

An aerial night photograph of a city featuring a canal and a modern, illuminated pedestrian bridge. The bridge has a white, curved top and is lit from below, with its lights reflecting in the water. In the background, there are various city buildings, some with lights on, and a large building with a white, arched roof structure. The overall scene is a mix of urban architecture and natural water features.

# Assessing ecological impacts of abstractions and impoundments – lessons and challenges

Environment Ireland 18–19 January 2022

Dr Eliot Taylor

**APEM** Group

# Introducing your speaker



## **Dr Eliot Taylor, Divisional Director Ireland**

Freshwater ecologist and water resources expert with 30+ years' experience in the UK, various African countries and Ireland. Has focussed on Integrated Water Resources and Catchment Management, with an emphasis on hydro-ecology. Has been involved in the assessment of the ecological impacts of numerous abstractions, discharges, impoundments and in-river flow requirements.



# We are specialists in freshwater, marine, terrestrial and geospatial data.

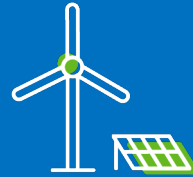
The APEM Group are a global environmental consultancy providing independent advice and guidance to support government and environmental regulatory guidelines.

Our integrated expert approach covers all areas of the natural environment, enhanced with innovative remote sensing technology and world-class laboratory services to provide advice reinforced by data excellence.

# The industries that we work with



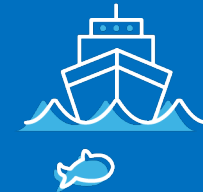
**Water**



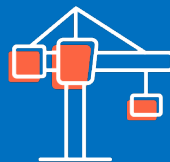
**Renewables**



**Power & Utilities**



**Marine & Ports**



**Construction &  
Development**



**Transport**



**Environmental**

- Our Irish Offices are located at 2 sites; in Cork and Sligo
- The Sligo office is that of Woodrow, acquired in July 2021 to further strengthen our offering in Ireland
- We work with Irish Water, the EPA, Inland Fisheries, Waterways Ireland, County Councils and numerous larger consultancy forms
- We have approx. 30 staff spanning Terrestrial, Freshwater and Marine Ecological disciplines and business support roles
- Our UK teams are located across 9 sites in England, Wales and Scotland
- They consist of another circa 270 staff also spanning multiple roles
- APEM was the Water Industry Awards Consultancy of the 2019, and was shortlisted in 2020 and again in 2021



# My talk outline

- What is sustainable abstraction and why does it matter?
- How do we assess the impacts of abstraction?
- What developments have there been in assessment methods
- Outcomes and case studies
- Beyond abstraction reduction
- Remaining challenges

# What is sustainable abstraction?

- United Nations Brundtland Commission 1987 defined sustainability as *“Meeting the needs of the present, without compromising the ability of future generations to meet their own needs.”*
- In 1992, at the International Conference on Water and the Environment (ICWE) in Dublin, it was recognised that:  
  
*“Scarcity and misuse of freshwater pose a serious and growing threat to sustainable development and protection of the environment. Human health and welfare, food security, industrial development and the ecosystems on which they depend, are all at risk, unless water is managed more effectively in the present decade and beyond than they have been in the past”*
- Principle No. 1 of the Dublin Statement was that freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment  
  
*“...Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems. Effective management links land and water uses across the whole of a catchment area or groundwater aquifer”*
- The Environmental Protection Agency (EPA) defines water abstraction as:  
  
*“...the removal or diversion of water from a river, lake, stream, spring, groundwater well, borehole or estuary, for any purpose”*
- Sustainable abstraction could be defined as *“Balancing current human water needs with those of the environment and future generations”*

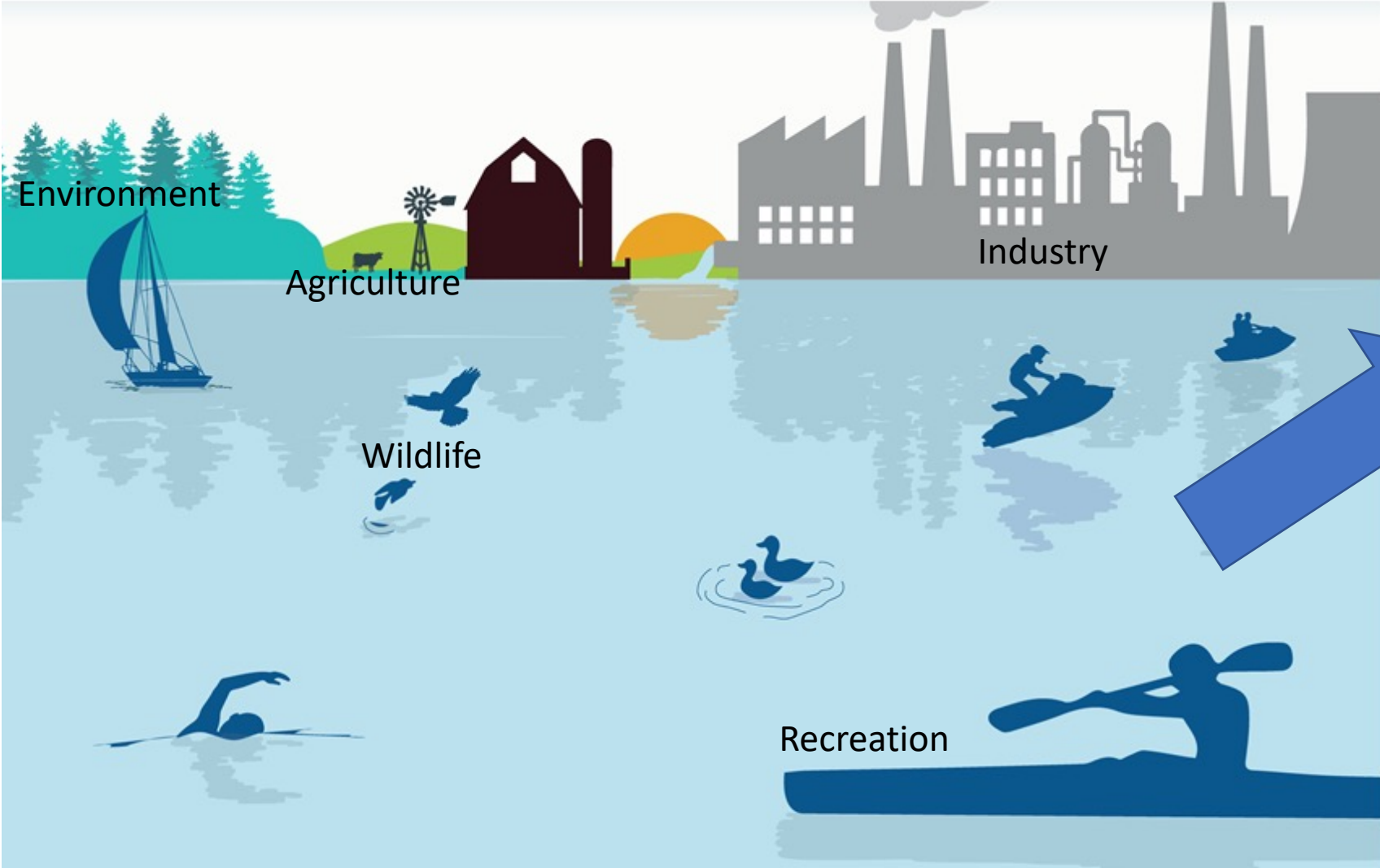
# What is sustainable abstraction?

## SUSTAINABLE DEVELOPMENT GOALS





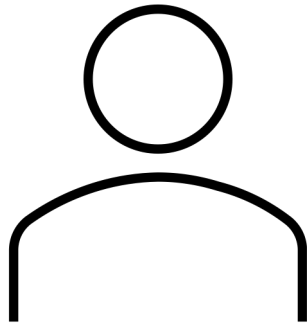
# What is water needed for?



Domestic

# Public water supply

ROI  
consumption

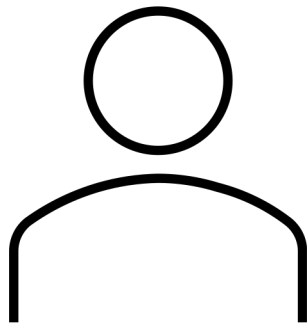


133 litres  
per day



349 litres  
per day

UK  
consumption

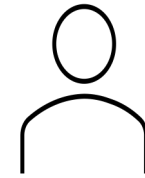


140 litres  
per day



560 litres  
per day

USA Consumption



= 373 litres



= 1,364 litres

World Health Organisation (WHO) states that **between 50 and 100 litres of water per person per day** are needed to ensure that most basic needs are met, and to ensure few health concerns arise

# Why does sustainable abstraction matter?

- Water scarcity affects more than 40% of the world's population  
<https://www.un.org/sustainabledevelopment/water-and-sanitation/>
- Ireland Climate Projections indicate that rainfall will increase in winter and decrease in summer, with more intense storms
- EPA states that *“Climate projections for the next century indicate changes in wind speeds and storm tracks; increased likelihood of river and coastal flooding; changes in the distribution of plant and animal species and in the phenology (the timing of lifecycle events) of native species; water stress for crops, pressure on water supply and adverse impacts on water quality and negative impacts on human health and wellbeing”*  
[What impact will climate change have on Ireland? | Environmental Protection Agency \(epa.ie\)](#)

Sir James Bevan, Chief Executive of the English Environment Agency, in a conference speech in March 2019 entitled “Escaping the jaws of death” noted that

*“...on the present projections, many parts of our country will face significant water deficits by 2050, particularly in the southeast where much of the UK population lives.”*



# Addressing the challenge - a changing focus

- 1990s Maintaining low flows – making sure rivers didn't dry out
- 2000s Introducing variability – maintaining (creating) some low, high and 'maintenance' flows
- 2010s
  - Looking for alternatives – can abstraction be reduced or moved
  - Preventing deterioration – in WFD status
- 2020s
  - Building resilience – through catchment management, natural flood management and nature-based solutions
  - Compound solutions to achieve multiple benefits – a mix of all the above

Ultimately, though, it all comes back to how to best apportion resources when there is scarcity – who/what deserves how much. When compared against our own needs for water, how much water does a river / the environment need?

# How much water does a river need?

WFD21d  
Final Rep  
July 2012

Literature review of the influence of large impoundments on downstream temperature, water quality and ecology, with reference to the Water Framework Directive

Scottish Environmental Protection Agency  
APEM Ref: 413570  
March 2015

Hannah Austin, David Bradley, Iain Stewart-Russon and Nigel Milner

Ecological indicators of the effects of abstraction and flow regulation; and optimisation of flow releases from water storage reservoirs




WFD 122 (WP 1)  
Final Report  
April 2013



Field trialling ecological indicators of water resource pressure

Physical habitat estimation for ecological river flow requirements

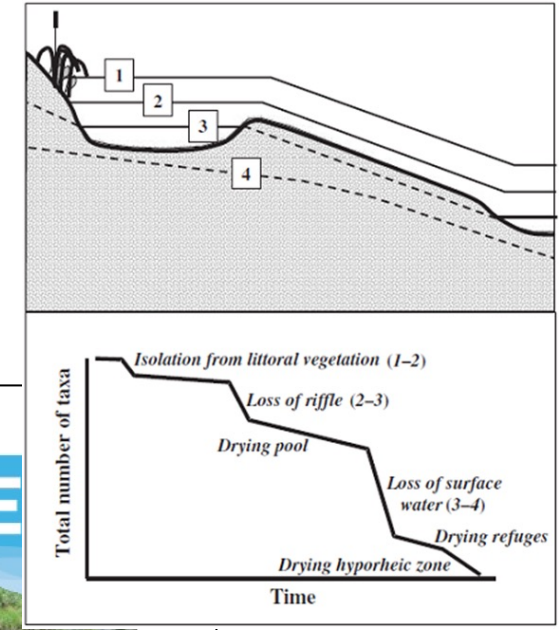
WFD 122 (WP 1)  
Final Report  
August 2013

Literature review of short-term flow reduction ecological impacts and recovery: R16115QQ

Scottish Environmental Protection Agency  
APEM Ref: P00001488  
September 2017

Rick Hayes, Hannah Austin, Daniel Cadman, David Bradley, and Nigel Milner



# How much water does a river need?

- How much water can you take out of the environment before you start to cause damaging impacts?
- Does this vary depending on the type of watercourse, the flow percentile or the time of year?
- Can you abstract over a very short-term period without causing a long-term ecological impact?
- Can you disentangle the effects of water quality from those of water quantity or hydromorphology?
- If you have an impoundment with no downstream flow, do the risks to water quality and temperature outweigh the benefits of provision of flow?

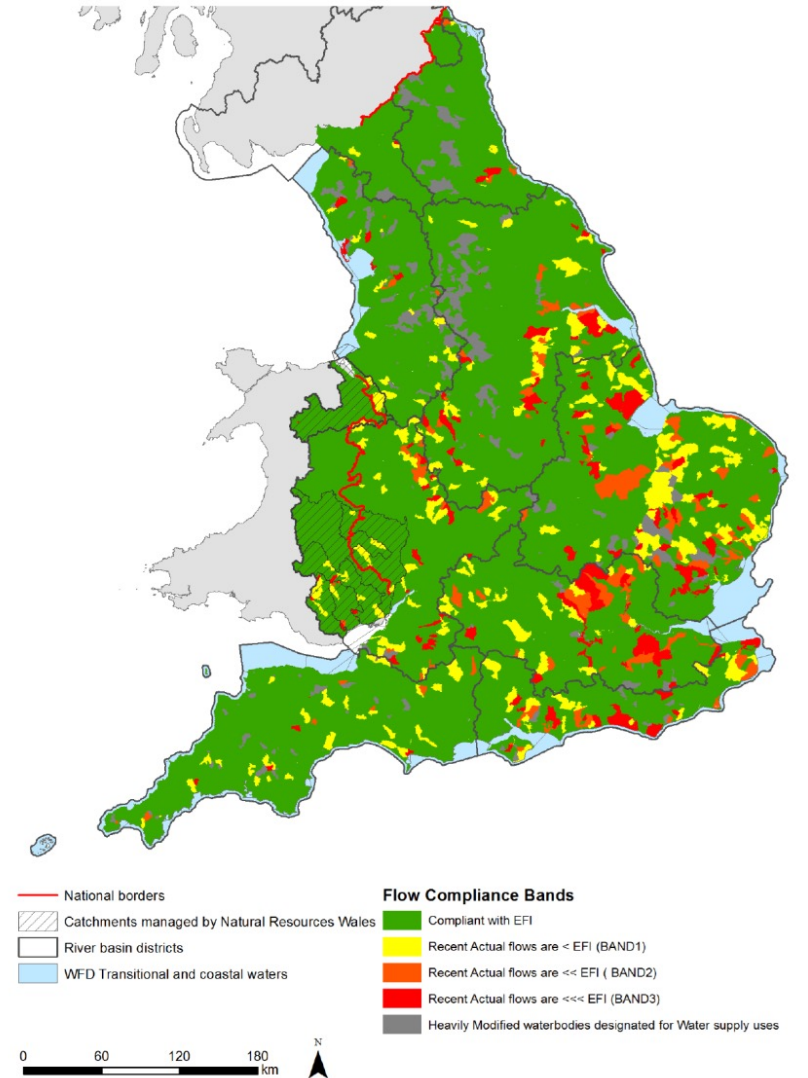
# Assessing the impacts of abstraction

- Ireland still very much at the start of this process
- Water Environment (Abstractions) Bill was subject to Pre-Legislative Scrutiny 20 October 2020 – this included a provision for:
  - EPA to be able to determine whether an abstraction might be “significant” irrespective of volume, i.e. an abstraction that causes the water body in question to be at risk, or potentially be at risk, from over-abstraction, resulting in its failing to achieve its environmental objectives or placing it at risk of failing to achieve those objectives
- 29 Jan 2021, the Joint Committee launched its Report on this, identifying several issues and recommendations, e.g.
  - The threshold for registration be lowered to 10 cubic metres in line with those in similar biogeographical location
  - The licensing thresholds to be lowered from 2,000 cubic metres per day to 20 cubic metres per day in line with similar jurisdictions



# Assessing the impacts of abstraction

- In England, the Environment Agency uses the 'Environmental Flow Indicator' (EFI) to indicate potential impact of abstraction on river habitats and species that requires further investigation
- This is basically a % deviation from natural flows with a level of confidence
- If flow is greater than the EFI for that water body, it is assumed that it provides Good Ecological Status (GES) under Water Framework Directive (WFD)
- EFI now applied as a default for assessing the **impact of abstraction on flows**, unless there is better locally agreed information





# Assessing the impacts of abstraction

**Environmental Flow Indicator**  
Application of the EFI for Water Resources licensing  
Position Statement  
Issued 04/12/17

**Environmental assessment for water company drought planning supplementary guidance**  
External guidance: LIT 56303  
Published: July 2020

**Guidance on water resources investigations into the risk of WFD water body deterioration**  
January 2018

In the UK, the EA now suggests the use of hydro-ecological models:

- (i) to develop local flow constraints as alternative to the EFI
- (ii) to demonstrate that abstraction growth will not cause ecological deterioration, and
- (iii) when undertaking environmental assessments of drought permits

My colleague, Dr Andrew Davey, will speak in more detail on this, in our 1st webinar of 2022 entitled ‘How much water does a river need – do statistics have the answer?’

You can register for that by following this link:  
<https://okt.to/txkhn5>

# Beyond abstraction reduction



# Lessons learned

## Holistic

Don't just focus on one aspect of the flow regime, and also, don't just focus on the flow regime alone

## Evidence

Base your decisions on local data, evidence and knowledge

## Monitor

When you make a change, allow time to monitor the effects and adjust your approach

## Time

Try to think long term – don't expect an immediate response

A scenic landscape featuring a person fly fishing in a mountain stream. The person is standing on a rocky bank, casting a line into the water. The stream flows over rocks, creating white water rapids. The background shows lush green hills and mountains under a cloudy sky.

Thank you

Any questions?

**APEM** Group