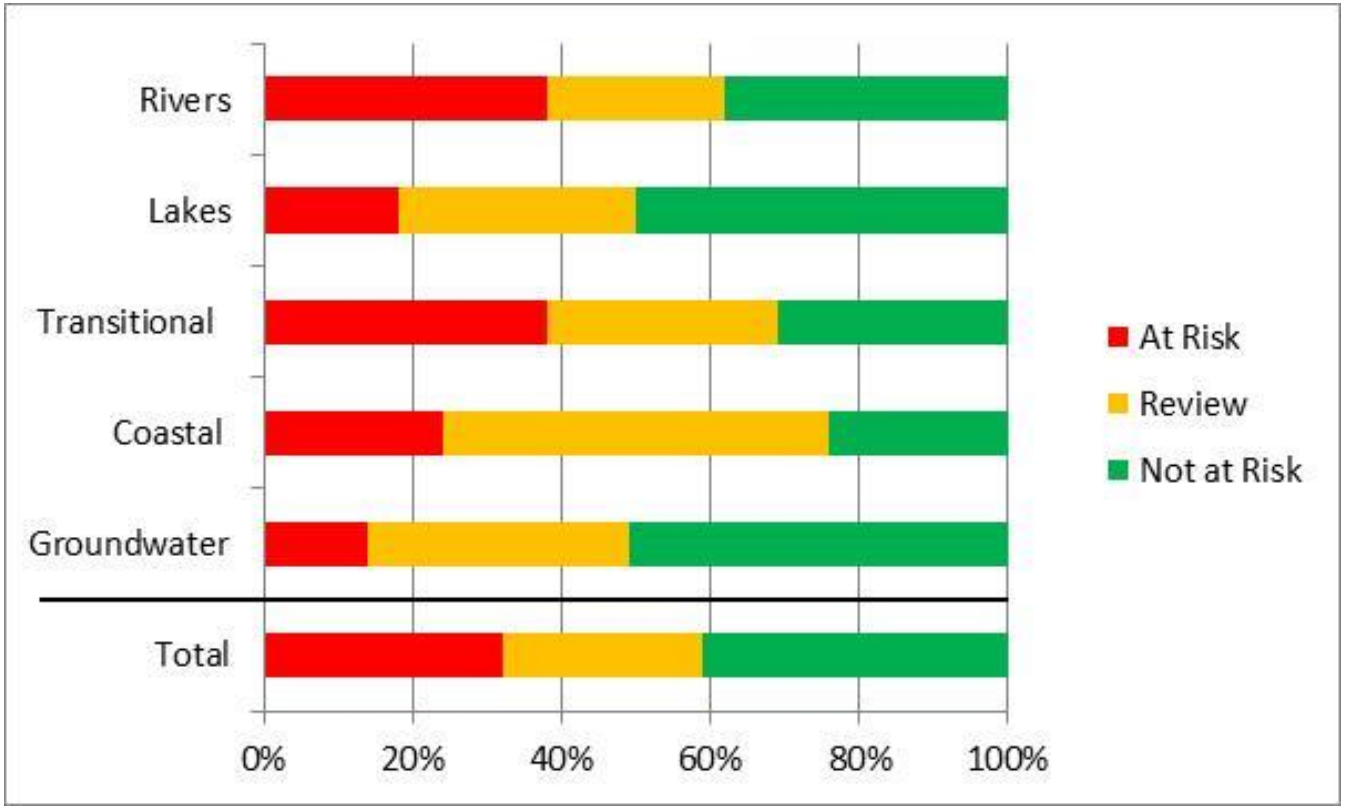
For every waterbody…



Local Catchment Assessments
189 Prioritised Areas for Action

Aiming for '*The right measure in the right place*'

Risk assessment outcomes



Approximately one third of all waterbodies are *At Risk* of not achieving WFD objectives and need additional action

Risk assessment outcomes: Significant pressures

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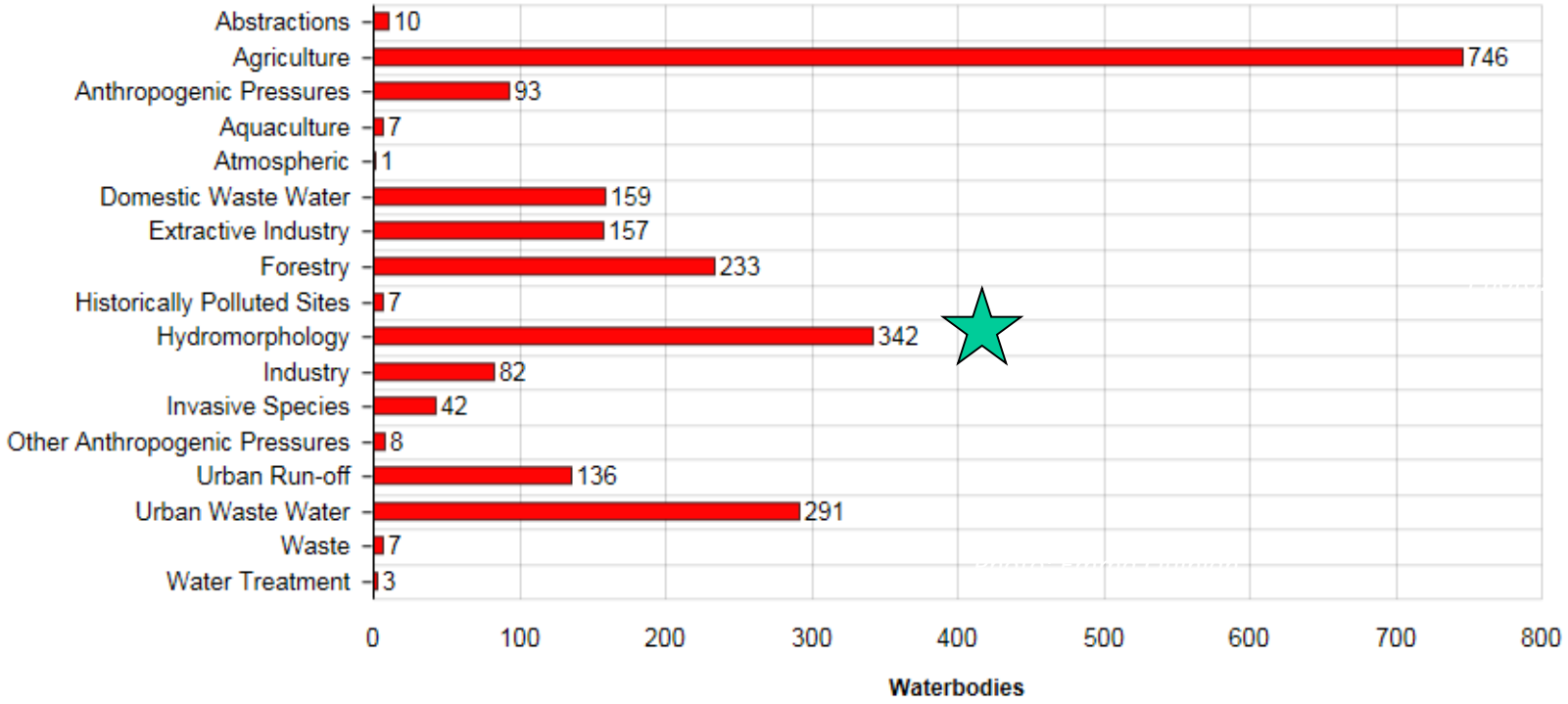


Photo: Emma Quinlan


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Actions and outcomes

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	Principal Actions
1	Existing regulations, which (i) provide for EIA to mitigate the impact of planned land-use changes on waters and (ii) reduced the exempted-development threshold for drainage of wetlands from 20 ha. to 0.1 ha., will continue to contribute to protecting surface waters from deterioration.
2	The EPA will improve assessment methods and knowledge of the physical condition of surface waters through a number of actions, including the development of a Morphological-Quality Index for Irish rivers and enhanced use of GIS for assessing lakes, transitional waters and coastal waters.
3	The EPA, with the support of other agencies, will develop the necessary evidence base for establishing the link between physical integrity of water bodies and ecological status. The EPA will also define appropriate environmental supporting conditions with regard to hydromorphology.
4	IFI will lead a multi-stakeholder programme that will collect and collate data to support the development of an inventory of barriers to fish migration nationally.
5	Mitigation measures incorporated in the OPW drainage maintenance programme will be applied for all such works.
6	The Minister for Housing, Planning and Local Government will establish a Steering Group to review and make recommendations on improving fish passage throughout the Shannon catchment within the period of this Plan.
7	A series of 4 EPA research projects related to hydromorphology (SILTFLUX, COSAINT, DETECT and RECONNECT) will be completed, and their outputs will be used to inform future actions to mitigate the impact of hydromorphological impacts.

	Expected Outcomes
255	Urban waste-water treatment projects progressed
€73m	Invested to reduce water leakage by 61million m³ *per annum*. Reduce leakage from 45% - 38%
30	Sustainability advisors in place to deliver the Agricultural Sustainability Support and Advisory Programme
43	Technical personnel deployed to regionally-based Local Authorities Water Support and Advisory Teams
23,000	Farmers will receive sustainability advice under the Dairy Sustainability Initiative and the Agricultural Sustainability Support and Advisory Programme
4,000	Inspections under the National Inspection Plan for Domestic Waste Water Treatment Systems
3,000+	Water abstractions registered and an authorisation system implemented
	Guidance for planning authorities on physical planning and the Water Framework Directive
726	Water bodies to achieve general water quality improvements
152	Water bodies to experience improved water quality status

River Basin Management Plan for Ireland, 2018-2021: www.housing.gov.ie

EPA National Hydromorphology Workplan

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EPA Focus

Steps	2017		2018		2019		2020		2021	
1. Improve knowledge of hydromorphology-ecology relationships										
2. Develop assessment tools										
3. Assess hydromorphological condition										
4. Review heavily modified designations										
5. Develop key indicators and agree a monitoring programme										
6. Identify appropriate measures										
7. Develop and agree a prioritised restoration programme										
8. Develop environmental quality standards										
9. Adapt tools for assessing impacts of proposed developments										

Develop in 2nd cycle, implement in 3rd cycle

Assessment of Hydromorphological Pressures on Rivers: Morphological Quality Index (MQI)

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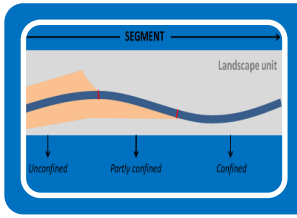


Step 1: Reach Identification / Typology

Most technically challenging

Step 2: Data Capture/ Digitising

Most resource demanding

Morphological Quality class	MQI score
High	0.85 ≤ MQI ≤ 1
Good	0.7 ≤ MQI < 0.85
Moderate	0.5 ≤ MQI < 0.7
Poor	0.3 ≤ MQI < 0.5
Bad	0 ≤ MQI < 0.3

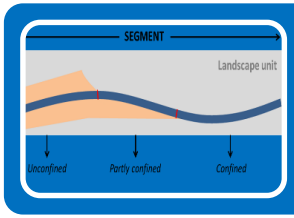
Step 3: Calculating Indicators and Condition Assessment Score

Requires most expert input

Step 4: Engagement and Decision Support

Stakeholder engagement

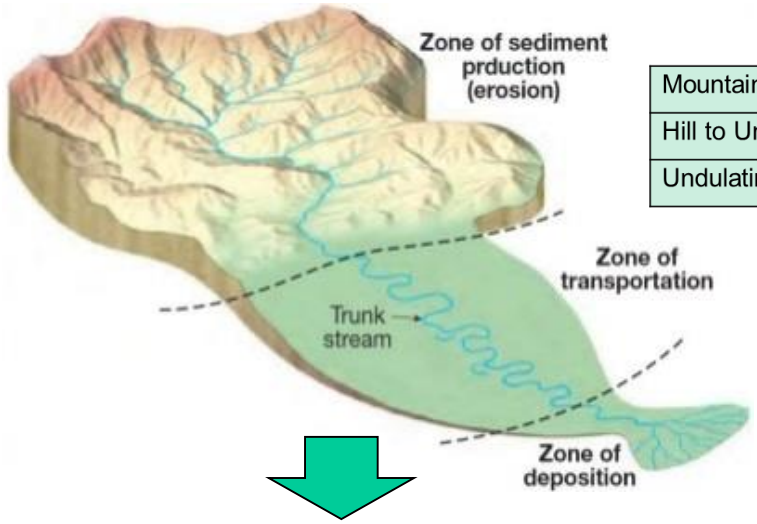
National overview of morphological condition, 60,000km of river channel



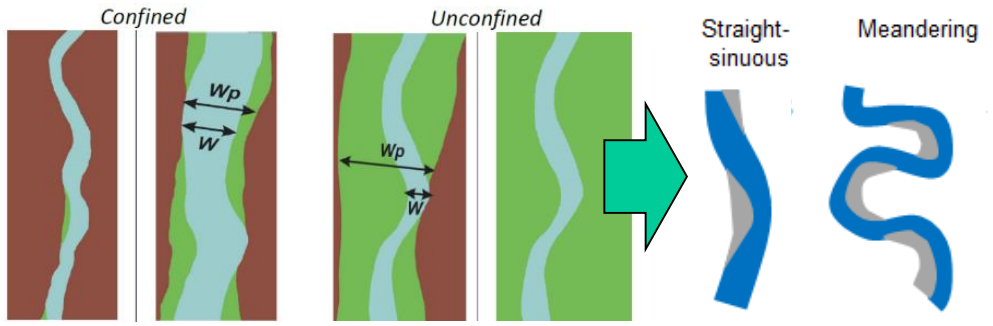
Step 1: Reach Identification / Typology

Most technically challenging

- River Reaches are categorised by their landscape setting, floodplain interactions, and channel pattern.
- Process automation ongoing.
- Outputs support river-type specific measures – *right measure in the right place.*



Mountain to Hill	
Hill to Undulating	
Undulating to Flat	



Step 2: Data Capture/ Digitising

Most resource demanding

- Identification of natural features……
  - E.g. riparian vegetation, floodplain features
- and hydromorphological pressures
  - E.g. weirs, dams, bridges, modification, drainage schemes, permeable surfaces
- With support of:
  - current remote sensing imagery;
  - present day and historical mapping;
  - extracting data and;
  - manual digitising (where necessary)

Farmbridge crossing a river:

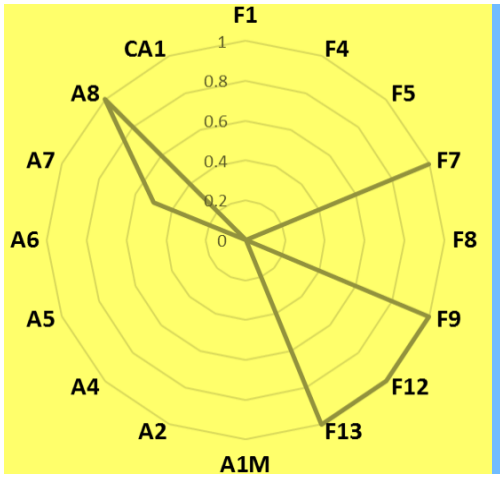
Morphological Quality
High
Good
Moderate
Poor
Bad

Step 3: Calculating Indicators and Condition Assessment Score

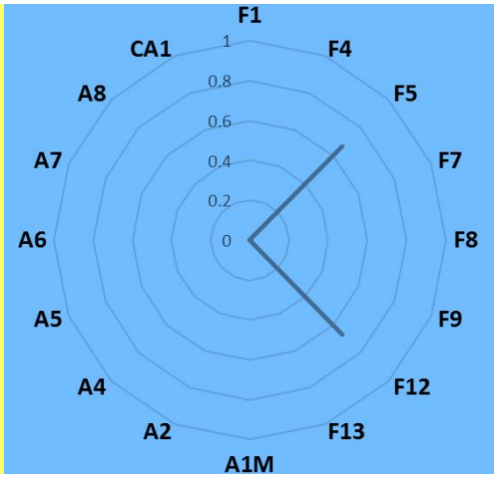
Requires most expert input

Functionality
Artificiality
Channel **A**djustment

Channelised reach, MQI= 0.6



Natural reach, MQI= 0.95



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→ automation in progress - condition assessment completed nationally by end of 2019.

Step 4: Engagement and Decision Support

Stakeholder engagement

- National overview
  - targets areas of significant hydromorphological impacts and where further investigation required
- MQI provides a strong diagnostic capability and baseline assessment
- Output will support:

Steps	2017		2018		2019		2020		2021	
4. Review heavily modified designations										
5. Develop key indicators and agree a monitoring programme										
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9. Adapt tools for assessing impacts of proposed developments										

Lake and TraC Hydromorphology

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Lakes:

- Lake Morphological Impact Assessment Tool (**MImAS**) since 2007
- GIS, remote sensing and groundtruthing over last 3 years for **224** lakes
- **19 pressure metrics** relating to the water levels, shoreline, structures and land use
- Development of further metrics of lake hydromorphology in 2019 to support WFD

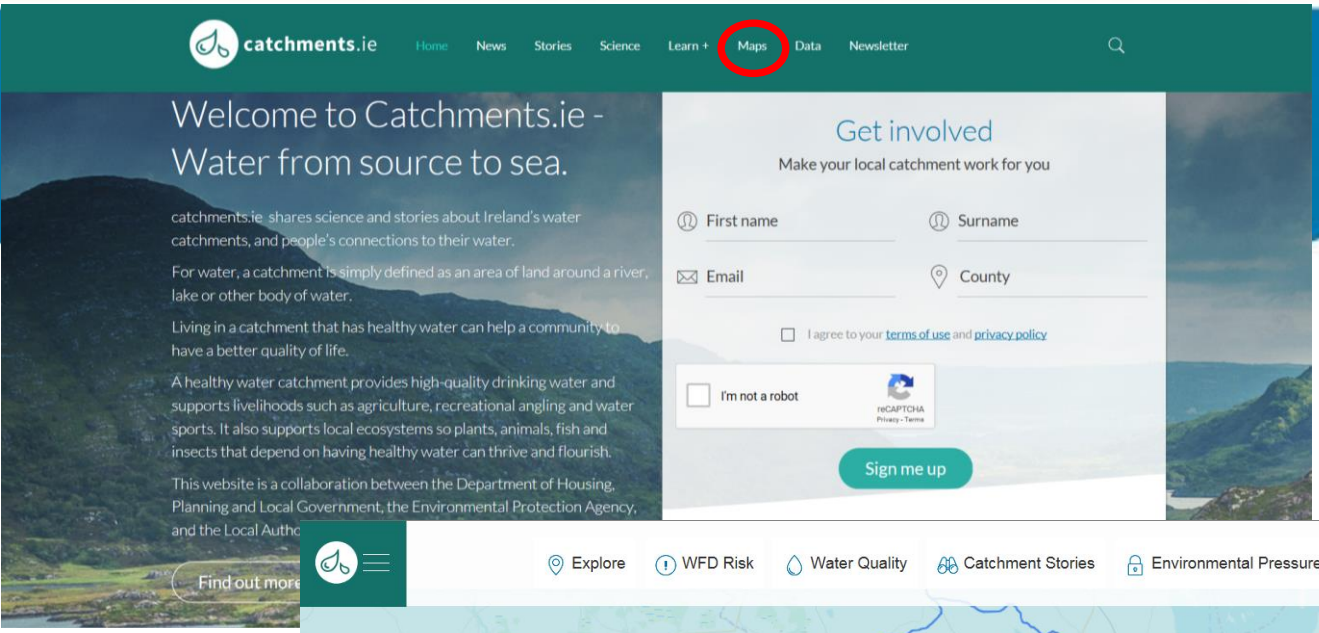

Photo: W. Trodd

Transitional and Coastal:

- Hydromorphological Quality Index (**HQI**; developed in-house)
- In line with European guidance on assessing the hydromorphological features of transitional and coastal waters (EN 16503:2014)
- 13 metrics
  - 4 GIS based
    - e.g. shoreline alterations, barriers, geology
  - 9 from monitoring data
    - e.g. changes to salinity, tidal/wave regime, river flows

Summary

- Adopting integrated catchment management approach – multi-disciplined, collaborative, evidence based.
- Prioritising resources and ensuring measures and environmental objectives are scientifically robust and achievable.
- WFD is cyclical so work is ongoing - work for third cycle (2021-2027) is already underway!
- Major focus on hydromorphology - improved hydromorphological tools in combination with the proposed monitoring programme will support the River Basin Management Plan's priorities and principle actions.
- Gaps still need to be addressed! There is a need to better understand the linkages between hydromorphology and ecology in all Member States.



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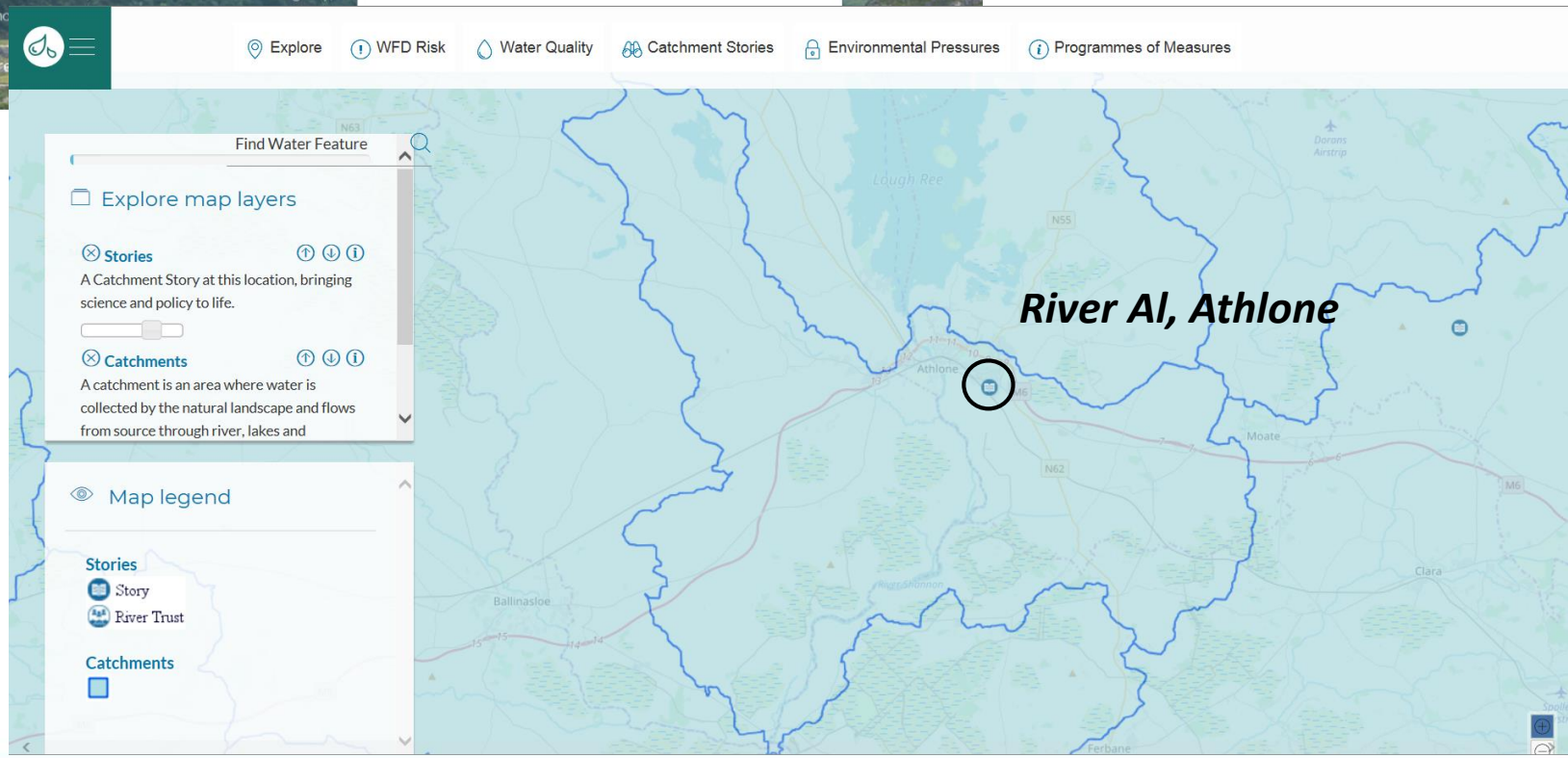
Public information:

www.catchments.ie



See also EPA Geoportal for data and maps: *https://gis.epa.ie*

Additional information

www.catchment.ie

hello@catchments.ie

Thank you

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Irish MQI Indicators

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Indicator Code	Indicator Name	
F1	Longitudinal continuity in sediment and wood flux	Functionality
F3	Hillslope-river corridor connectivity	
F4	Processes of bank retreat	
F5	Presence of a potentially erodible corridor	
F7	Planform pattern	
F8	Presence of typical fluvial landforms in the floodplain	
F9	Variability of the cross section	
F12	Width of functional vegetation	
F13	Linear extension of functional vegetation	
$A1_M$	Upstream alteration of flows	Artificiality
$A1_H$	Upstream alteration of flows (Hydro-component)	
A2	Upstream alteration of sediment discharges	
A4	Alteration of sediment discharge in the reach	
A5	Crossing structures	
A6	Bank protection	
A7	Artificial levees	
A8	Artificial changes of the river course	
CA1	Adjustments in channel pattern	Channel adjustment
CA2	Adjustments in channel width	

BODY TYPE	HYDROMORPHOLOGICAL QUALITY ELEMENTS	
Rivers	Hydrological regime	• quantity and dynamics of water flow • connection to groundwater bodies
	River continuity	• longitudinal and lateral connectivity
	Morphological conditions	• river depth and width variation • structure and substrate of the river bed • structure of the riparian zone
Lakes	Hydrological regime	• quantity and dynamics of water flow • residence time • connection to the groundwater body
	Morphological conditions	• lake depth variation • quantity, structure and substrate of the lake bed • structure of the lake shore
Transitional waters	Morphological conditions	• depth variation • quantity, structure and substrate of the bed • structure of the intertidal zone
	Tidal regime	• freshwater flow • wave exposure
Coastal waters	Morphological conditions	• depth variation • structure and substrate of the coastal bed • structure of the intertidal zone
	Tidal regime	• direction of dominant currents • wave exposure