

Acclimatize



www.acclimatize.eu





Gerry Galvin

Chief Technical Officer, Irish Water

Dublin and Dublin Bay
Threats and Opportunities



ACCLIMATIZE: Dublin & Dublin Bay

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Chief Technical Officer, Irish Water

12th October 2017



- **Established July 2013**
- **Took responsibility for water services from 1st January 2014**
- **Serving 3.3 Million people & 220,000 businesses**
- **Water Supply output 1.6 billion litres per day**
- **856 treatment plants**
- **63,000 km of watermains**
- **Wastewater – over 1,000 plants**
- **25,000 km of public sewers**



IRISH WATER
CUSTOMER



A National Utility with One Strategic Plan and One Budget

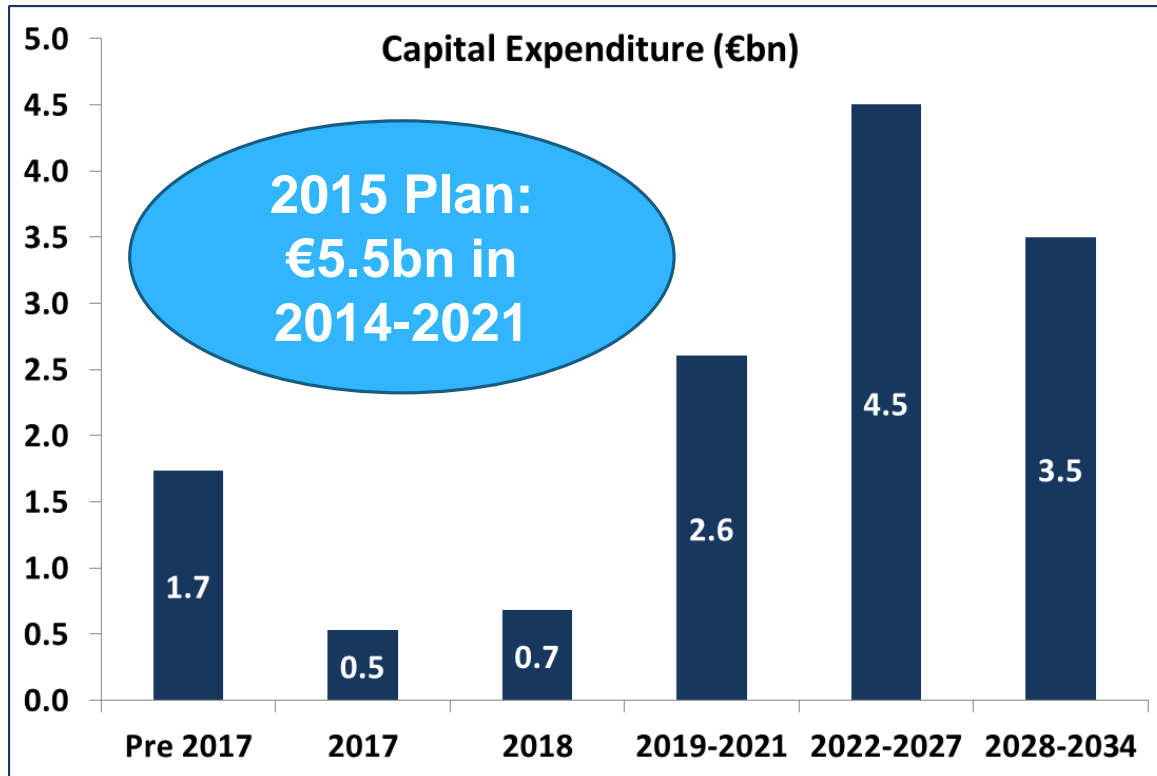
Delivering

- Drinking Water Quality
- Wastewater Quality
- Service Continuity
- Supporting growth



Ensuring the same standard of service for water/wastewater across the country is one of our key goals

We are investing heavily in Capex



1.7	2.2	2.9	5.5	10.0	13.5
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Capital Investment split across 5 strategic aims:

- Ensure a Safe & Reliable Water Supply
- Provide Effective Management of Wastewater
- Protect and Enhance the Environment
- Support Local & Economic Growth
- Non Infrastructure Expenditure

Our plan is to deliver substantial efficiencies



2015 Plan outlined €1.1bn of efficiencies by 2021. Striving to achieve this challenging target.

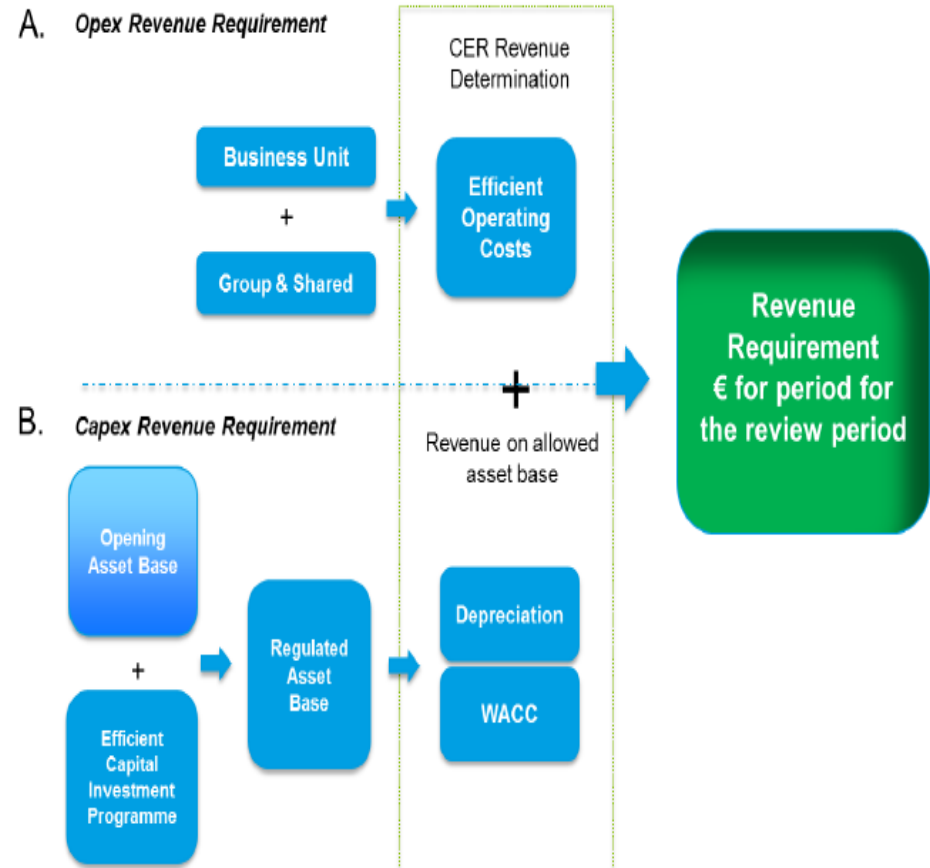
Efficiencies can be delivered by many measures, including:

- **Ways of Working**
- **Implementing the Single Public Utility**
- **Procurement & Economies of Scale**
- **Modern Infrastructure & Invest to save**

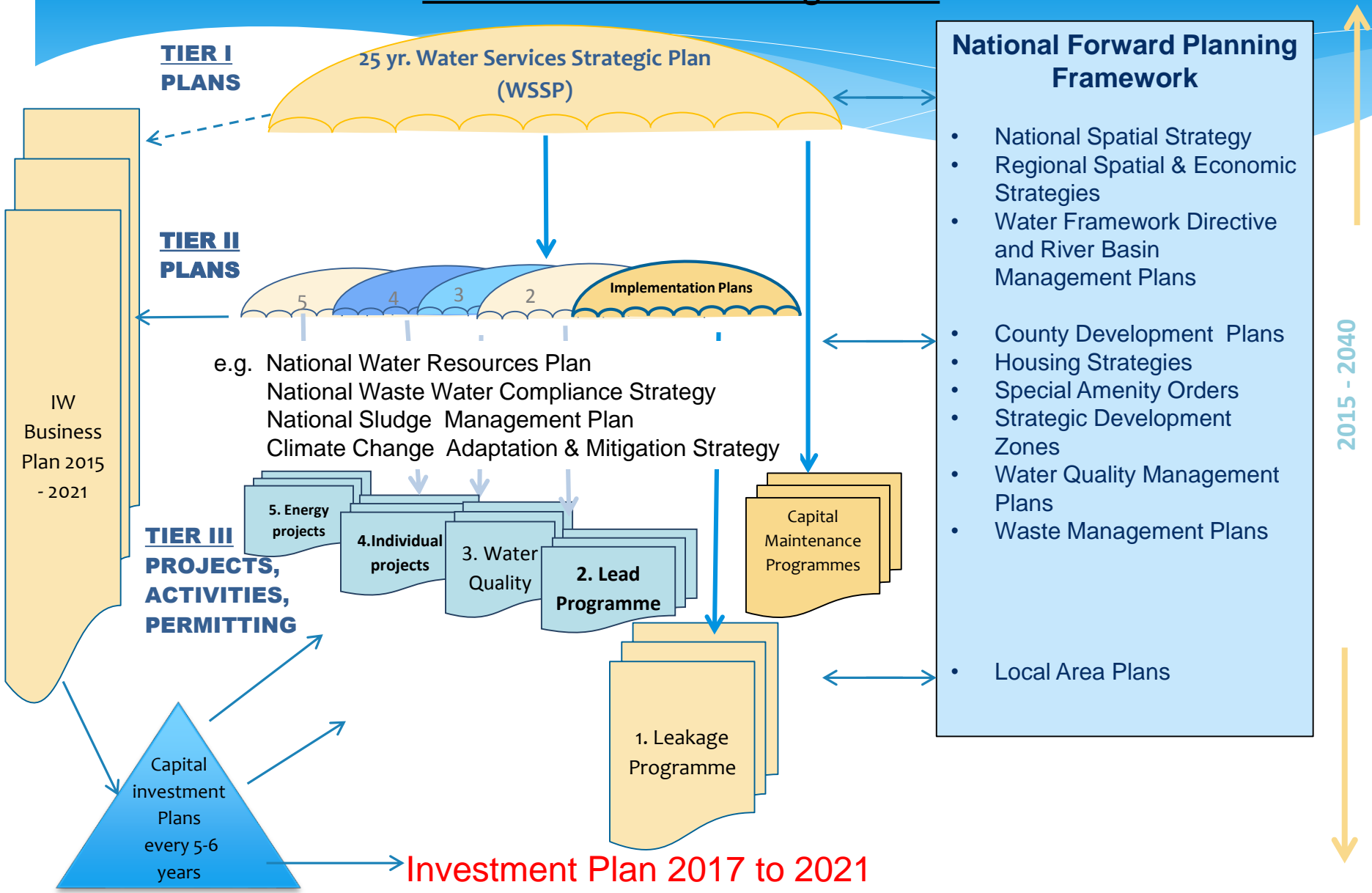
Timely implementation of Single Public Utility to deliver more than €200m per year efficiencies by the end of the Plan

Key Outcomes

- **Public Utility is confirmed**
- **Regulatory model to continue**
- **Funding of domestic services via government funding**
- **Funding of non-domestic services via charges and debt**



Water Services Strategic Plan



The Water Services (No. 2) Act, 2013 provides Ministerial Direction on the form and content of this WSSP and the Minister has set out the requirement for the plan to address the delivery of six strategic objectives as follows:

- **Meet Customer Expectations;**
- **Ensure a Safe and Reliable Water Supply;**
- **Provide Effective Management of Wastewater;**
- **Protect and Enhance the Environment;**
- **Support Social and Economic Growth; *and***
- **Invest in Our Future.**

Provide Effective Management of Wastewater

- **Manage the operation of wastewater facilities in a manner that protects environmental quality.**
- **Manage the availability and resilience of wastewater services now and into the future.**
- **Manage wastewater in an efficient and economic manner.**

Protect and Enhance the Environment

- Ensure that Irish Water services are delivered in a sustainable manner which contributes to the protection of the environment.
- Operate our infrastructure to support the achievement of objectives under the Birds, Habitats and Water Framework Directives.
- Manage all our residual waste in a sustainable manner.

“The standards that we must treat waste water to are getting stricter and pose serious constraints on further developments located in or adjacent to sensitive or protected areas. Stricter standards will also impact significantly on treatment costs. The on-going identification of further “protected areas” under Habitats, Bathing Waters and Shellfish Directives will place additional constraints on the location and quality of waste water discharges. Our challenge is to develop innovative approaches so as to minimise impact of discharges on protected areas at least cost to our customers.”

“Irish Water must develop adaption and mitigation strategies to meet the challenges of climate change. Climate Change Adaptation will require action to both manage the risks and to make adjustments to reduce Irish Water’s vulnerabilities.”

“The provision of clean drinking water and the disposal of wastewater in a manner that protects the environment is vital to our daily lives, and for economic and social development.

However, today Ireland’s national water services are under severe stress and are simply not delivering to the standard required by a modern economy.”

Drinking Water

- supply/demand balance of approx. 5% (compared to other large cities of 15%)
- Leakage – UFW 28% (compared to UK average of 20%)

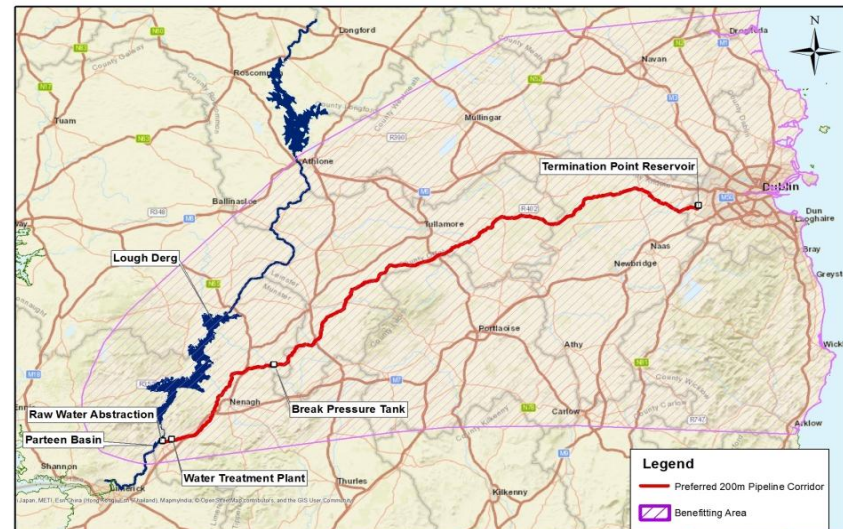
Waste Water

- Collection network capacity
- Treatment plant capacity & effluent quality
- Climate change resilience

Eastern & Midlands Water Supply Project

Irish Water has since 2014 been undertaking technical & environmental studies (including 4 public consultations) to prepare a planning application for the provision of a new water supply to serve the Eastern & Midlands area including the Greater Dublin Area. These studies will be completed by the end of this year.

Irish Water intends to submit planning applications for this project, under strategic infrastructure legislation, to An Bord Pleanála in early 2018.



Irish Water has since 2014 been undertaking comprehensive environmental and technical studies to prepare a planning application for the upgrading of the Ringsend WWTP. Procurement of the 400,000 PE capacity upgrade contract is progressing to programme. Construction is scheduled to start in Q1, 2018 and to be completed in Q1, 2020.

Irish Water intends to submit further planning applications for SBR Retrofit, under strategic infrastructure legislation, to An Bord Pleanála in Q1, 2018.



Irish Water has since 2014 been undertaking comprehensive environmental and technical studies to prepare a planning application for the provision of a new regional waste water treatment facility in Clonshaugh, North Dublin. These studies will be completed by the end of this year.

Irish Water intends to submit planning applications, under strategic infrastructure legislation, to An Bord Pleanála in Q2, 2018.



- Work carried out in the Dublin area will be planned in close coordination with Irish Water & Dublin City Council
- Identify main sources of faecal pollution impacting on Dublin's rivers & streams & the Dublin Bay bathing waters
- Large/medium scale urban environments (Ireland) - Dublin Bay (Sandymount, Merrion, Dollymount strands) & Bray South Promenade
- Suggest cost effective strategies to ameliorate these pressures

- Commitment of in-kind funds amounting to c. €3.8m
- Technical expertise:
 - SME - environmental science & policy regarding the provision of water services
 - SME - hydraulic modelling of wastewater networks
- Provision of InfoWorks CS wastewater network hydraulic models of all sub-catchments in the Dublin Bay catchment area
- Provision of technical expertise from DHI on water quality modelling in Dublin Bay

- Irish Water is committed to the vision set out in our WSSP

“Through responsible stewardship, efficient management and strong partnerships, Ireland has a world-class water infrastructure that ensures secure and sustainable water services, essential for our health, our communities, the economy and the environment”.

- Irish Water is strongly supportive of the Acclimatize project as the outputs will increase our understanding of the sources of pollution impacting on Dublin Bay and enable Irish Water to develop cost effective strategies for mitigation measures

Thank You
Míle Buíochas



John O'Neill

*Principal Officer in the Climate Adaptation, Soil,
GMOs & Chemicals Division of the Department of Communications,
Climate Action & Environment*

*Climate Adaptation Planning in Ireland and the
National Adaptation
Framework*



Acclimatize

UCD - 12th October 2017



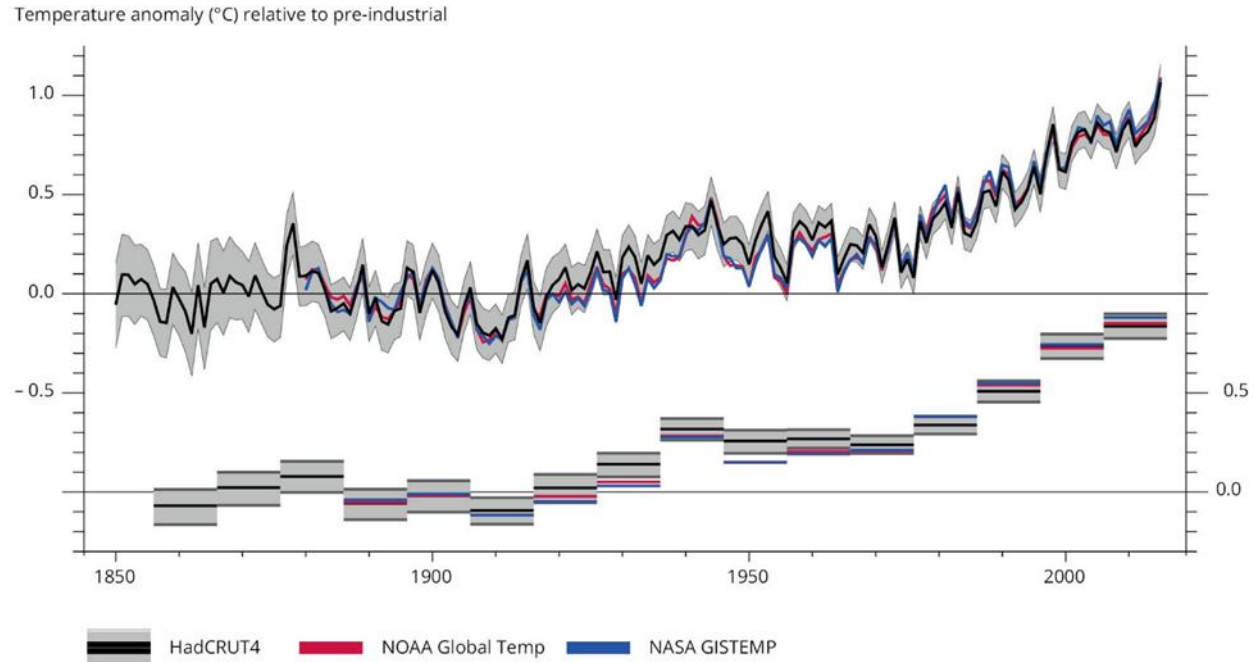
Planning for Climate Resilience in Ireland

John O'Neill
DCCA

Acclimatize?

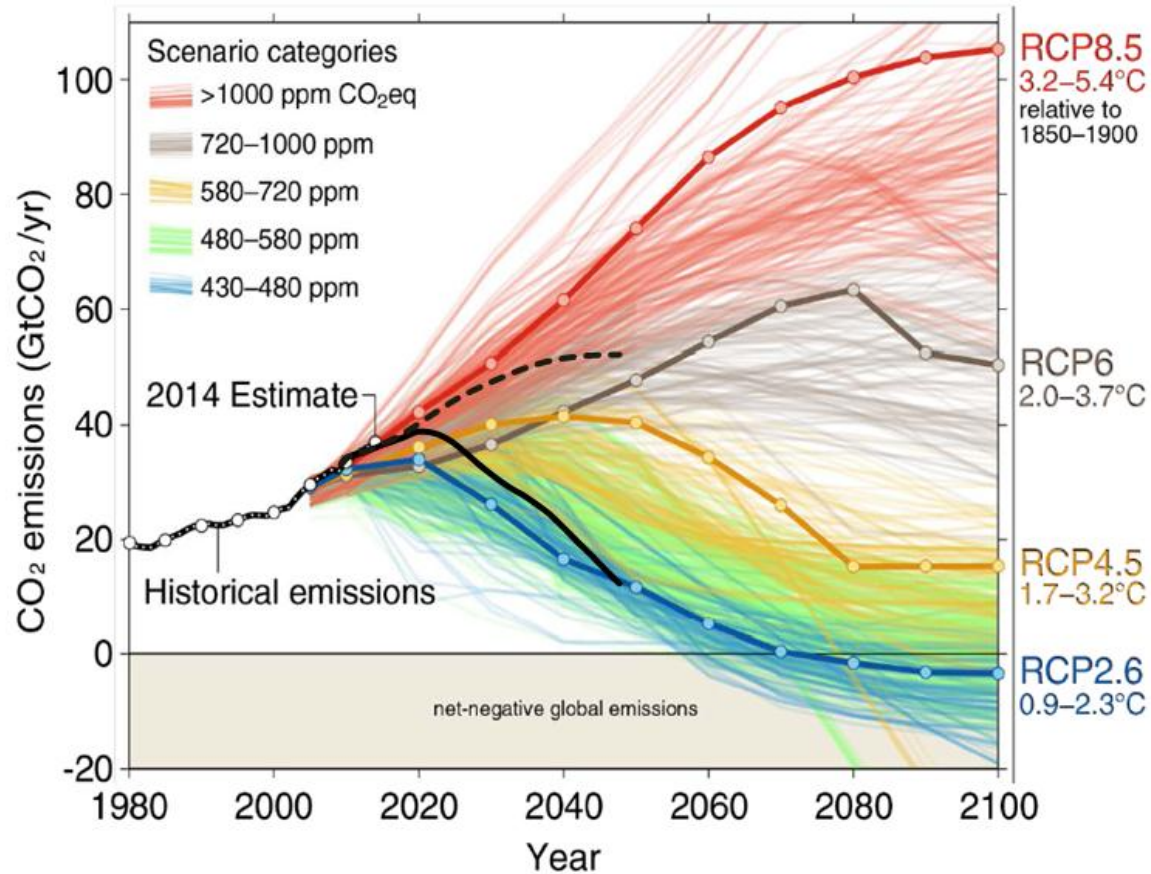
- IrelandWales – EU Projects
 - Priority 2 – Adaptation of the Irish Sea and Coastal Communities to Climate Change
 - <http://www.irelandwales.eu/projects/acclimatize>
 - <http://www.irelandwales.eu/projects/cherish>
 - <http://www.irelandwales.eu/projects/bluefish>
 - <http://www.irelandwales.eu/projects/ecostructure>

Global Temp – 1850-2015/16



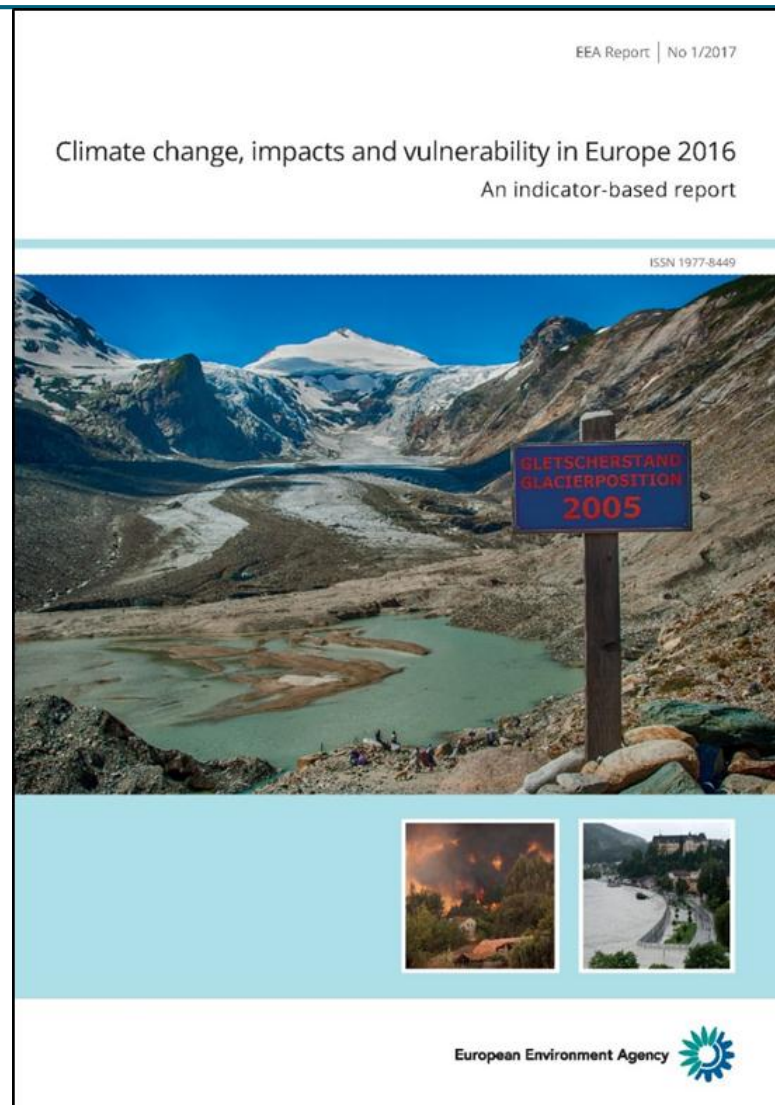
Source EEA

2 Degree Challenge (1.5?)



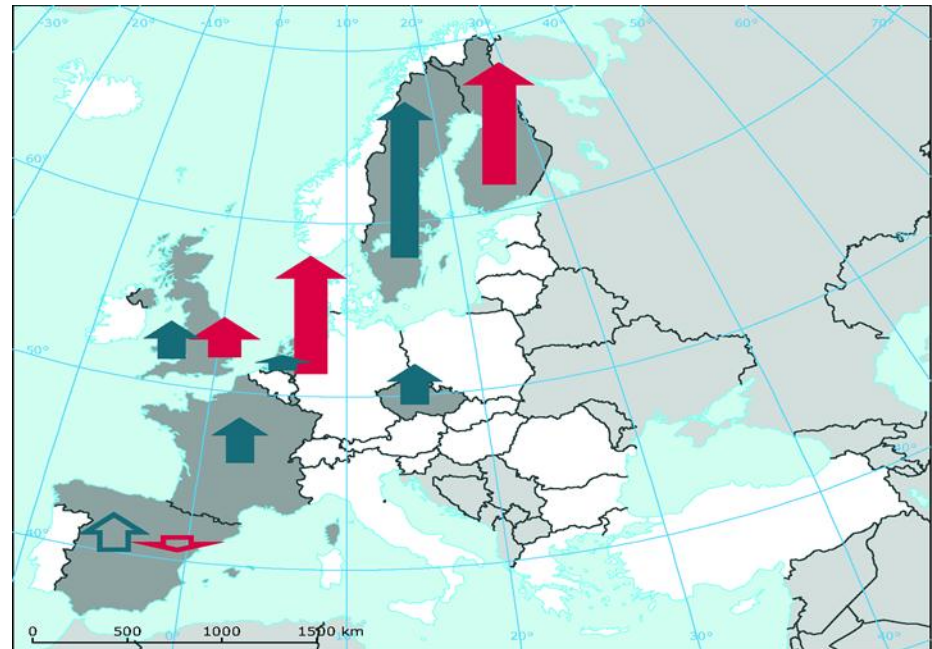
EEA Report 2016

- **Observed changes in extreme weather events** (heavy precipitation)
- **Observed impacts to climate change** – disease outbreaks/invasive species etc.
- **Future increases of climatic hazards** – heat waves, droughts etc.



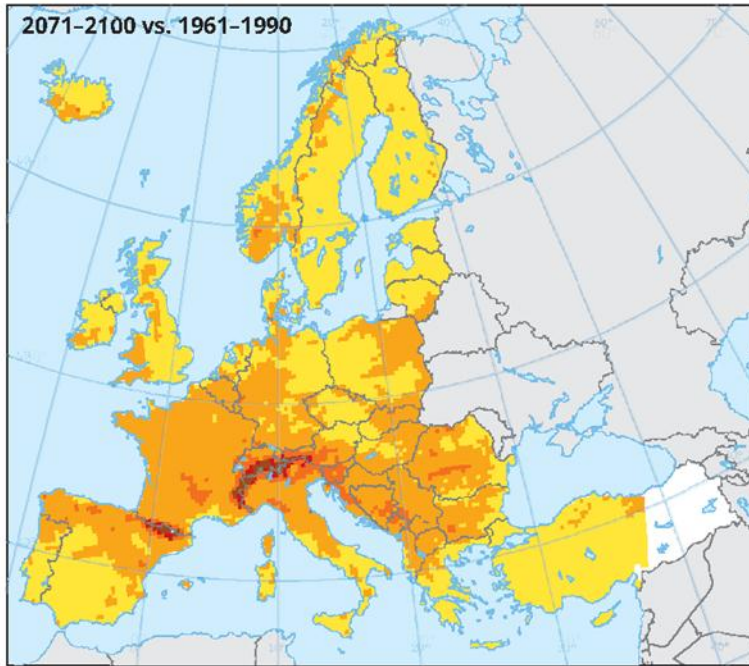
Ecosystems – Birds/Butterflies

- Trending Northwards
- Cold Adapted losing out to warm adapted!
- 9490 Bird Communities - 37km on average
- 2130 butterfly communities – 114km on average

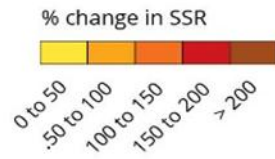


Forest Fires Crop yield

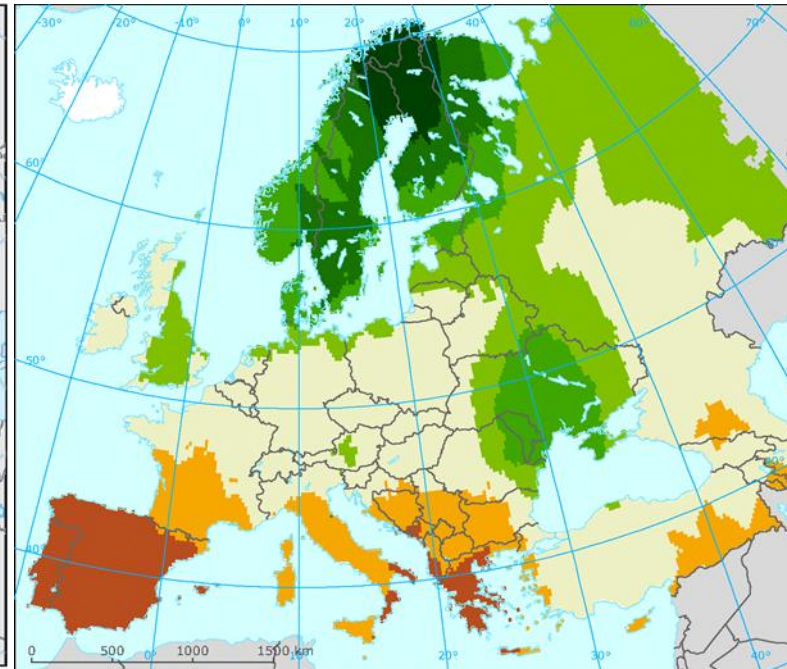
2080



Projected change in forest fire danger



2050



Projected changes in water-limited crop yield

(%)

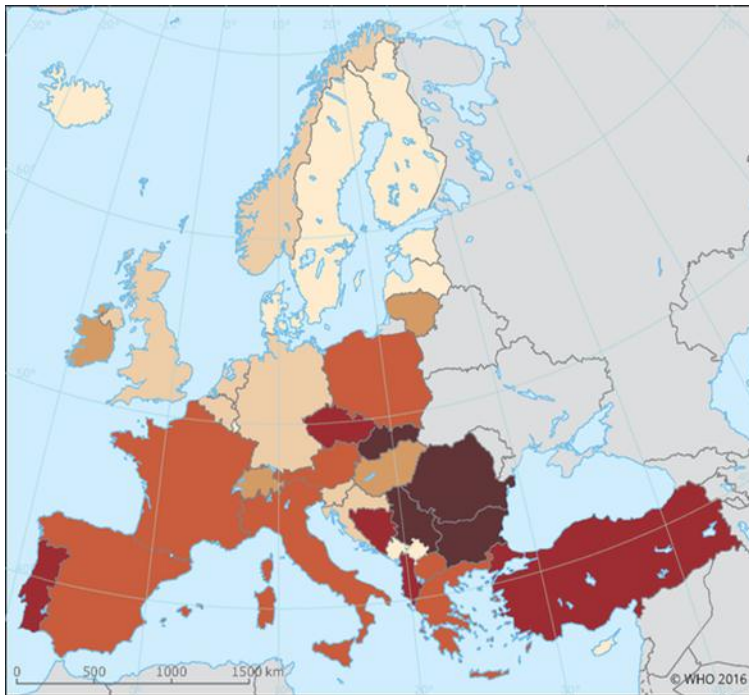
- 25 to - 15
- 15 to - 5
- 5 to 5
- 5 to 15
- 15 to 25
- 25 to 35
- > 35

No data

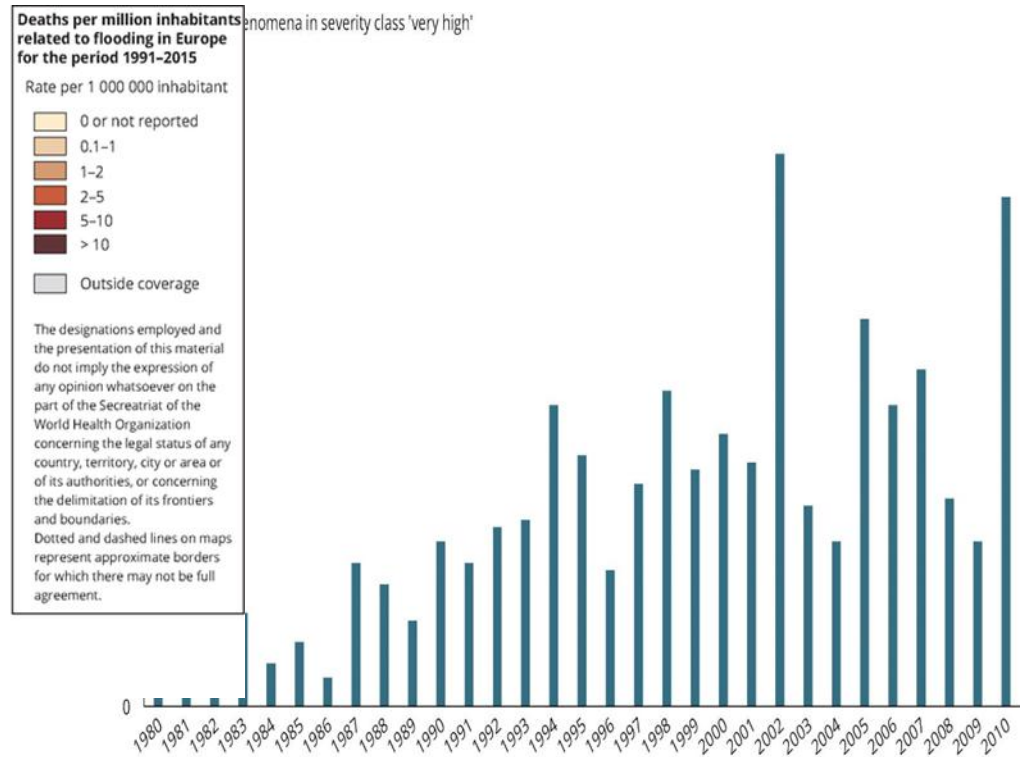
Outside coverage

Flooding

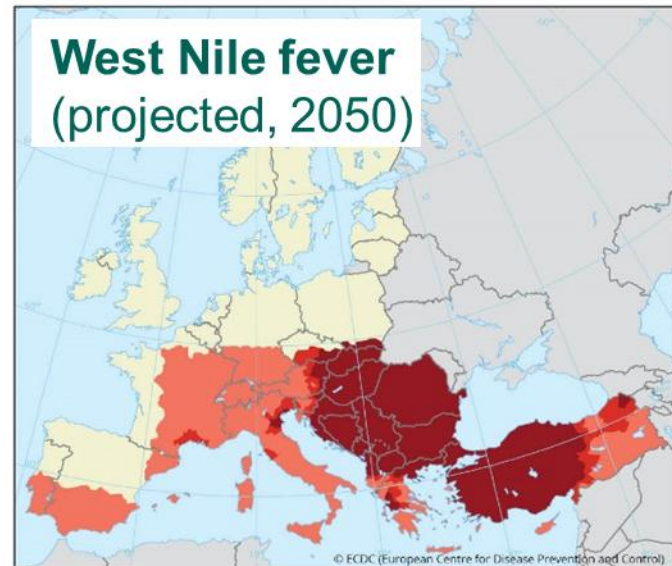
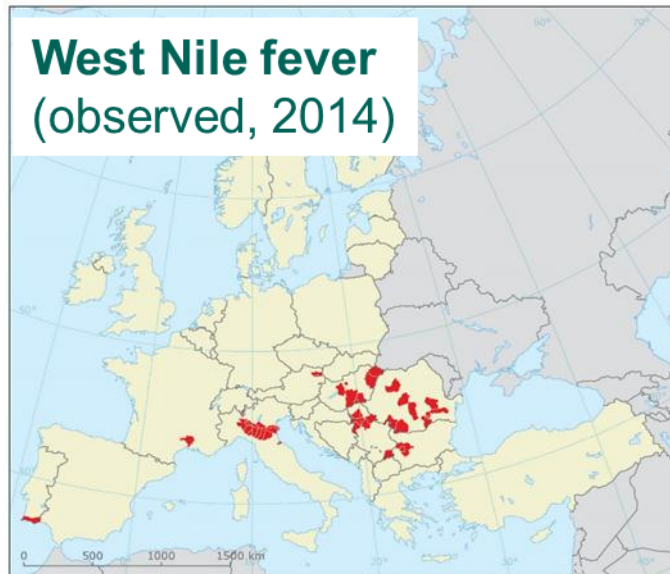
Deaths from Flooding 1991-2015



Very Severe Floods 1980-2010



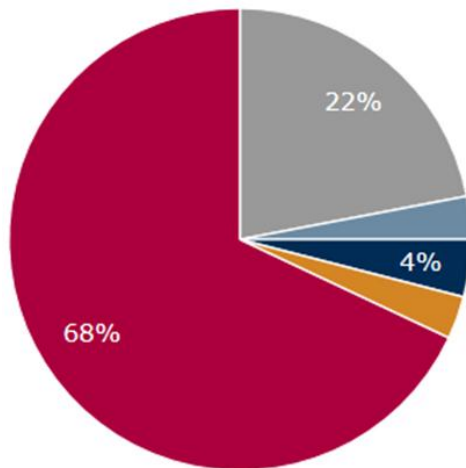
Spread of infectious diseases!



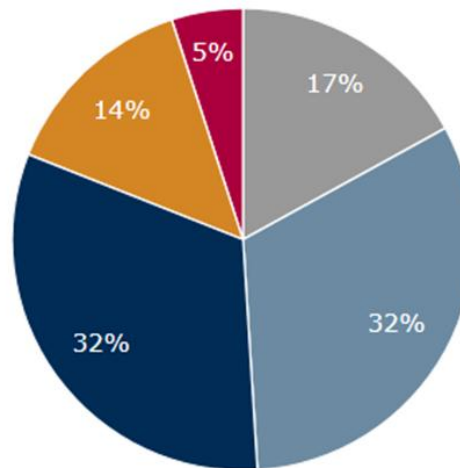
Impacts of extreme events – 1980-2015 (EEA)

Fatalities

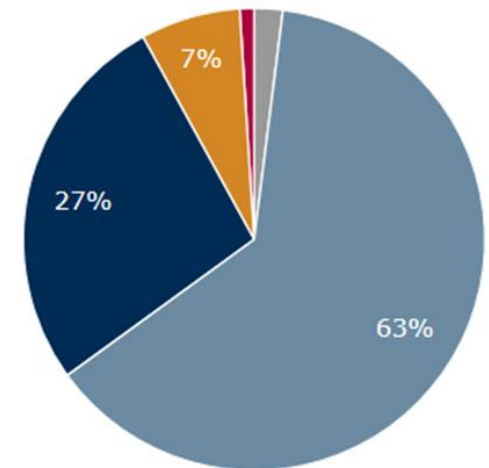
114 807



Total economic losses EUR 520 billion (2015 prices)



Insured losses EUR 155 billion (2015 prices)



● Geophysical events ● Meteorological events ● Hydrological events ● Climatological events ● Climatological event (heat wave)

International Response





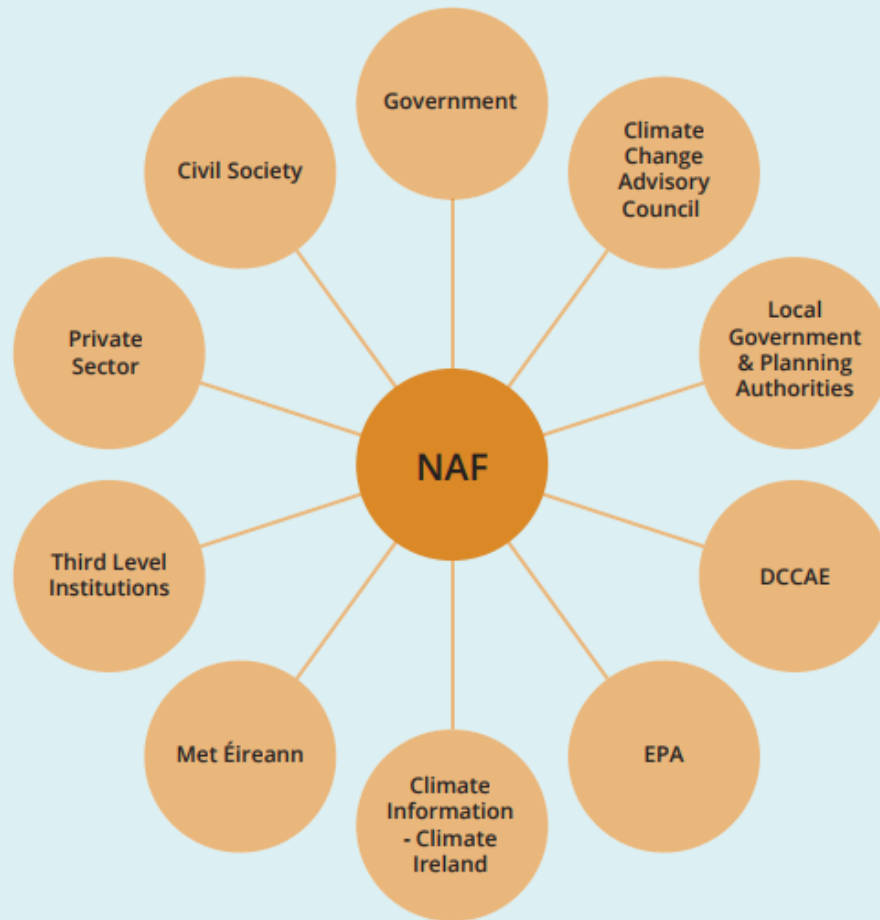
IRLANDE

National Response...

- Publication of Policy 2014
 - Guided by a long-term vision of a low-carbon climate resilient transition
- Climate Action and Low Carbon Development Act 2015
- Climate Change Advisory Council

Climate Act...

- Preparation of National

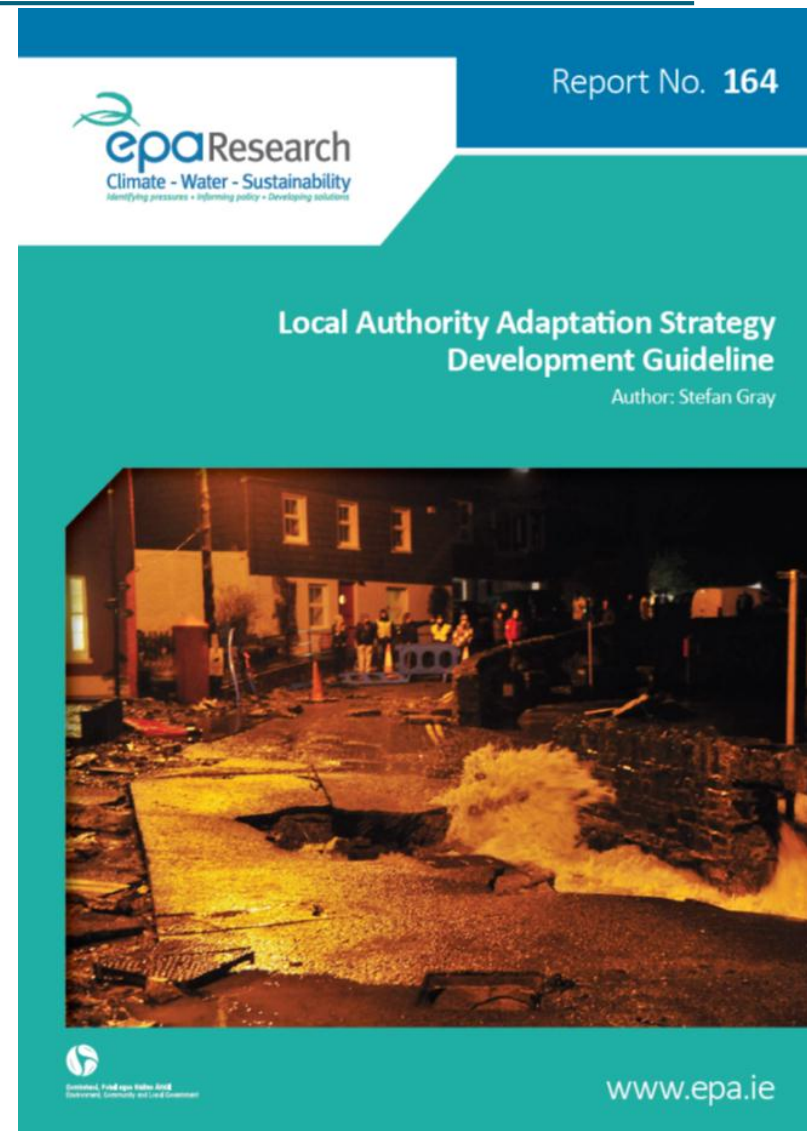


Sectoral Response?

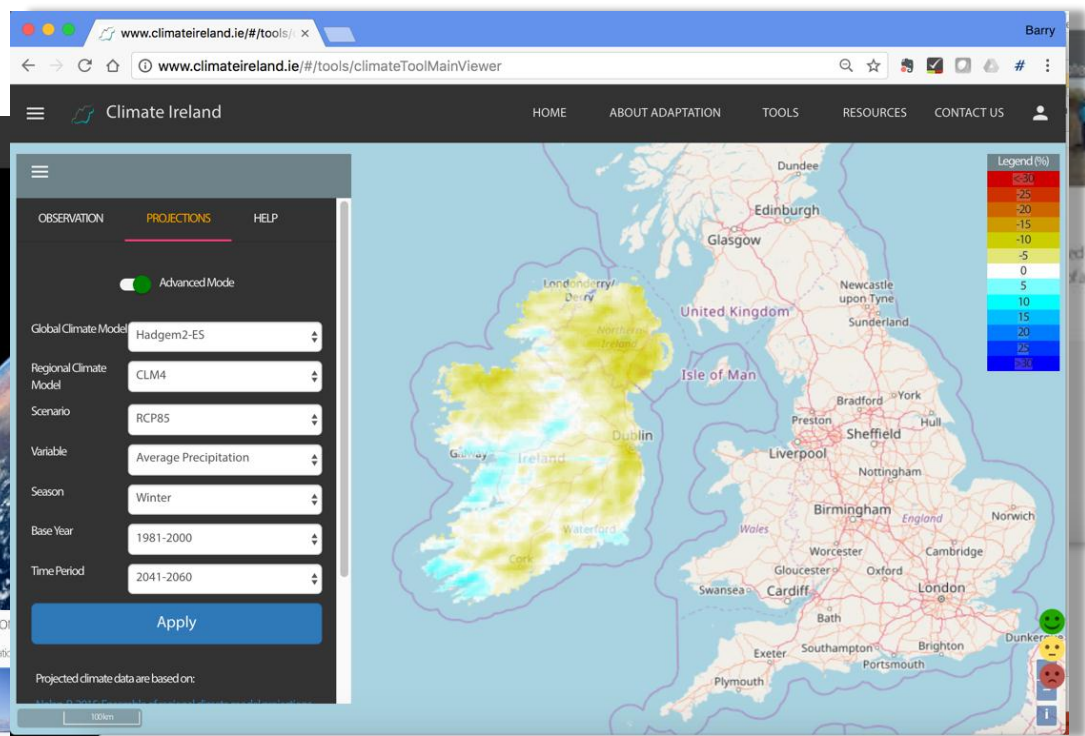
Theme	Sector Level	Lead Department for Sectoral Adaptation Plans
Natural Capital	Marine	Department of Agriculture, Food and the Marine
	Agriculture	
	Forestry	
	Biodiversity	Department of Culture, Heritage and the Gaeltacht
	Cultural Heritage	
Critical Infrastructure	Transport infrastructure	Department of Transport, Tourism and Sport
	Electricity and Gas Networks	Department of Communications, Climate Action and Environment
	Communications networks	
	Water Services Infrastructure	Department of Housing, Planning and Local Government
River and Coastal Flood Risk	Flood Risk Management	Office of Public Works
Public Health	Health	Department of Health
	Water Quality	Department of Housing, Planning and Local Government

Local Authority Response...

- Low carbon transition
- Climate resilience
- Awareness – Dialogue at local/regional level
- Leadership
- Regional Approach?



Climate Ireland



Climate Ireland

Climate Ireland provides informational support and advice to help organisations, sectors and government to adapt to the now inevitable consequences of climate change*

- Information for Local Authorities
- Information for Sectors

Climate Adaptation. What, Why and How?

Sectoral Adaptation. Impacts, Opportunities, Adaptation

Climate Change

- Overview
- What is Climate Change?
- Evidence of Climate Change

Climate Adaptation

- Overview
- Climate Adaptation
- Adaptation & Uncertainty

Climate Adaptation Tools

- Overview
- The Status of Ireland's Climate 2012
- Climate Hazard Scoping Tool

Resources

- Case Studies
- Web links
- Report

Getting Started

- Local Authority
- Sectoral

About Climate Ireland

- Home
- Climate Ireland Info
- Events

Climate Adaptation

ed to continue and if any opportunities

About Climate Ireland

- Home
- Climate Ireland Info
- Events
- News
- Contact Climate Ireland

Research

- Climate Ireland
- Irelands Climate Futures
- Adaptive responses to Climate Impacts – ARC
- Critical Infrastructure Vulnerability to Climate Change (Civic)
- Climate**Risk**Ireland (C-Risk)
- UrbAdapt – Climate Change impacts within the Urban Environment
- Ireland/Wales – Acclimatize et al...
- Imagining 2050?

Policy Coherence....

- National Mitigation Plan
- National Adaptation Framework
- Sustainable Development Goals
- National Planning Framework
- National Investment Plan
- Natural Capital
- Resource Efficient Economy
- Sustainable Cities
- **Research!!**

A Dialogue on Climate Action?



A National Dialogue on Climate Action!

- Create awareness, engagement and motivation to act
- Create structures and information flows to facilitate engagement
- Establish, on a long term basis, appropriate networks
- Provide regular input, through the NDCA, into the prioritisation and implementation of climate policy

Citizens Assembly...

- Sept/Nov
 - What are the challenges facing communities and individuals?
 - How can individuals and communities best communicate their concerns?
 - At what level can action best be taken – Central, Local, Community, Individuals?

Thank you.....



- Questions?



Andy Fanning

*Water Management Programme, Office of Evidence and
Assessment, Environmental Protection Agency*

Water Management in Ireland and Climate

Water Quality In Ireland and Climate



Andy Fanning, Programme Manager
Water Management, OEA, EPA
September 2017

Content

- Role of the EPA
- State of the Environment Challenges
- Bathing Water Quality in Europe
- Water Quality in Ireland including Bathing Water Quality
- Characterisation: Better understanding of pressures and Impacts on Water Quality
- Public Information
- Future?

Role of the EPA

- Environment Research including Climate and Water Pillars
- Reporting on Bathing Waters
- Advice and Support to the Minister for Housing, Planning and Local Government in the making of River Basin Management Plan for Ireland
- Characterisation of the risk posed by anthropogenic pressures on the Water Environment
- Monitoring under Water Framework Directive
- Regulator of large Industry and urban waste water discharges
- State of the Environment Reporting
- Strategic Environmental Assessment
- +++++

State of the Environment Report 2016

Challenges

In summary the key environmental actions for Ireland on the state of the environment in 2016 are as follows:

SYSTEMIC
MESSAGES



Environment and Health & Wellbeing

Recognition of the benefits of a good quality environment to health and wellbeing.



Climate Change

Accelerate mitigation actions to reduce greenhouse gas emissions and implement adaptation measures to increase our resilience in dealing with adverse climate impacts.



Implementation of Legislation

Improve the tracking of plans and policies and the implementation and enforcement of environmental legislation to protect the environment.

TOPIC
MESSAGES



Restore & Protect Water Quality

Implement measures that achieve ongoing improvements in the environmental status of water bodies from source to the sea.



Nature & Wild Places

Protect pristine and wild places that act as biodiversity hubs, contribute to health and wellbeing and provide sustainable tourism opportunities.



Sustainable Economic Activities

Integrate resource efficiency and environmental sustainability ideas and performance accounting across all economic sectors.



Community Engagement

Inform, engage and support communities in the protection and improvement of the environment.

Bathing Water Quality in Europe based on excellent Quality

Bathing water quality in Europe

Bathing water quality in Europe continues to improve. In 2016, more than 85% of Europe's coastal and inland bathing water sites met the most stringent 'excellent' water quality standards, while more than 96% of the sites met the minimum requirements set out under the EU rules.

European Environment Agency



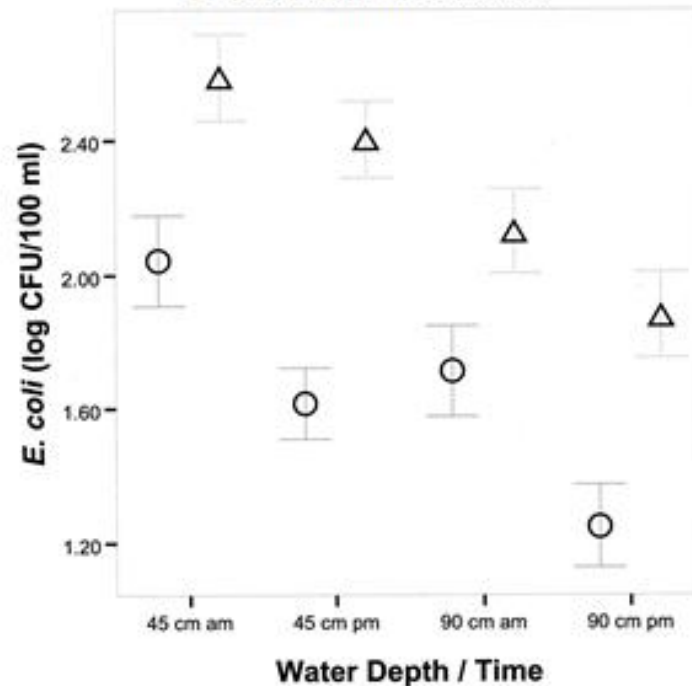
European Environment Agency



Bathing Water Directive report 2013 , Cyprus

- “The assessment shows that all bathing waters are of excellent quality. Authorities note that climatic conditions (increased sunlight and high temperature) and salinity of the coastal waters in the region are quite unfavorable to the survival of microorganisms. “

E. coli concentration (mean log transformed) from 4 April to 27 September 2000 during clear and sunny (○) and nonsunny (△; i.e., fog, haze, partly cloudy, or cloudy) mornings and afternoons at 45- and 90-cm water depths.

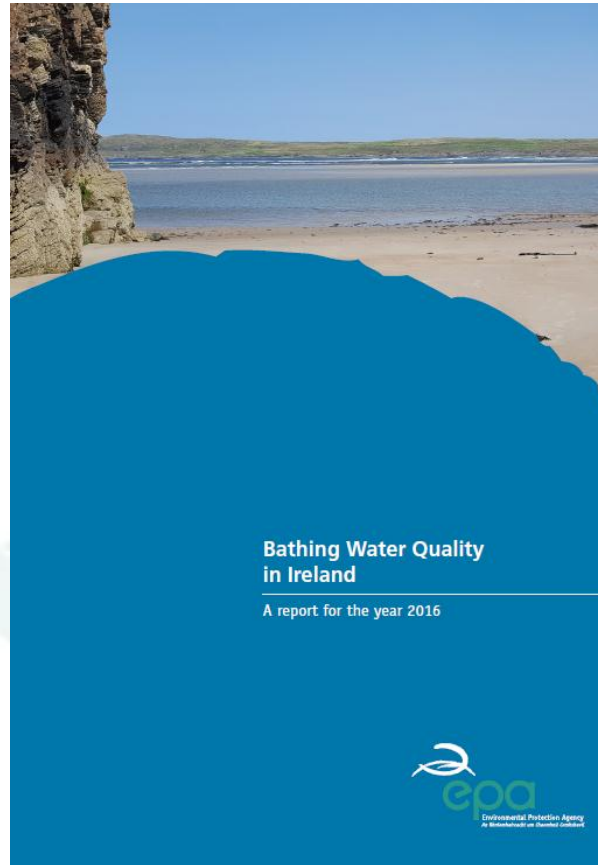


Richard L. Whitman et al. Appl. Environ. Microbiol.
2004;70:4276-4285

Applied and Environmental Microbiology

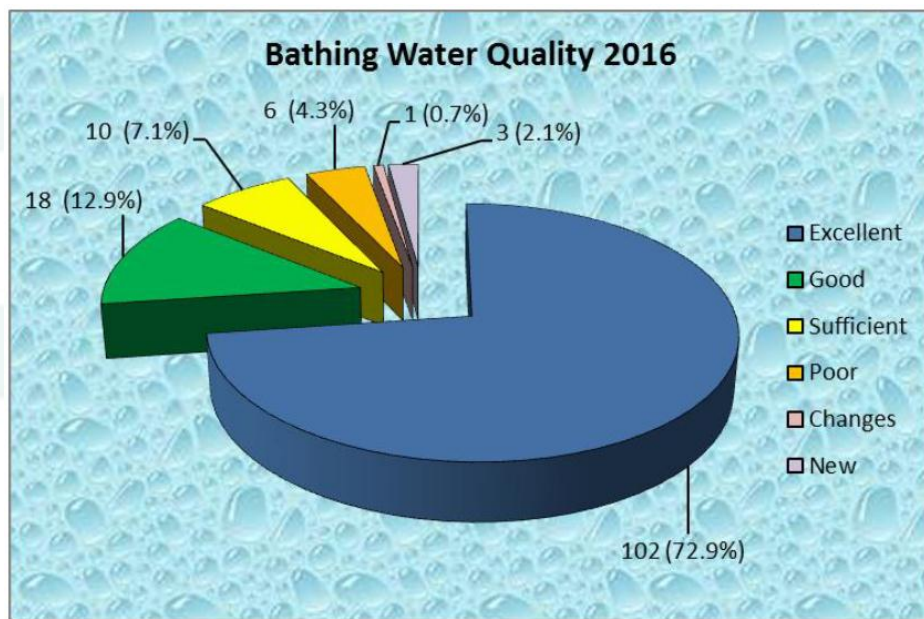
Journals.ASM.org | Copyright © American Society for Microbiology. All Rights Reserved.

Bathing Water in Ireland



Overview of Bathing Water Quality in Ireland

Classification	Coastal (No.)	Coastal (%)	Inland (No.)	Inland (%)	Total	% (rounded)
Excellent	94	71.8%	8	88.9%	102	72.9%
Good	17	13.0%	1	11.1%	18	12.9%
Sufficient	10	7.6%	-	-	10	7.1%
Poor	6	4.6%	-	-	6	4.3%
New / Changes	4	3.1%	-	-	4	2.9%
Overall	131		9		140	100%

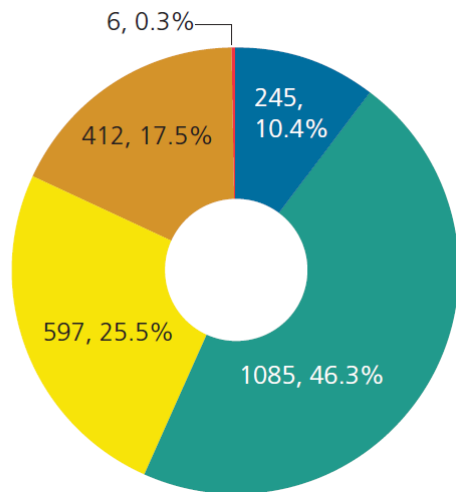


Water Quality in Ireland: Water Framework Directive Status

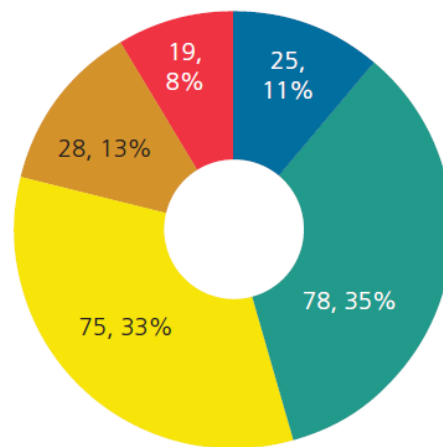


Current Status of Ireland's Waters

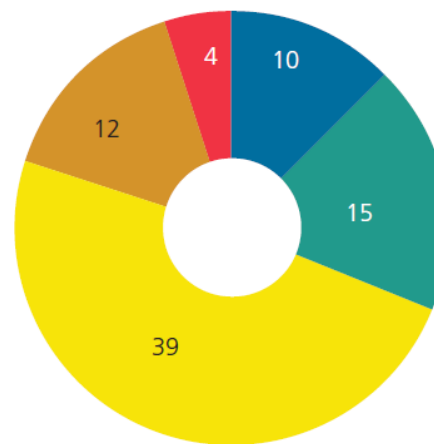
Rivers



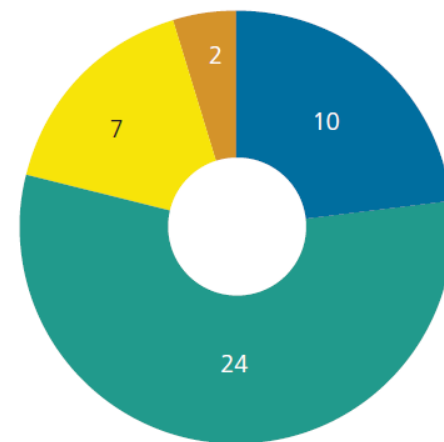
Lakes



Estuaries

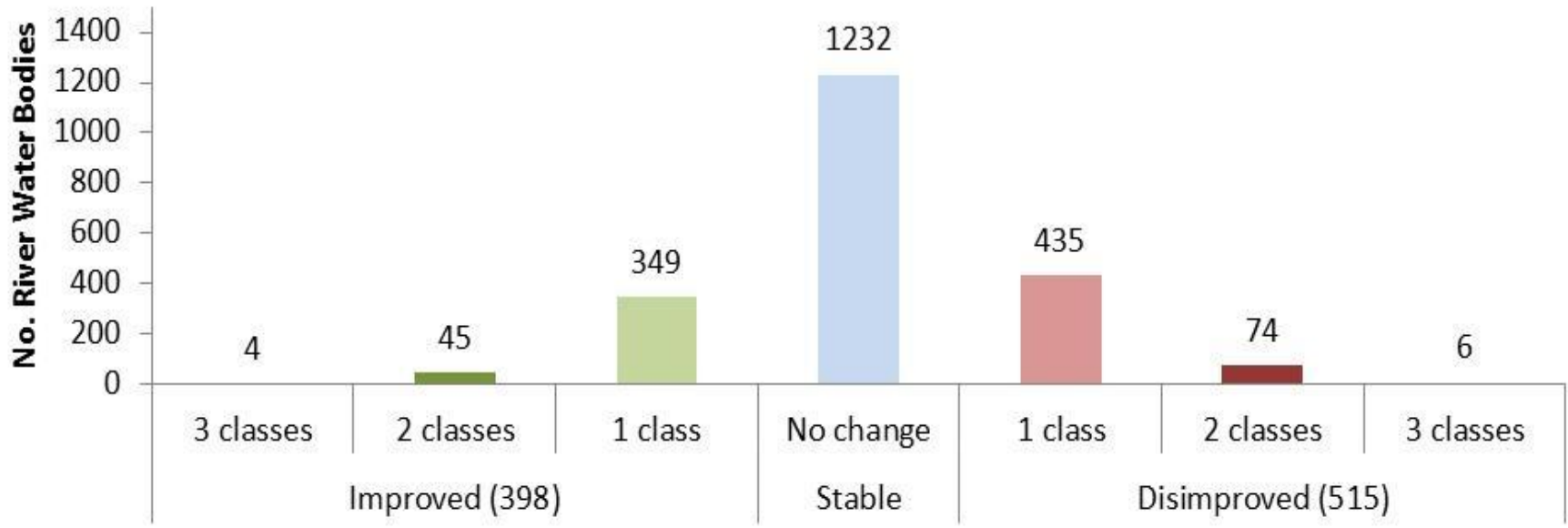


Coast

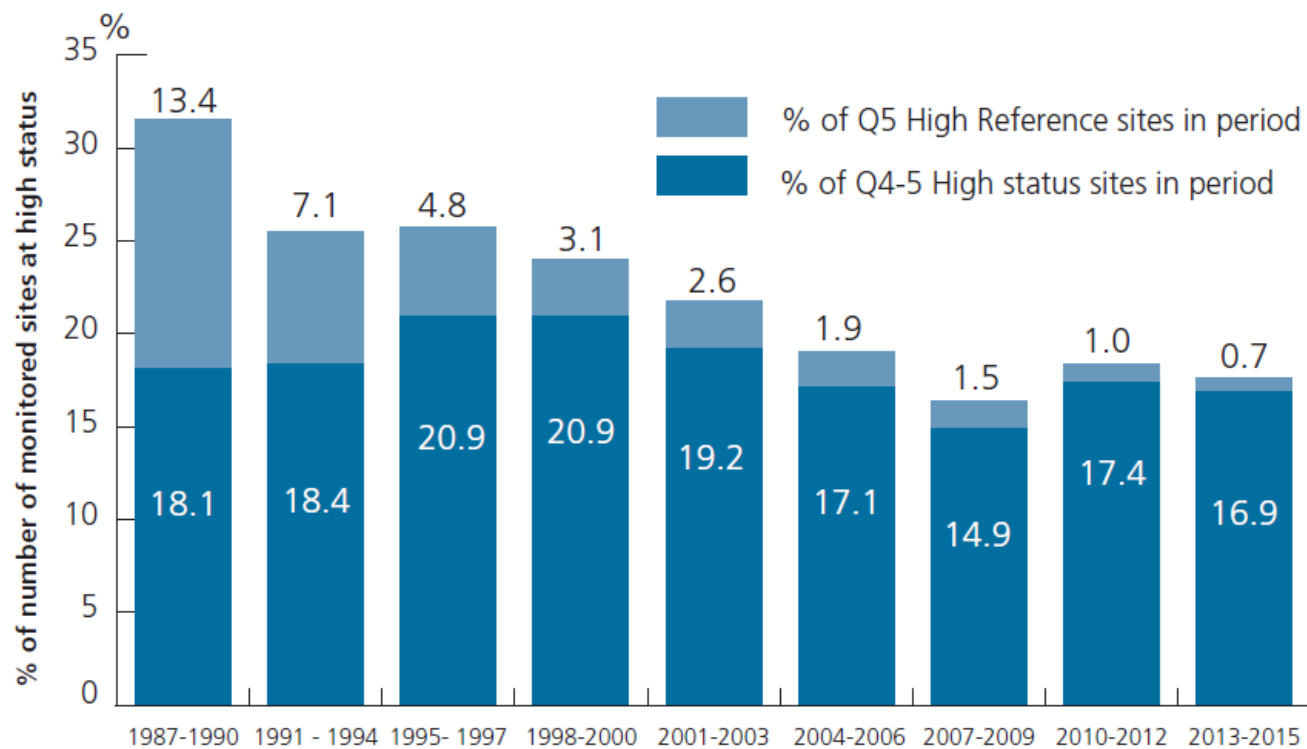


Improvements and Declines

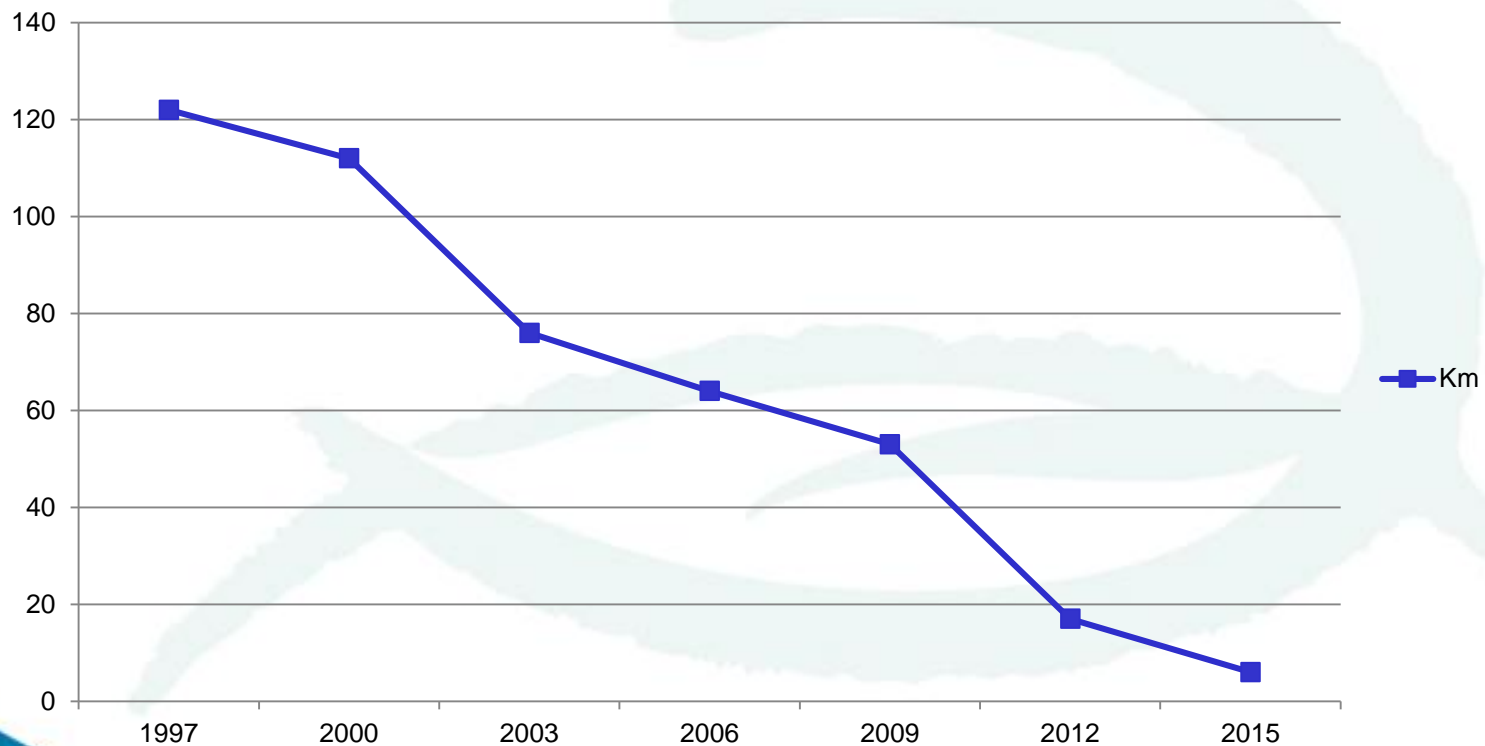
River Water Body Ecological Status Changes 07/09 to 13/15



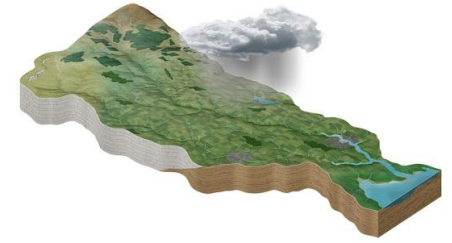
Current Status of Ireland's Waters



Kilometers of Seriously Polluted Waters based on Q values



What is characterisation?



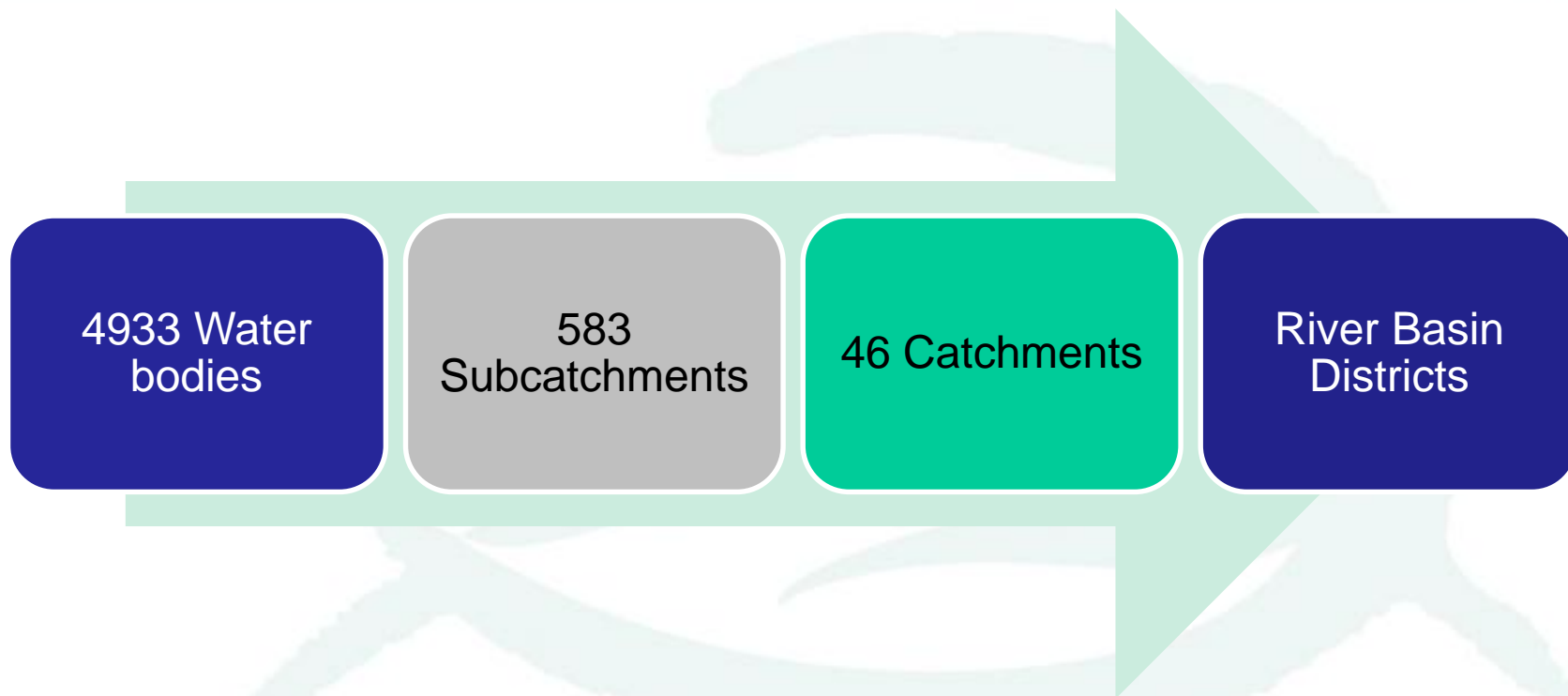
EVIDENCE BASED ASSESSMENT

Is there a
problem?

What is
causing it,
where, and
why?

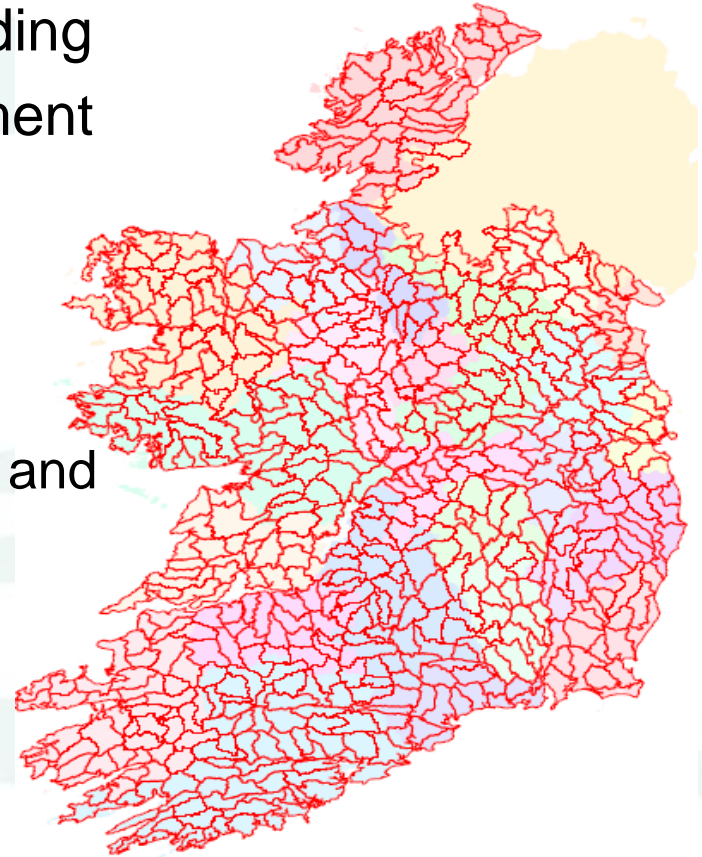
How do we
fix it?

Water management unit scales

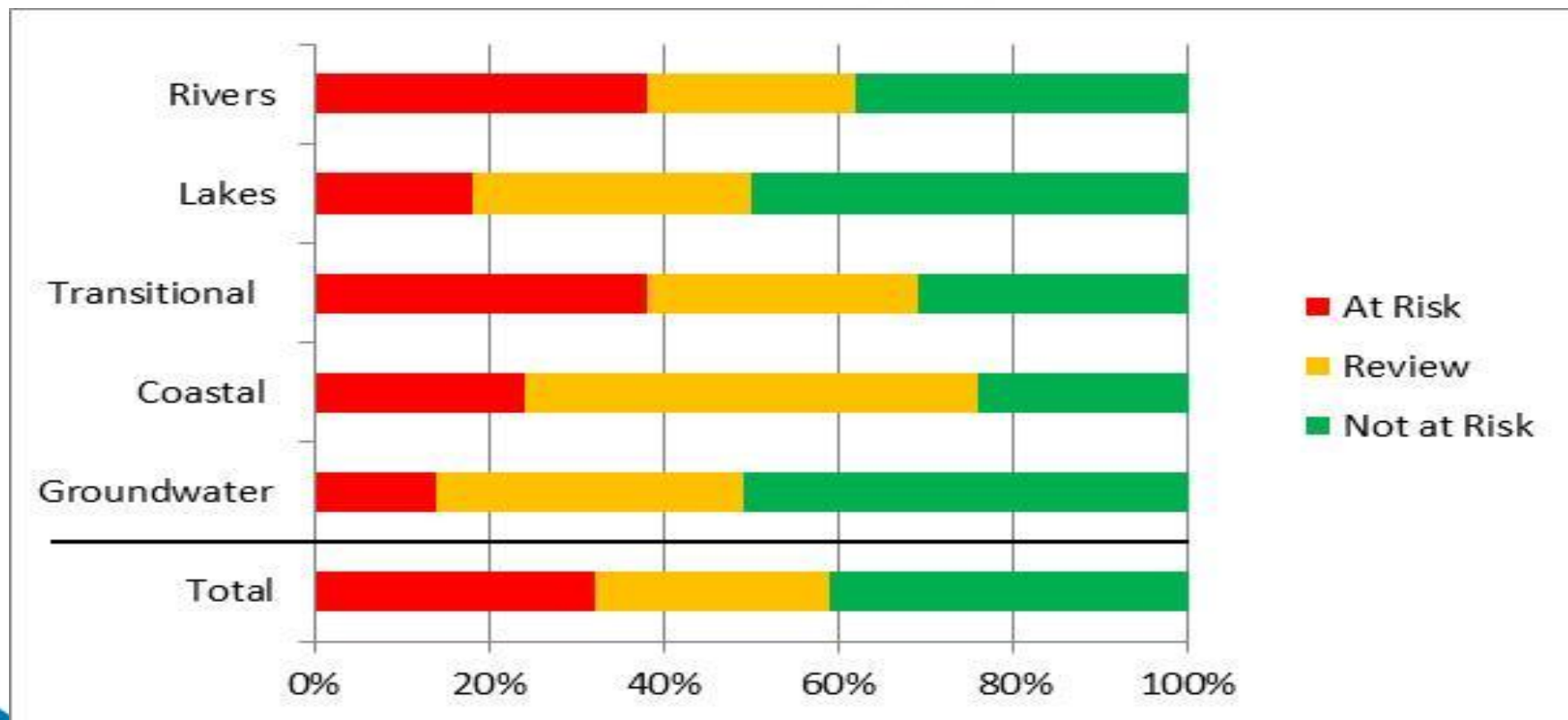


Characterisation

- Characterisation = Improved Understanding
- Assessment at Waterbody, Sub Catchment and Catchment Scale to:
 - determine if “at risk” and the significant pressures driving that risk
 - Inform the actions needed to address pressures at Water body, sub catchment and catchment scales

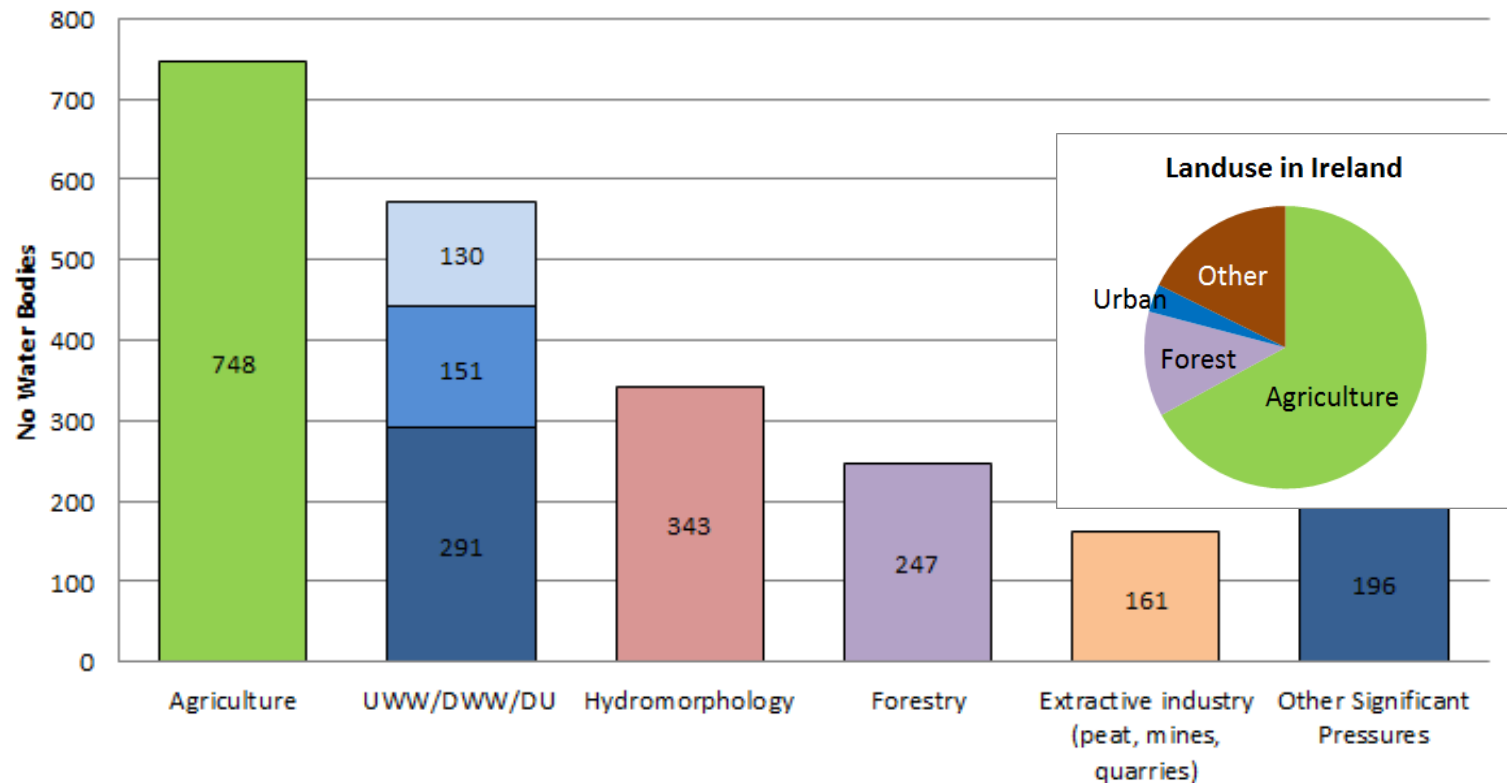


Risk Assessment Outcomes



Significant Pressures: Rivers & Lakes

Significant Pressures in *At Risk* River and Lake Water Bodies



Climate and Water Quality

- Climate drives hydrological processes, which in turn mobilise and transports nutrients/microbes through the landscape and the attenuation potential varies considerably with hydrological and hydrogeological settings.

Climate → Hydrology → Water Quality

Literature

Loads increase with discharge in several studies including with, for example:

- hourly E.coli (Murphy et al., 2015),
- monthly Total P (Mellander et al., 2015),
- Annual nitrate (Dupas et al., 2016), and
- Annual phosphorus (Kalkhoff et al., 2016).

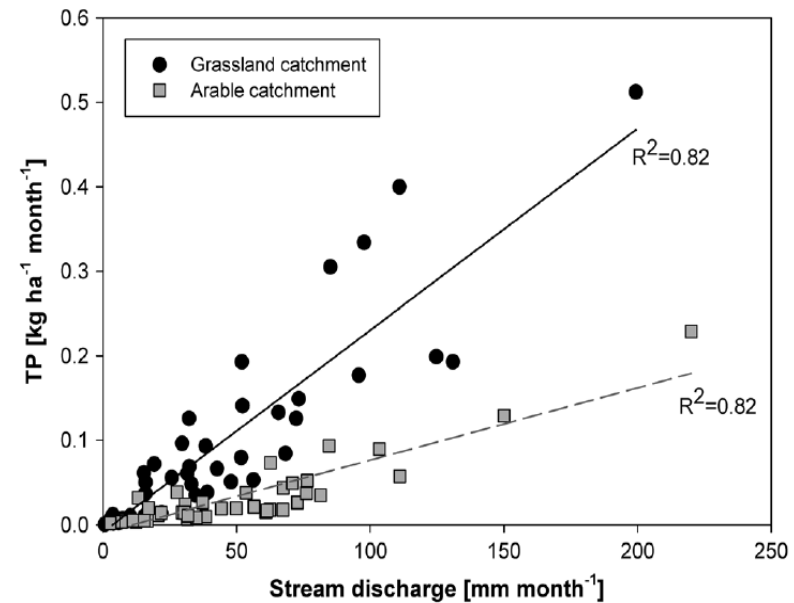


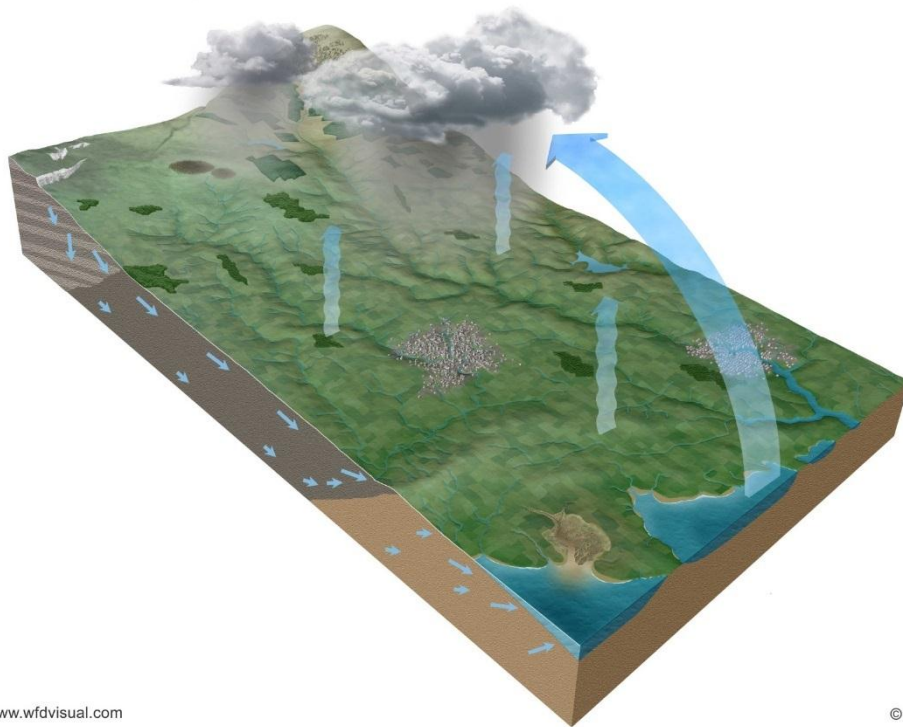
Figure 3. Four years of monthly total phosphorus (TP) loss related to stream discharge in two catchments (Grassland and Arable)

(Mellander et al., 2015)

Mellander et al., 2015

- Two intensively farmed river catchments (~10 km²) with contrasting flow controls and dominating flow paths.
- A grassland catchment with mostly poorly drained soils
- an arable catchment with mostly well-drained soils
- grassland catchment **had three times higher annual P loss** than arable catchment despite the arable catchment having larger areas with high soil P status and more discharge.
- The magnitude of the P losses from the two catchments was not defined by land use, source pressure or discharge volume but rather by **..partitioning influences that determine proportions of quickflow and slowflow**. The results confirmed the need to manage the quickflow components of runoff to moderate P transfers. in order to further reduce diffuse pollution it may be necessary to account for the contrast in hydrological function before or in addition to any of the other factors influencing P losses (soil P and land use)..

Importance of Pathways



www.wfdvisual.com

© 2005

- Where does water go when it rains?
- What flow path does it take to the river?
- What solutes does it bring with it?



Welcome to Catchments.ie - Water from source to sea.

Water is a precious resource and is essential for all life on earth.

Looking after our rivers, lakes and coastal waters so they can meet our current and future needs, and also continue to support the ecosystems that depend on them, is vital for Ireland's future.

Doing this at community level is the best way to get people actively involved.

[Find out more](#)

Get involved

Make your local catchment work for you

<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

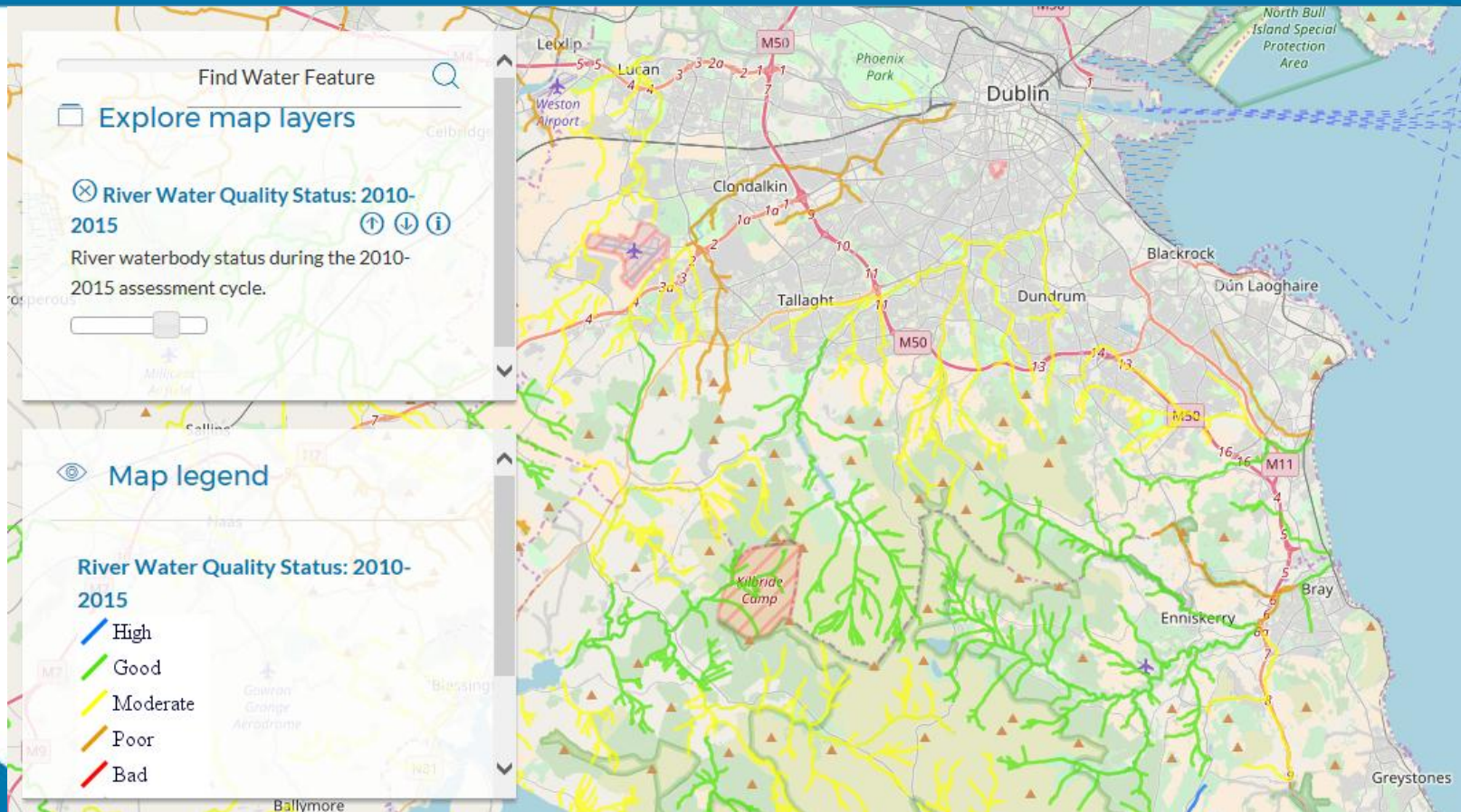
I agree to your [terms of use](#) and [privacy policy](#)

I'm not a robot

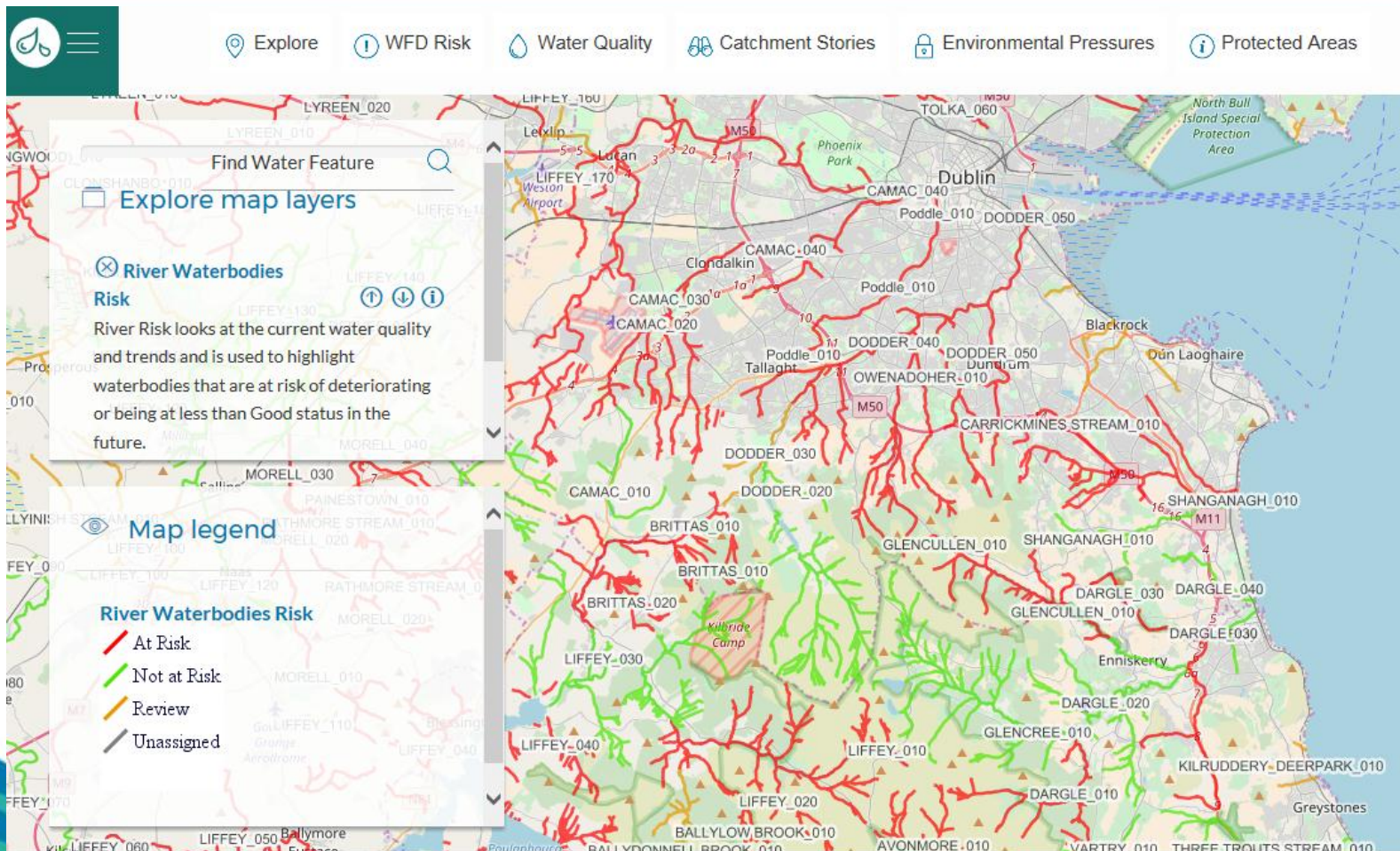


[Sign me up](#)

Status

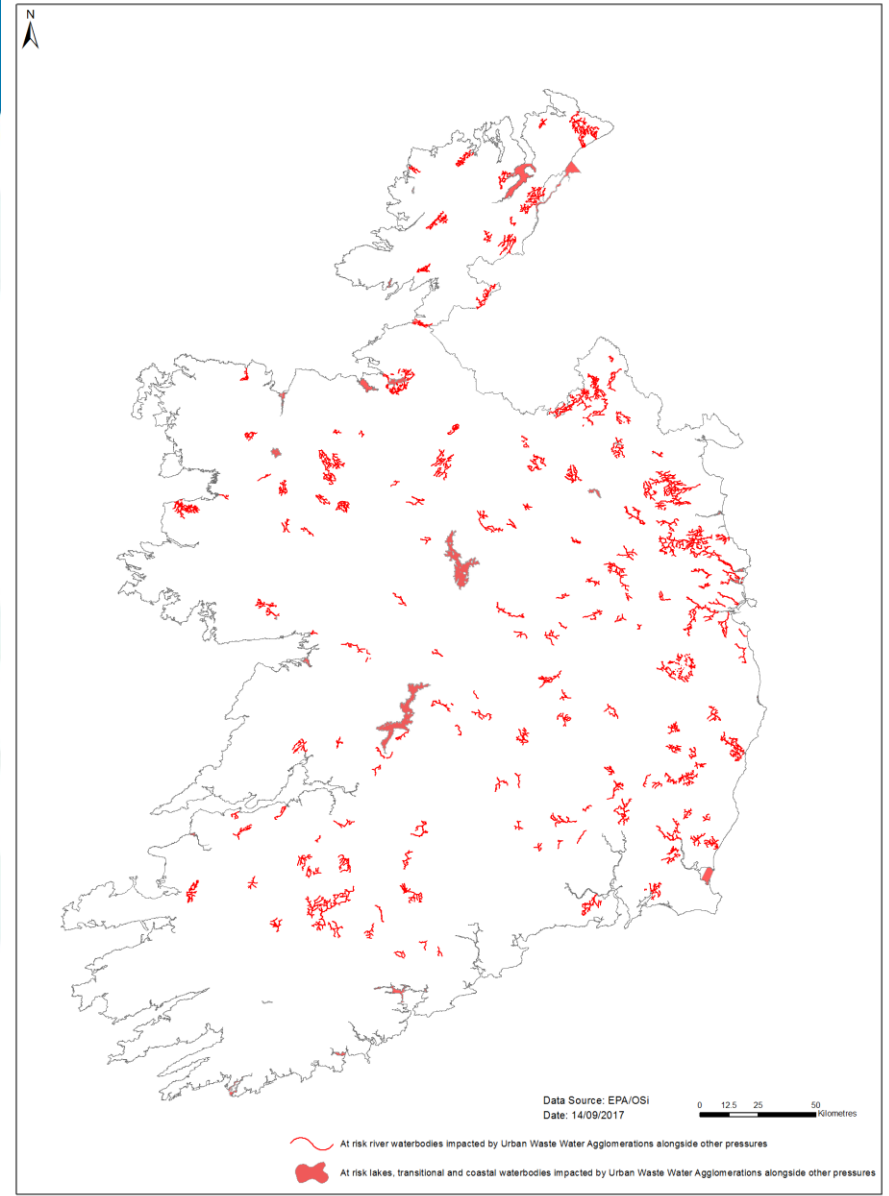


Risk



Multiple Significant Pressure

Map 4: Location of 'At Risk' Water Bodies impacted by Urban Waste Water Agglomerations that are one of Multiple Pressures



Climate Change and Eutrophication

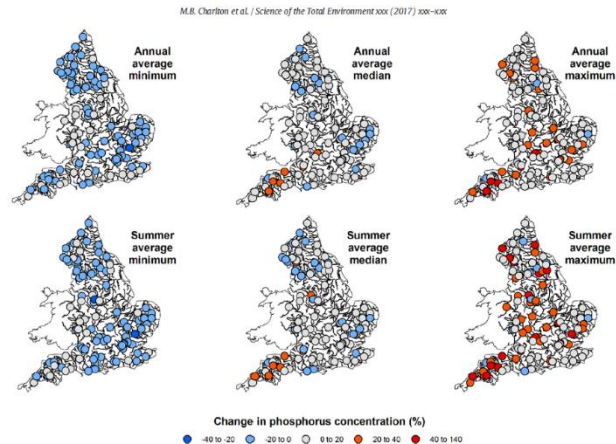


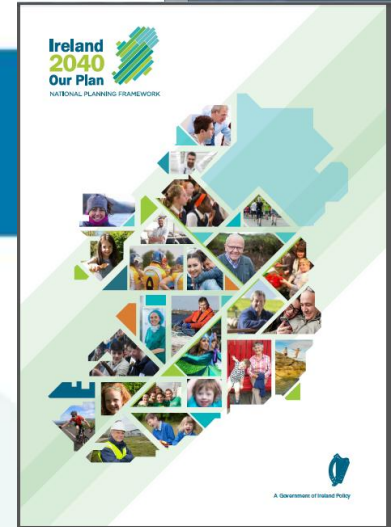
Fig. 5. (a) Maximum, median, and minimum maps of percentage change in phosphorus concentration from baseline to 2050s for annual average. (b) Maximum, median, and minimum maps of percentage change in phosphorus concentration from baseline to 2050s for summer average.

Mapping Eutrophication Risk From Climate Change: Future Phosphorus Concentrations in English Rivers

MB Charlton et al. Sci Total Environ. 2017 Sep 05.

“National maps of change indicate a **small but inconsistent increase** in annual average TRP concentrations **with a greater change in summer**. Reducing the Total Reactive Phosphorus concentration of final sewage effluent to 0.5mg/L P for all upstream sewage treatment works was inadequate to meet existing P standards required through the EU Water Framework Directive, indicating that more needs to be done, including efforts to reduce diffuse pollution.”

Pressures



Minister of State for Housing and Urban Development Damien English added:

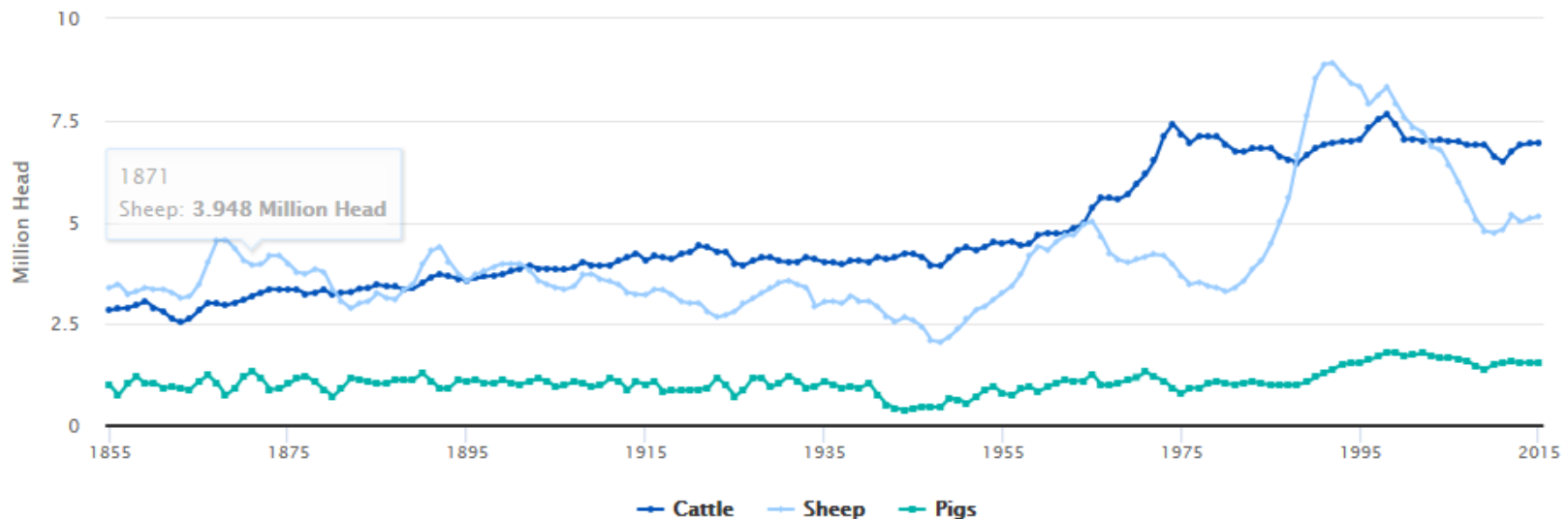
“By 2040, we know that Ireland will be home to an additional one million people, an extra 600,000 people at work, needing at least half a million additional homes. Twenty years ago, we were a country of 3.5m people; by 2040, that will be approaching 6m people and an island population of nearly 8 million meaning that vision, determination and strategic planning will be vital in ensuring that our growth is well planned and leaves lasting benefits”.

Pressures

Number of cattle, sheep and pigs 1855-2015



21.4 Number of cattle, sheep and pigs 1855-2015



Source: CSO Ireland



An Phríomh-Oifig Staidrimh
Central Statistics Office

<http://www.cso.ie/en/releasesandpublications/ep/p-syi/psyi2016/agri/cl/>

Summary

- Bathing Water Quality in Ireland is good overall but there continue to be bathing waters where bacteriological water quality is poor
- Climate plays a significant part in transport of nutrients to waters but there is need to look at the local level (i.e. water body) to consider the interactions between climate, sources, geophysical setting (**and related pathways**) to inform action to mitigate impacts
- Changes in human and animal populations and land use need to be considered together with climate change scenarios **within a catchment context** to provide for resilient mitigation of impacts on water quality and support improvements in quality.

Acclimatize



www.acclimatize.eu





Shane Casey

Biosphere Co-Ordinator

Dublin Bay Biosphere Partnership

Dublin Bay Biosphere



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Dublin Bay

BIOSPHERE

Past – Present – Future

UNESCO

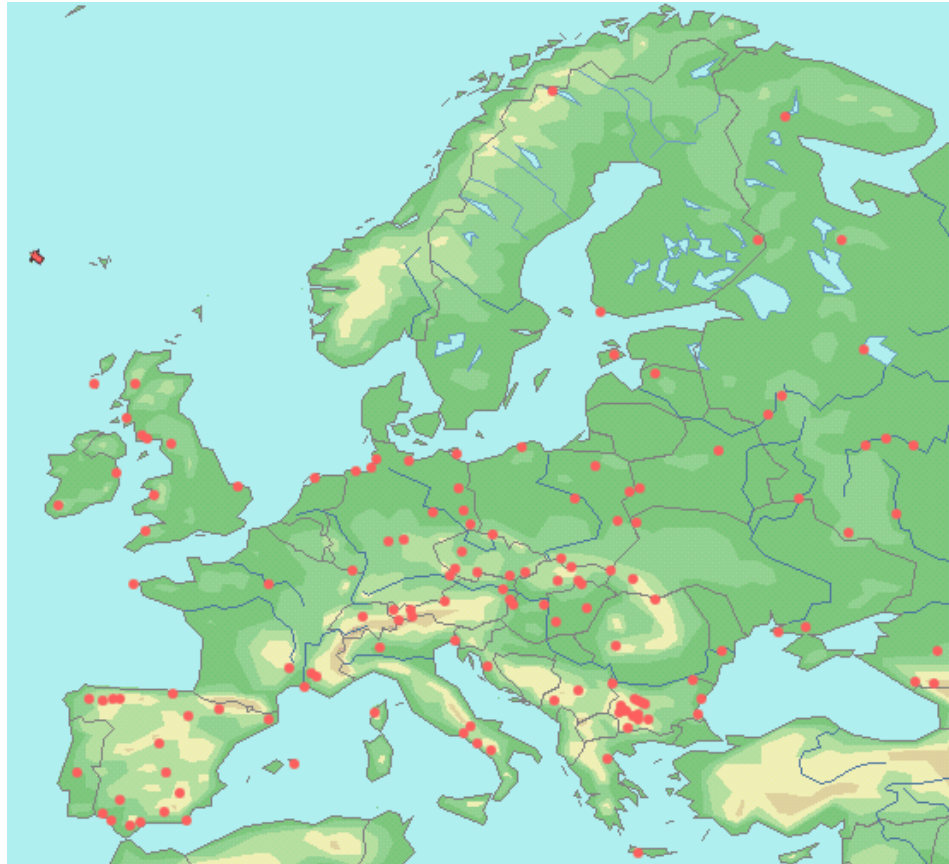
Building peace in the minds of men and women



To establish the intellectual and moral solidarity of mankind and prevent the outbreak of another world war

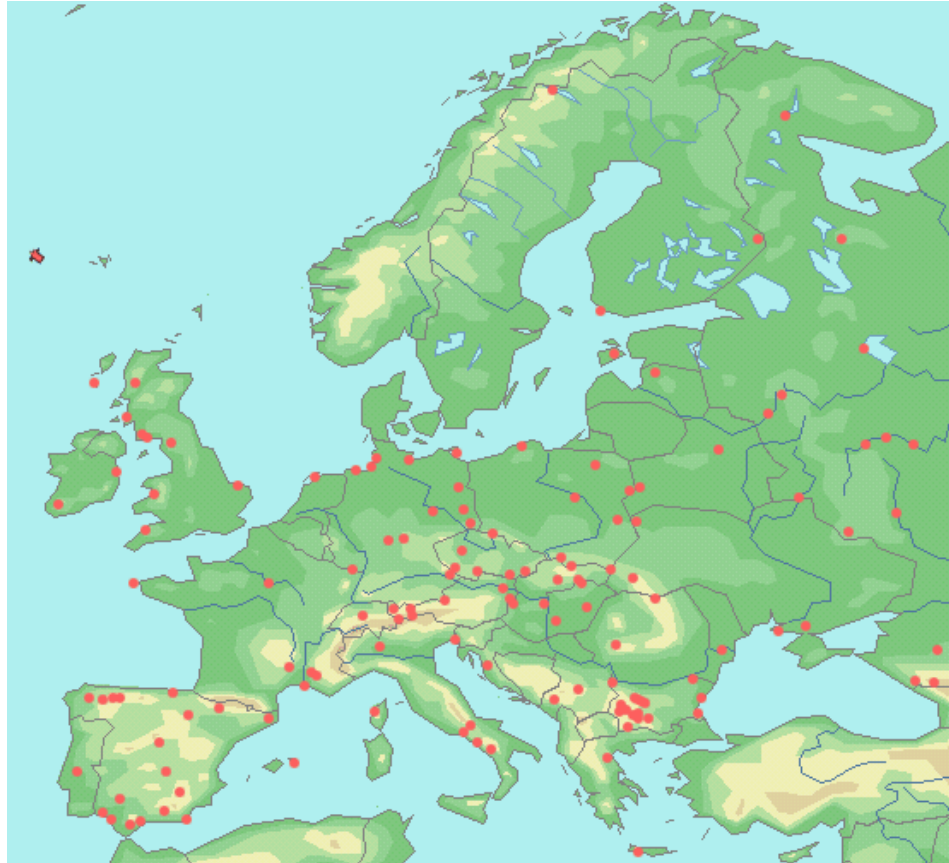
Biosphere Reserves

case studies for best practice



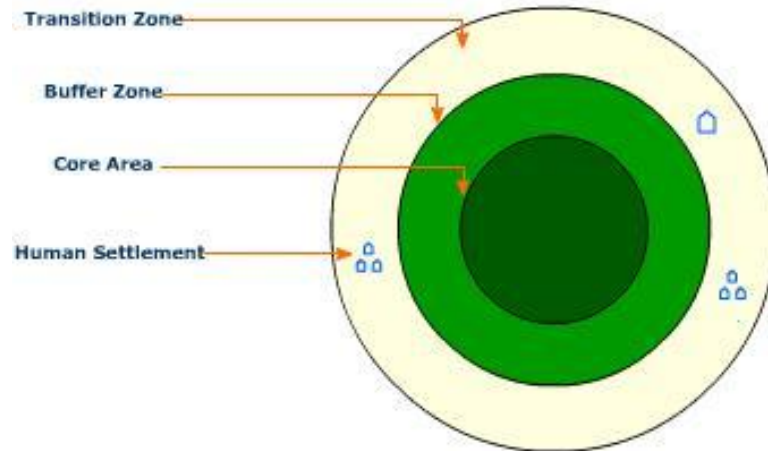
Places to test interdisciplinary approaches to managing interactions between social and ecological systems, including conflict prevention and management of biodiversity

Biosphere Reserves



Places that are internationally recognised for their biodiversity value yet also actively managed to promote a balanced relationship between people and nature

Biosphere Reserves



- **Core zone:** protected habitat which is used for biodiversity conservation, ecological monitoring, non-destructive research, education and other low-impact uses
- **Buffer zone:** surrounds or adjoins the core zone and is managed to support the core zone. Used for activities compatible with sound ecological practices e.g. education, recreation, ecotourism and research
- **Transition zone:** contains settlements and a variety of activities. Management agencies work together with stakeholders to promote sustainable development

Biosphere Reserves

- **Conservation:** protect biodiversity and cultural diversity
- **Development:** foster an environmentally sustainable economy and society
- **Learning:** support environmental education and training, research, monitoring and demonstration projects

North Bull Island Biosphere Reserve, 1981



In applying the biosphere reserve concept, the ambition is to reconcile the multiple uses in this small area

Designations on North Bull Island

1914 – Rothschild Reserve – North Bull, Dublin Bay

1931 – Wild Birds (North Bull Island) Order

1950 – Wild Birds (North Bull Island Area) Order

1981 – North Bull Island UNESCO Biosphere Reserve

1988 – North Bull Island Ramsar Site

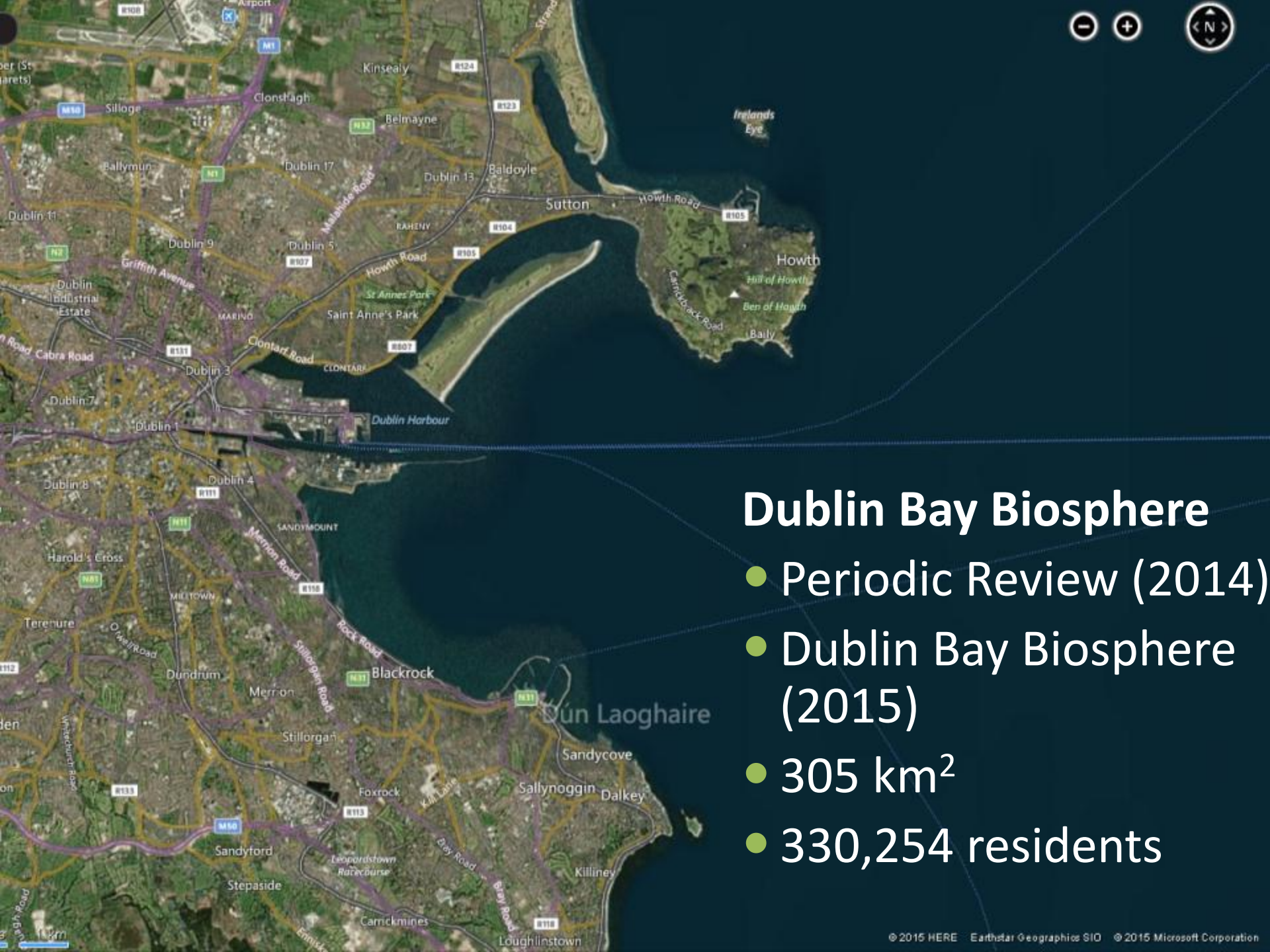
1988 – Nature Reserve (North Bull Island) Establishment Order

1992 – EU Habitats Directive

1995 – North Bull Island Special Amenity Area Order

1999 – North Dublin Bay SAC

2010 – North Bull Island SPA



Dublin Bay Biosphere

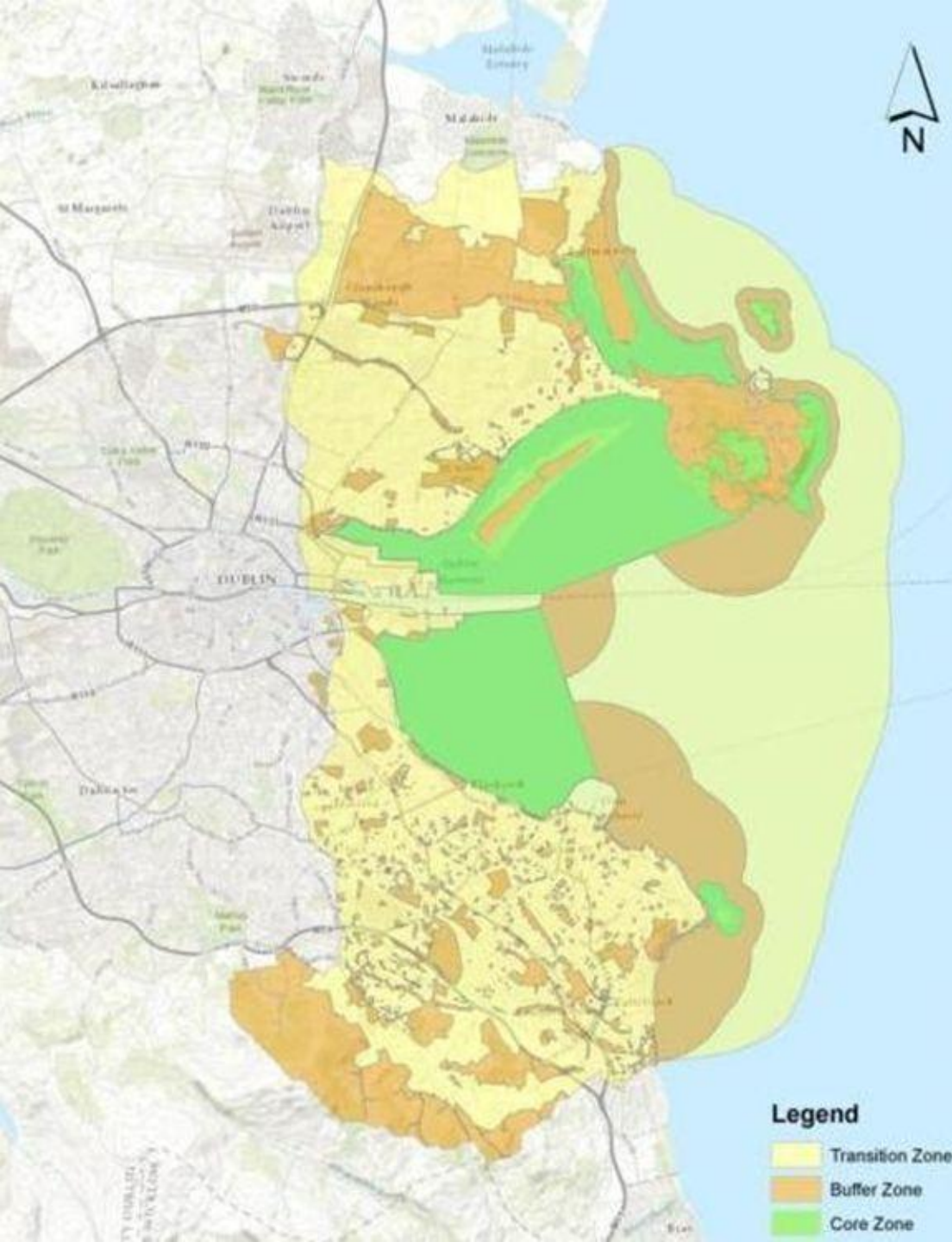
- Periodic Review (2014)
- Dublin Bay Biosphere (2015)
- 305 km²
- 330,254 residents

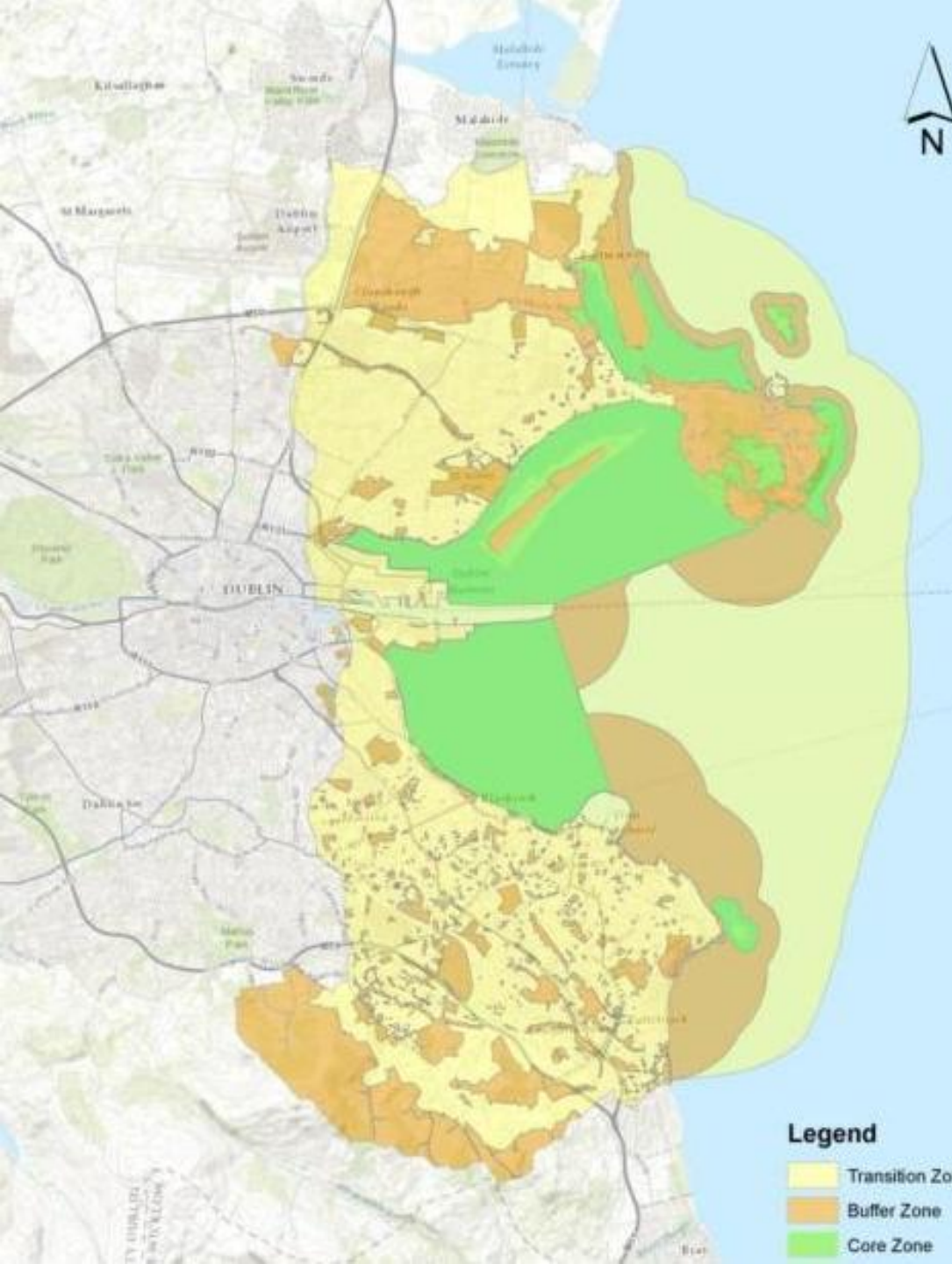


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Dublin Bay
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Vision

'To celebrate and promote a wider appreciation of the natural and cultural heritage of Dublin Bay,

to capture the inherent passion of the community for the Biosphere concept

and for the Dublin Bay Biosphere to be an exemplar for a new wave of biospheres in the world network'

Biosphere Reserves

- **Conservation:** protect biodiversity and cultural diversity
- **Development:** foster an environmentally sustainable economy and society
- **Learning:** support environmental education and training, research, monitoring and demonstration projects

Progress - Conservation

**Dublin Bay Biosphere Biodiversity Conservation and
Research Strategy 2016-2020**



Dublin Bay Biosphere Partnership



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Management of North Bull Island Nature Reserve



2017

Prepared by:
Parks & Landscape Services
Dublin City Council



Progress – Development

Goal: For Dublin Bay Biosphere to become a world-class destination for Sustainable Eco-Tourism and Recreation.

Draft Charter:

(Name of Organisation/ Business) agrees with the Dublin Bay Biosphere's vision:

'To celebrate and promote a wider appreciation of the natural and cultural heritage of Dublin Bay, to capture the inherent passion of the community for the Biosphere concept and for the Dublin Bay Biosphere to be an exemplar for a new wave of biospheres in the world network'

(Name of Organisation/ Business) pledges to help:

1. Achieve this vision
2. Protect and promote our natural resources and cultural heritage
3. Develop our economy in a sustainable way, and make our environmental impact positive wherever possible
4. Engage with Dublin Bay Biosphere Partnership, our local community, and visitors to promote the natural, cultural and built heritage of our Biosphere.

(Name of Organisation/ Business) will demonstrate our contribution to Dublin Bay Biosphere's Vision in each of the following areas:

1. Our organisation's mission/ work programme/ business plan etc. contains a specific Biosphere and Environmental policy.
2. Our business practices/ work programmes contribute to the Biosphere Vision, e.g. promotion of the Biosphere's natural, built and cultural heritage, nature conservation, promotion of responsible/ sustainable behaviours in the Biosphere, e.g. Leave No Trace, training of staff in biosphere communication.
3. Our business practices/ work programmes are sustainable e.g. water conservation, use of SuDS, use of sustainable transport, use of local goods and services.
4. Our communications policy promotes the Biosphere, other local attractions, and fellow tourism and recreation providers
5. Our business practices/ work programmes do not conflict with or undermines any policies of Dublin Bay Biosphere Partnership, or any policies of the Partnership members.
6. We will use the Biosphere logo responsibly and in compliance with the requirements of Dublin Bay Biosphere, and as a demonstration to how our organisation/ business contribution to the Biosphere Vision.
7. Other (please specify):

Identifying Criteria for a Business Network

Based on the model of the Burren Ecotourism Network, the following is a draft list of criteria for a Biosphere Business Network:

1. Businesses will be based within, and operate from the Biosphere, with priority given to businesses operating within or adjacent the Biosphere's Core Zone.
2. Businesses will be involved in eco-tourism, recreation or ancillary services, e.g. food and lodging.
3. Businesses will commit to a Biosphere Business Charter
4. Consideration should be given to businesses not involved in these sectors, but who demonstrate a commitment to the Biosphere through Corporate Social Responsibility, e.g. a regular programme of conservation volunteering.
5. Businesses will have a Biosphere and Environmental policy as part of their Business Plan.
6. Businesses will identify how their business practices are sustainable and contribute to the Biosphere Vision, e.g. water conservation, use of SuDS, use of sustainable transport, use of local goods and services, training of staff.
7. Businesses will identify their communications policy and how they promote the Biosphere, other local attractions, fellow tourism/recreation providers, and network members.
8. Businesses will ensure their practices do not conflict with or undermines any policies of Dublin Bay Biosphere Partnership, or any policies of the Partnership members.

Progress – Development

Biosphere Discovery Tours



Progress - Learning

The screenshot shows the homepage of the Dublin Bay Biosphere website. At the top left is the logo for the Dublin Bay Biosphere, featuring a stylized 'D' and 'B' with a butterfly. The navigation menu includes Home, About, Resources, Events, Get Involved, News, Conference, and Contact. A large banner image features a butterfly, a rabbit, and people in a boat, with the text: "Working together to promote a balance between people and nature". Below the banner is a section titled "Our Purpose" with the text: "Inspire a positive future by connecting people and nature today." and a link "About Dublin Bay Biosphere". A cookie consent banner is visible at the bottom of this section.

A video player showing a young boy in a wetsuit standing in front of a harbor with boats. The text "EMBRACE THE NATURE" is overlaid in large, bold, yellow letters. The video player interface includes a play button, a progress bar showing 0:30 / 4:35, and a YouTube logo.

Four children in school uniforms (blue jackets and dark skirts) are standing in front of a display board. The board features a large drawing of a swan with the text "THE SWAN" and "GIVE" written around it. There are also smaller drawings and text on the board.

Communications Charter

Our Biosphere is not just about where we are today, it's about where we want to go, to inspire a positive future by connecting people and nature today

Communications Charter

For nature-lovers, our biosphere is full of wildlife all year round – nesting seabirds, seals, over-wintering wildfowl and waders, porpoises, wildflowers, shellfish and much more.

Communications Charter

For recreational enthusiasts, our biosphere offers unparalleled opportunities for kite-surfing, hill-walking, cycling, etc.

Communications Charter

For the culturally curious, our Biosphere has a rich maritime heritage and some iconic landmarks - Samuel Becketts bridge, Poolbeg Chimneys, James Joyce Mortello Tower, Kish Lighthouse, etc

Communications Charter

All parts of our Biosphere are accessible via public transport – boat, train, bus, bike, and all within short commuting distance

Communications Charter

Dublin Bay Biosphere:
A place to live, work and visit



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Chuan Bhaile Átha Cliath

Dublin Bay

BIOSPHERE



Wim Meijer

*UCD School of Biomolecular and Biomedical
Science, UCD*

Acclimatize – Overview and the Irish Experience

Acclimatize



€6.7 million investment in bathing waters in Ireland and Wales
5 year project – 80% funded by European Regional Development Fund
UCD is the lead partner



What is INTERREG?

- INTERREG is a series of European Territorial Cooperation programmes that aim to stimulate cross border and inter-regional cooperation in the European Union.
- Started in 1989, INTERREG is financed by the European Regional Development Fund (ERDF)
- The new phase of the Programme is INTERREG V, covering the period 2014-2020

European Territorial Co-operation 2014-2020

- Cross Border Programmes (INTERREG VA)

Ireland-Wales Programme - ACCLIMATIZE €6.7 million

Ireland/Northern Ireland/Scotland Programme - SWIM €1.1 million

- Transnational Co-Operation (INTERREG VB)

Northern Periphery and Arctic Programme (NPA)

Atlantic Area Programme

North West Europe Programme

- INTERREG EUROPE (VC)

Interreg V Ireland – Wales

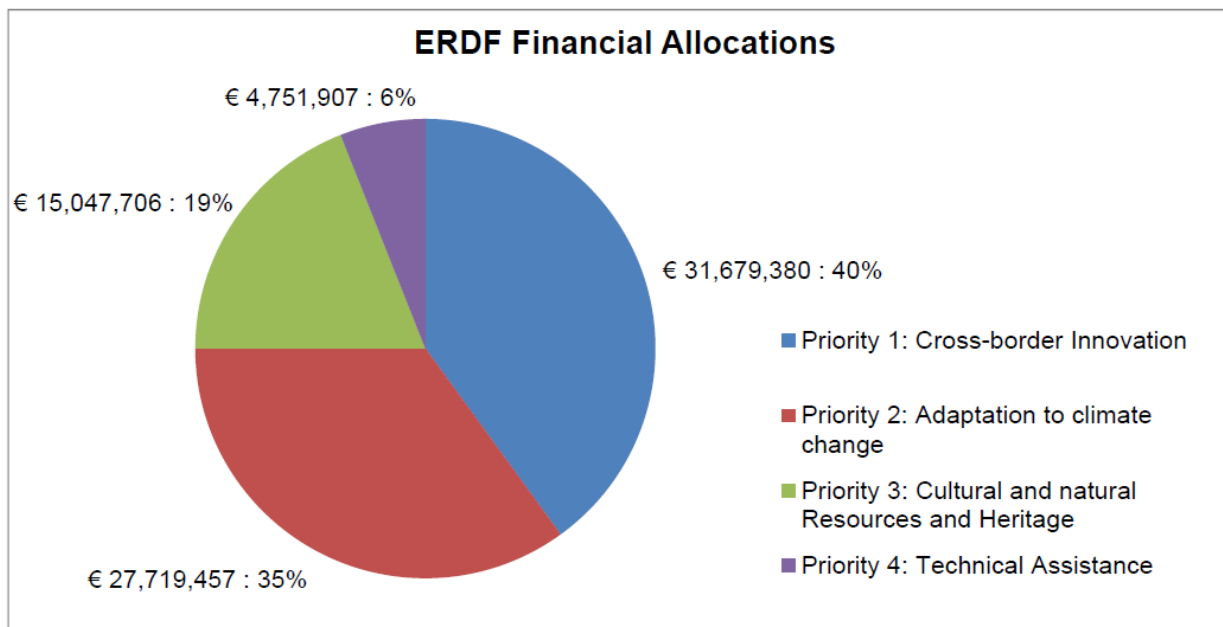


Figure 1: ERDF funding allocation for Interreg V Ireland Wales

Total ERDF funding for Ireland Wales: €79,198,450

Priority 2: 'Adaptation to Climate Change' €27,719,457

Projects receive 80% ERDF funding and require 20% match funding

Priority Axis 2: Adaptation to Climate Change

Specific objective: To increase capacity and knowledge of Climate Change adaptation for the Irish Sea and coastal communities

Projects need to demonstrate:

- Alignment with the EU Climate Change Adaptation Strategy
- Alignment with the Ireland Wales Co-operation Programme 2014-2020
- Alignment with relevant Irish and Welsh Government policies

A key goal of the programme is:

‘to preserve and enhance the marine and coastal environment for the enjoyment of future generations in the face of the increasing impacts of climate change’

Result based approach: development and implementation of real solutions, i.e., ‘Blue Skies research’ is not funded.

Acclimatize

aims to address both

- immediate concerns in relation to human and animal contamination of rivers and bathing waters
- as well as to assess the impact of climate change driven effects on water pollution

Wales

Bathing waters primarily impacted on by agricultural activities

main 'at-risk' bathing waters commencing with Cemaes Bay in Anglesey which formed the focus of environmental sampling and instrumentation in 2017

Ireland

Urban bathing waters

Merrion Strand, Sandymount Strand, Dollymount strand

'Urban' rivers and streams



Dublin Bay

Acclimatize: 4.5 years of research focusing on Dublin Bay

NOW:

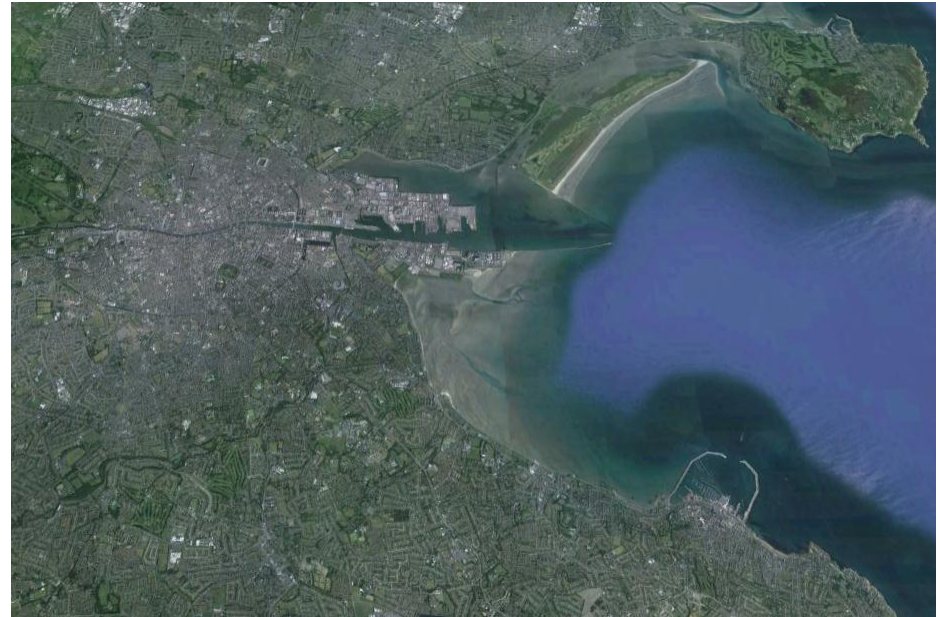
Identify the main pollution pressures on Dublin Bay.

- Suggests amelioration methods for current pollution pressures
- Suggests effective infrastructure investment strategies

FUTURE:

Determine how Climate Change driven effects alter these pollution pressures

- 'Climate proof' investments
- Identifies potential new threats or benefits



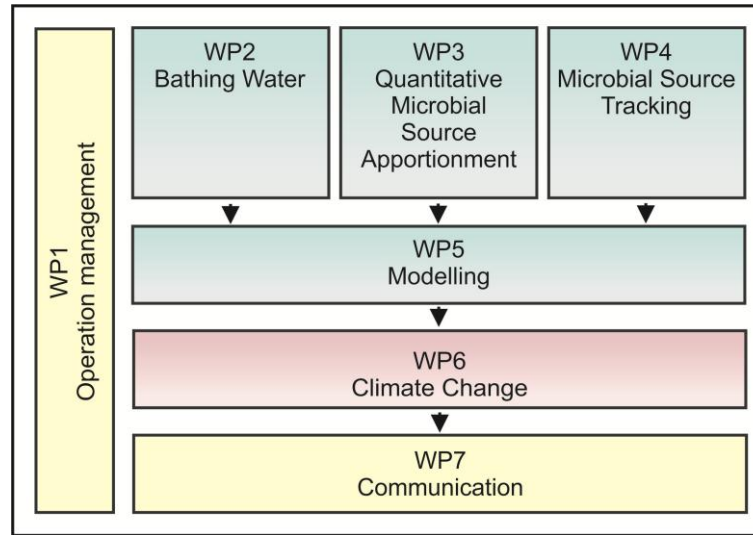


Figure 1: Overview and functional relationship between Acclimatize work packages.

Activity	Work package	Description
Bathing water characterisation	WP2	Determination of FIB loading of bathing water by animals and sediments, and variability of FIB in the bathing water
Quantitative Microbial Source Apportionment (QMSA)	WP3	Determination of the FIB flux from catchments to bathing waters
Microbial Source Tracking	WP4	Determination of the biological origins of FIB
Linked models of catchments and the near-shore zone	WP5	Modelling of catchments and near shore waters to describe bathing water quality
Climate change effects on near-shore microbial water quality and health risk	WP6	Determination of the climate change effects on factors contributing to faecal pollution of bathing waters in the study areas, and long-term impacts on water quality and public health

Rivers and streams

e.g., Liffey, Tolka, Dodder, Elm Park stream

- Baseline pollution levels in Dublin area water bodies
- Identification of pollution 'hot spots' and source identification in these water bodies
- Weather impacts
- Instrumentation of ungauged rivers and streams – potential loadings by these waterbodies

Bathing waters

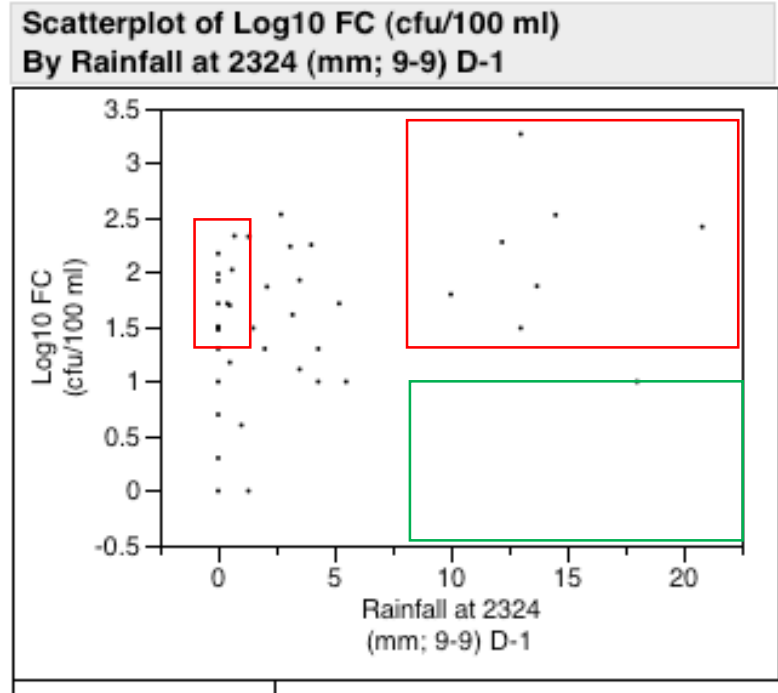
Merrion, Sandymount, Dollymount Strands

- Contribution by birds, dogs and other sources on the beach
- Contribution by human pollution
- Contribution from sand/sediment
- Short-term variability

Integration

- Development of a numerical hydro-environmental model of the near-shore waters; transport and fate of FIB and impact on compliance point
- Determine subsurface currents (Drogues)
- Determination of the impact of a stream or river on the bathing water/compliance point (Tracer studies)
- Embedding of the DCC model into an overall Dublin Bay model

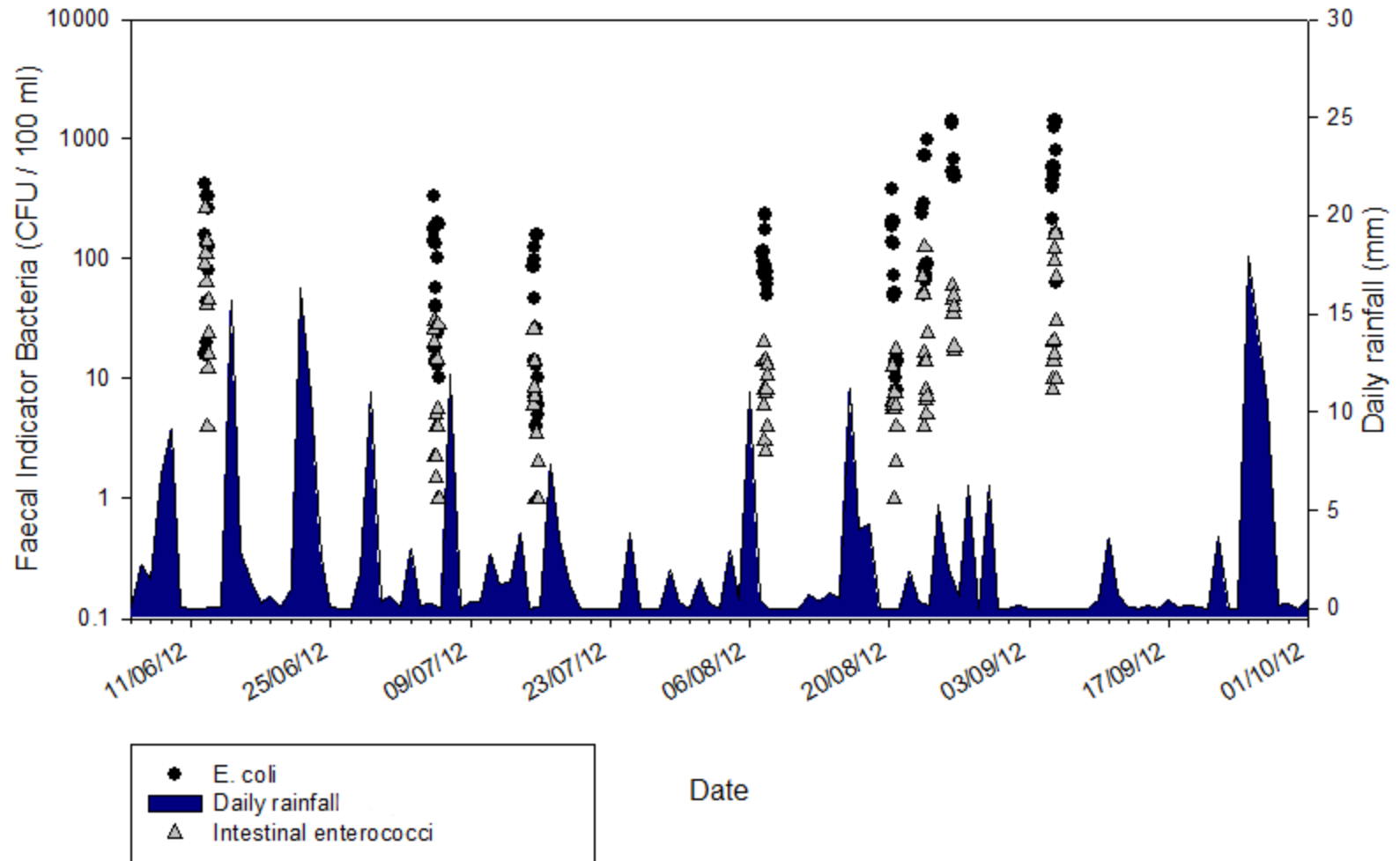
Data analysis shows that rainfall is not the only parameter affecting microbial counts.



Other factors need to be taken into account to explain short-term water pollution



Short Term Variability



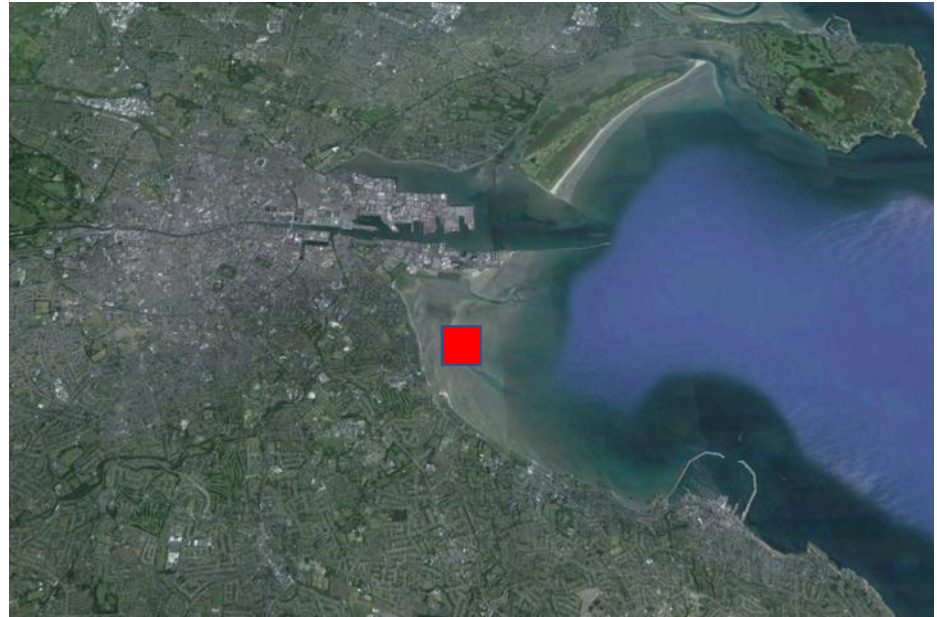


Is the contribution by birds significant?

If so, how much do they contribute

Historical data
Direct observation

Microbial Source Tracking



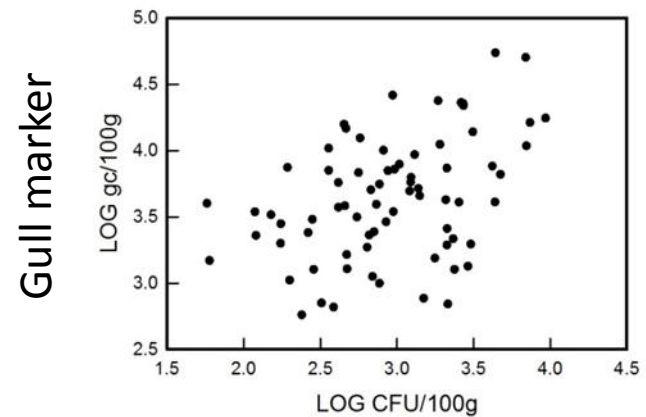
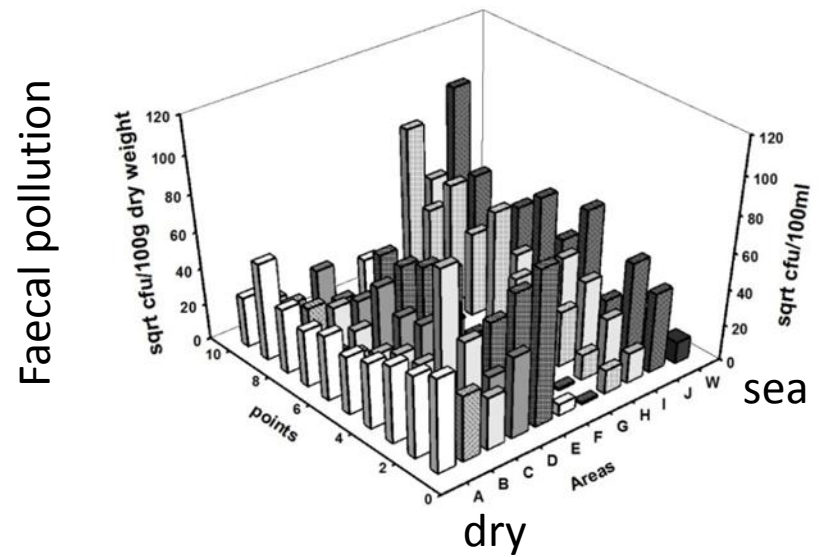
Microbial Source Tracking

to identify animal and human pollution
On Sandymount Strand

Gull, dog, human and ruminant markers



500 m² section of Sandymount





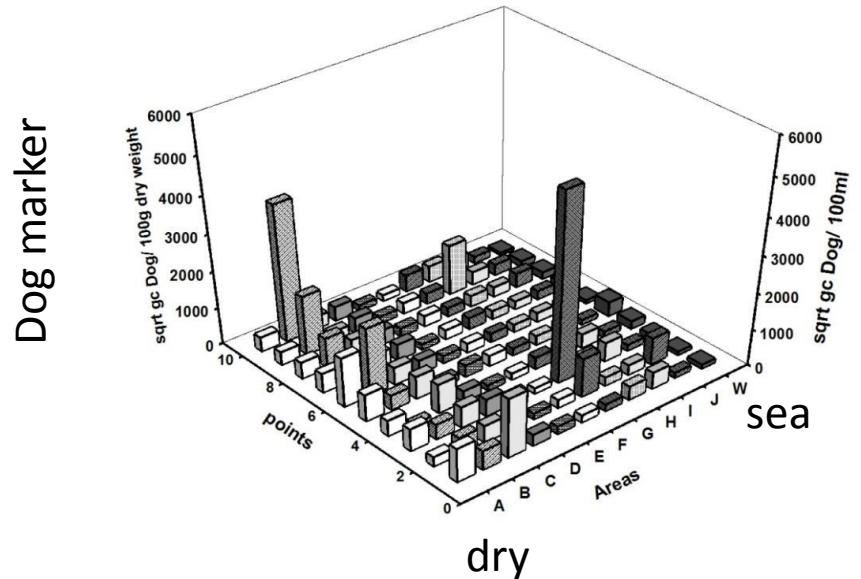
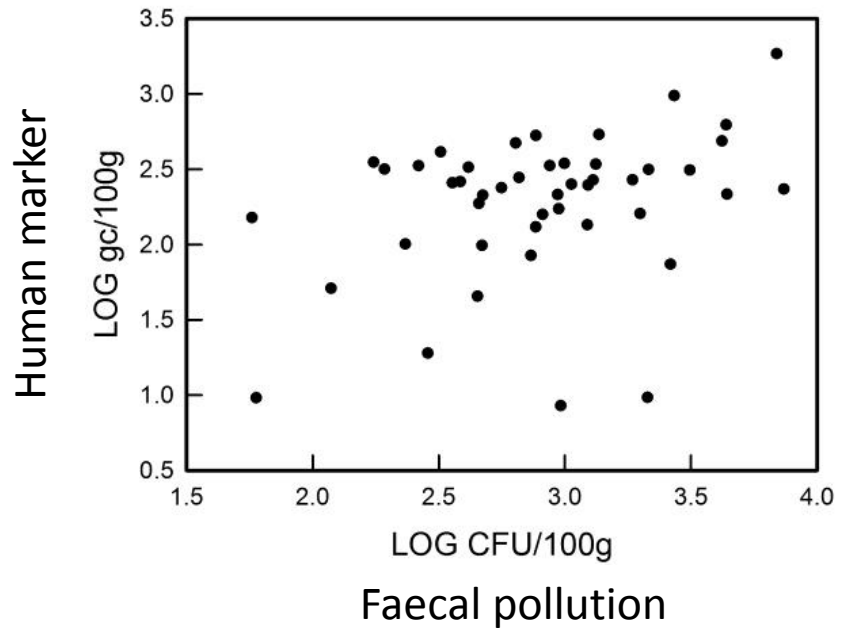
Pollution on Sandymount Strand:

Multiple origins

Significant correlation between

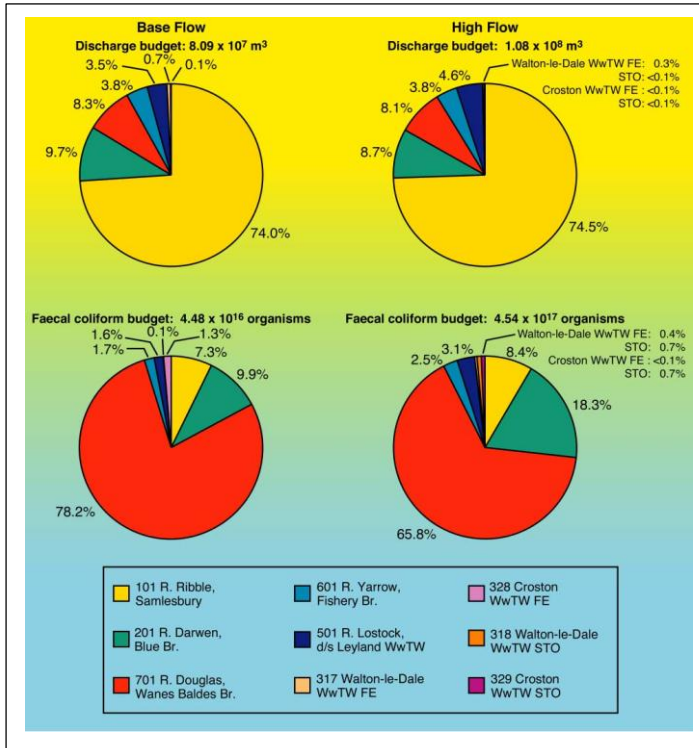
- *Enterococci and human marker*
- *Enterococci and gull marker*

Heterogeneous distribution of FIB and MST markers

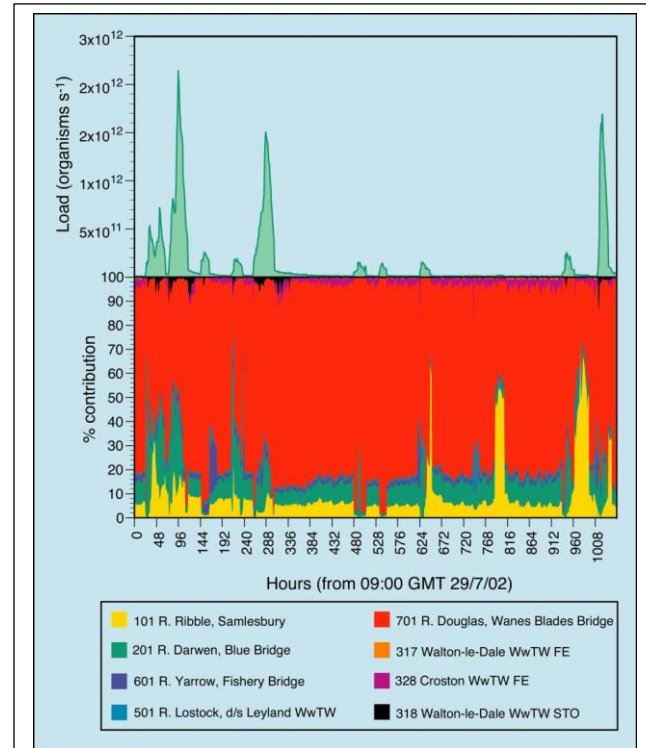


Quantitative Microbial Source Apportionment

Professor David Kay



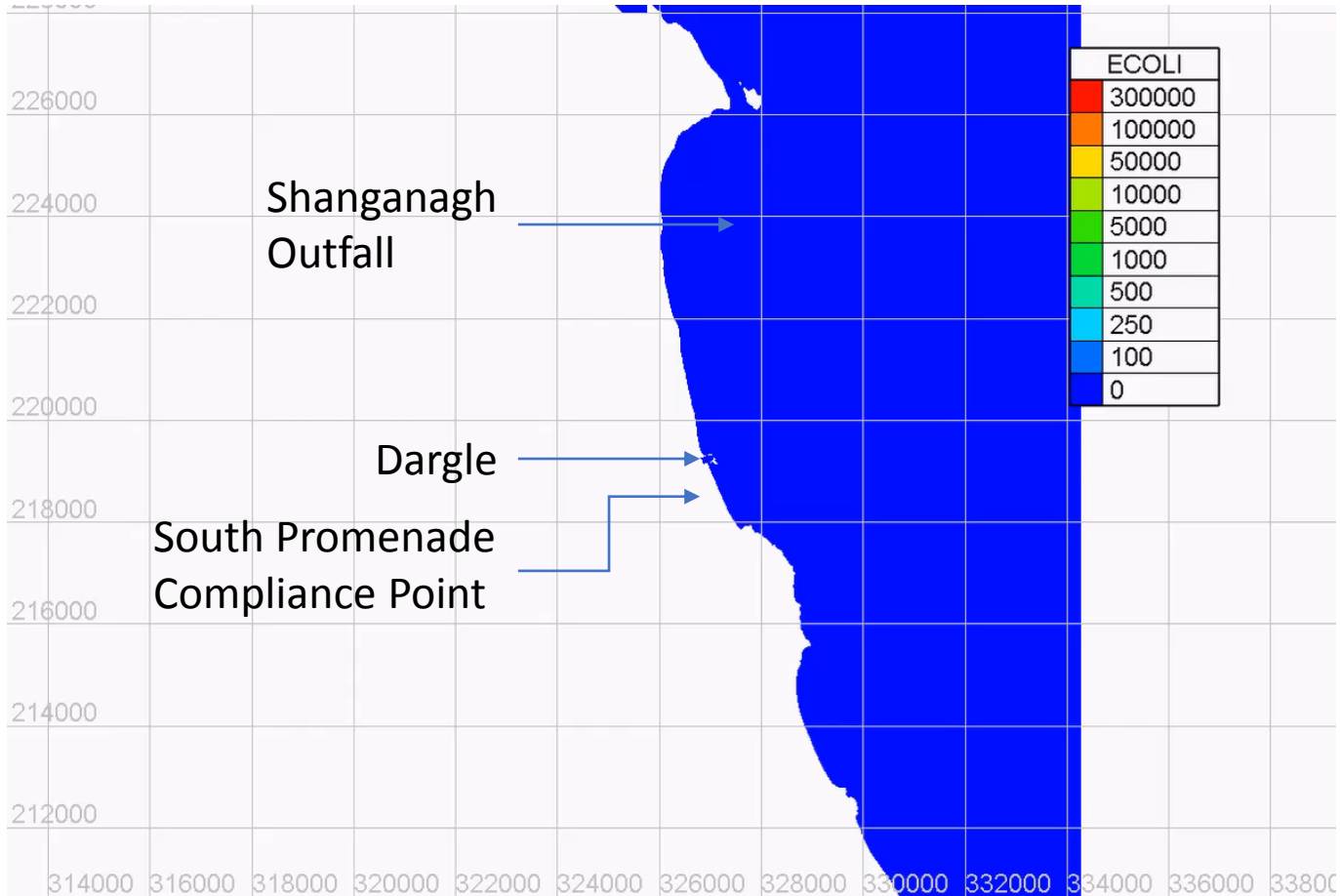
Discharge and bacterial flux pie charts for the Ribble Estuary, Lancashire



Hourly flux plot for bacterial flux to the Ribble estuary over a two month study period

Pollution at the Bray South Promenade beach

Shanganagh Wastewater Treatment Plant and Dargle Outfall





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School of Biomolecular and
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Institute for Geography and
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Aberystwyth University



Joanne Chadwick
Overall Project Manager
School of Biomolecular and
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School of Civil, Structural and
Environmental Engineering,
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Bat Masterson
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Biomedical Science, UCD



Gregory O'Hare
School of Computer Science
and Informatics, UCD

Strong degree of interdisciplinarity and complementarity



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Cheryl Davies
 Postdoctoral Researcher
 Institute for Geography and
 Earth Sciences
 Aberystwyth University



Comhairle Cathrach
 Bhaile Átha Cliath
 Dublin City Council



Comhairle Contae County Council



UISCE
 ÉIREANN : IRISH
 WATER



Cyfoeth
 Naturiol
 Cymru
 Natural
 Resources
 Wales



Comhairle Contae
 Fhine Gall
 Fingal County
 Council



Environmental Protection Agency
 An Ghníomhaireacht um Chaomhú Comhshaoil

Thank
you!





David Kay
Aberystwyth University

Acclimatize – The Welsh Experience

Acclimatize



Activity in Wales

www.acclimatize.eu





Mark Wyer and David Kay
Aberystwyth University

Welsh Project Partners



City and County of
Swansea



Cyfoeth Naturiol Cymru
Natural Resources Wales



Dŵr Cymru
Welsh Water



Llywodraeth Cymru
Welsh Government



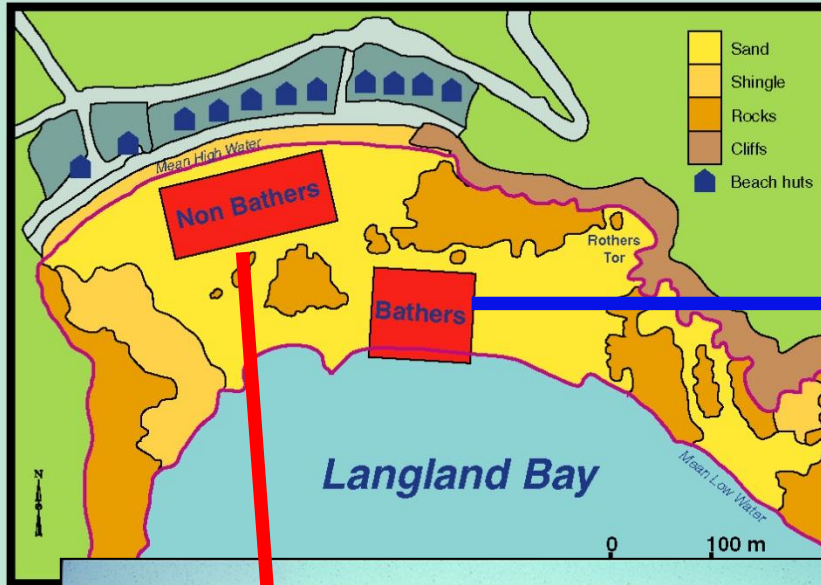
Environment
Agency

The Background



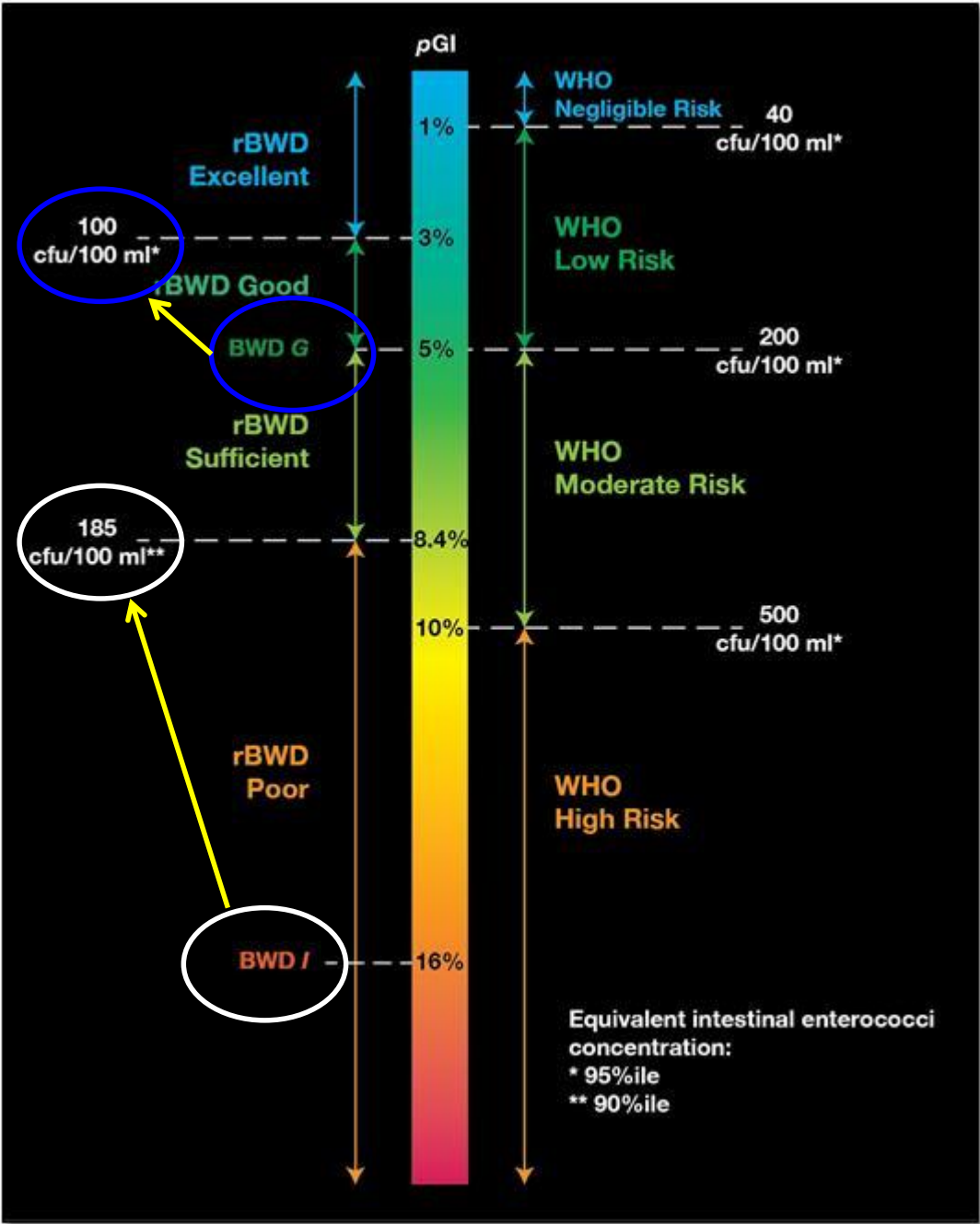
2015 Prize from the UK Water Industry Foundation for the Highest Impact Research in the Water Sector in the area of Software Development as outlined in the 2014 UK Research Assessment Exercise.

UK studies 1989-1992

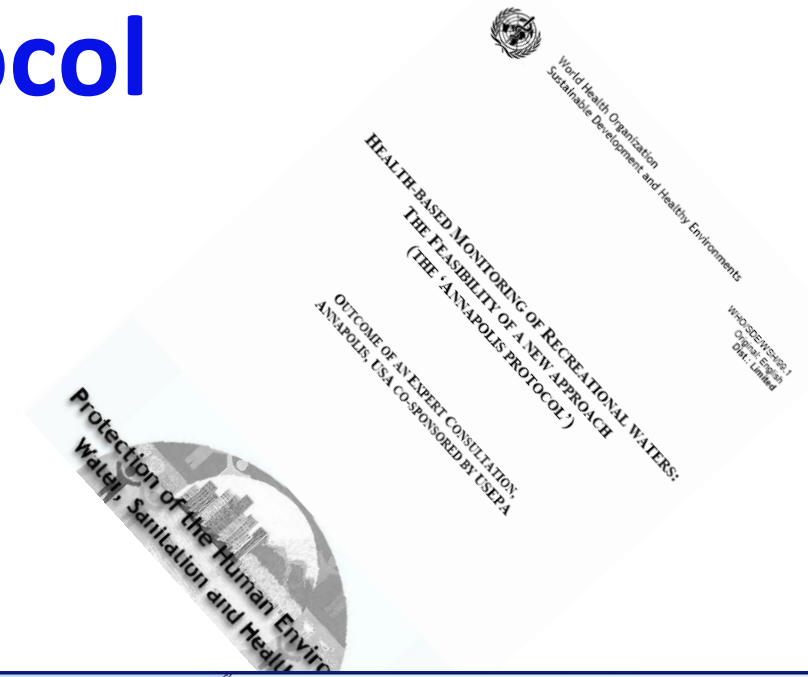


The WHO Microbiological Guidelines

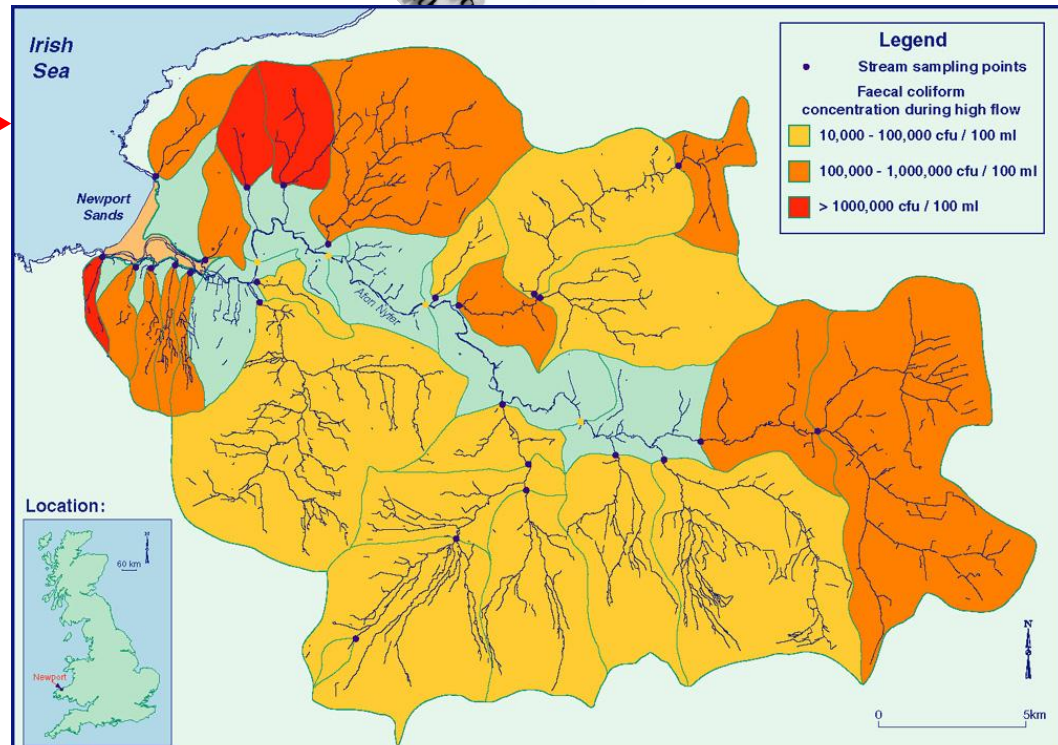
≤40	This range is below the NOAEL in most epidemiological studies.	<1% GI illness risk <0.3% AFRI illness risk
41–200	The 200/100 ml value is above the threshold of illness transmission	1–<5% GI illness risk 0.3–<1.9% AFRI illness risk
201–500	This range represents a substantial elevation in the probability of all adverse health outcomes	5–10% GI illness risk 1.9–3.9% AFRI illness risk
>500	Above this level, there may be a significant risk of high levels of minor illness transmission.	>10% GI illness risk >3.9% AFRI illness rate



The Annapolis Protocol



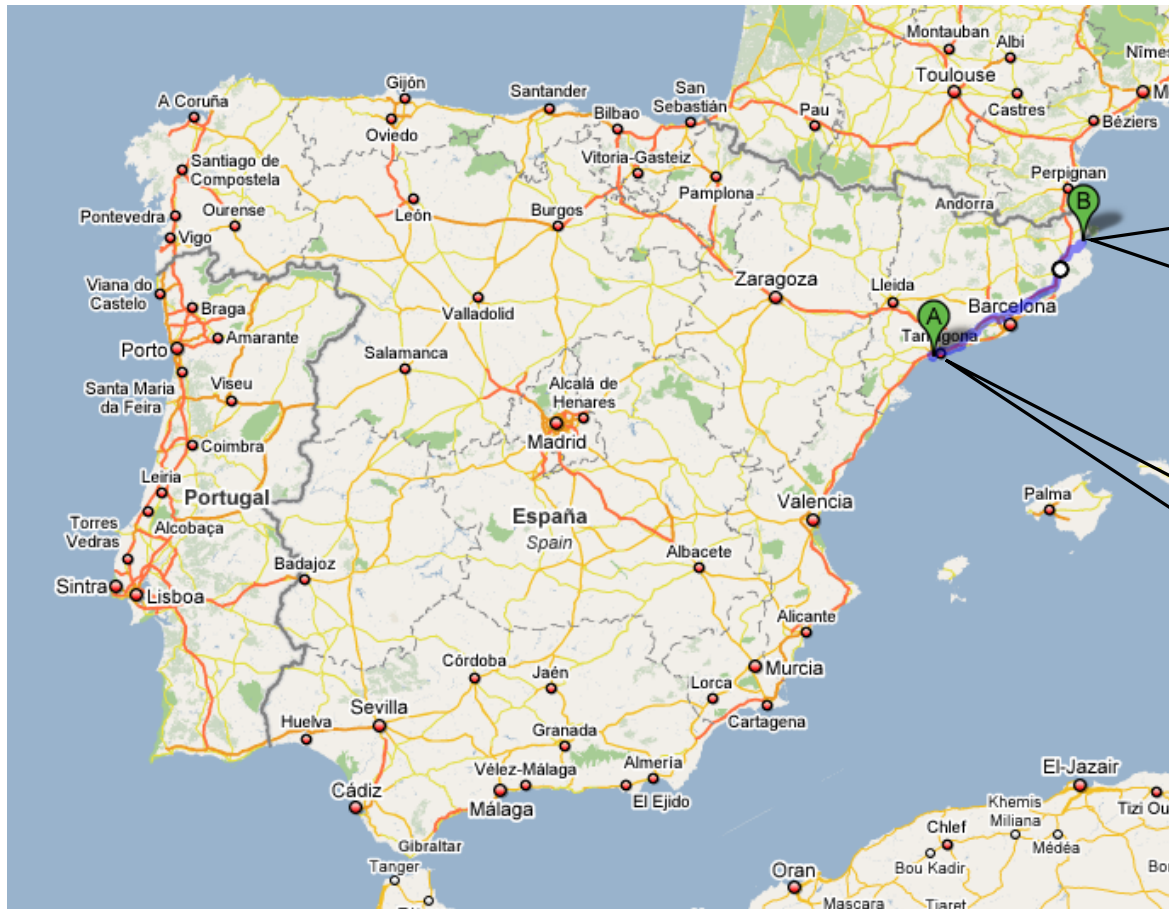
Norman Lowe DCWW
Nick Humphrey DCWW
Peter Bird EA



Spanish Studies

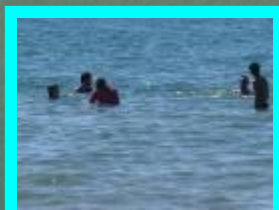


1. Study sites



Trials 8 & 9
Sant Pere Pescador
22 & 23 Sep 07

Trials 6 & 7
Salou
24 & 30 Sep 06



Epibathe Hungary

The team...



...and their great leader

1. Study sites

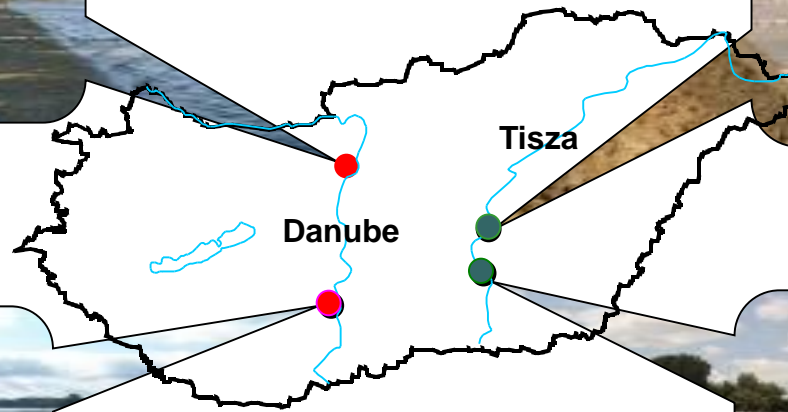
Trial 11
Dömsöd, 16 JUL 06



Trial 14
Tiszakécske, 5 AUG 07



Trial 12
Dombori, 13 AUG 06



Trial 13
Csongrád, 1 JUL 07

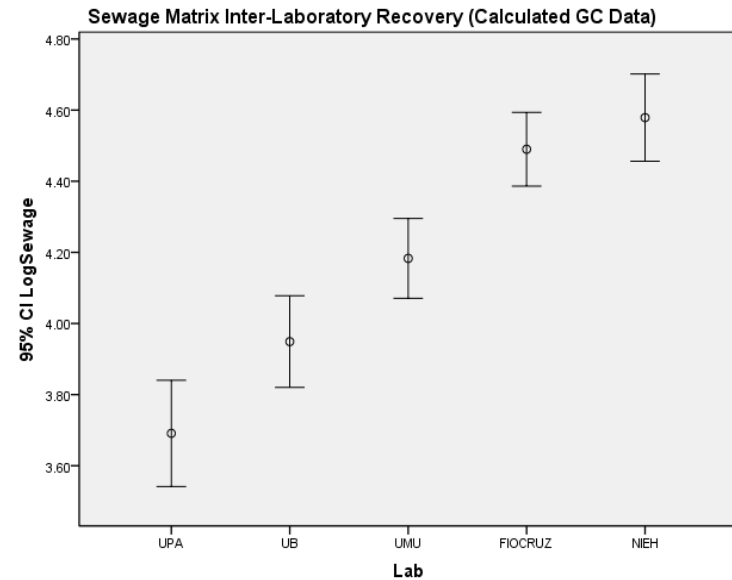
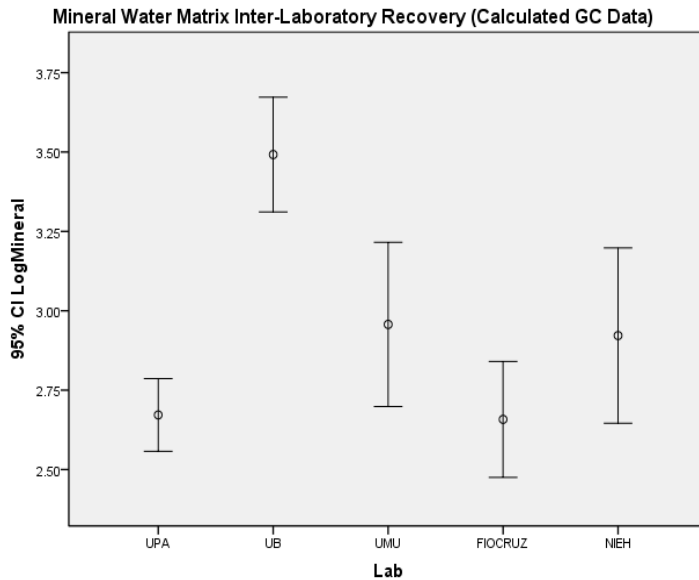
Virobathe Viroclimate



Viroclimate

5 river basins within 5 different countries

Virobathe/Viroclimate



Conclusion

Improvement on the inter-laboratory reproducibility of virological data generated by qPCR would be needed before such data could be used in a regulatory context having legal force.

Outcomes



WHO/HSE/WSH/10.04

ADDENDUM TO THE

WHO GUIDELINES FOR SAFE RECREATIONAL WATER ENVIRONMENTS, VOLUME 1, COASTAL AND FRESH WATERS

LIST OF AGREED UPDATES

4.3.2006 EN Official Journal of the European Union L 64/37

DIRECTIVE 2006/7/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 15 February 2006

concerning the management of bathing water quality and repealing Directive 76/160/EEC

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission ⁽¹⁾,

Having regard to the opinion of the European Economic and Social Committee ⁽²⁾,

Having regard to the opinion of the Committee of the Regions ⁽³⁾,

Acting in accordance with the procedure laid down in Article 251 of the Treaty ⁽⁴⁾, in the light of the joint text approved by the Conciliation Committee on 8 December 2005,

Whereas:

(1) Building on the Commission's Communication on sustainable development, the European Council has singled out objectives as general guidance for future development in priority areas such as natural resources and public health.

(2) Water is a scarce natural resource, the quality of which should be protected, defended, managed and treated as such. Surface waters in particular are renewable resources with a limited capacity to recover from adverse impacts from human activities.

(3) Community policy on the environment should aim at a high level of protection, and contribute to pursuing the objectives of preserving, protecting and improving the quality of the environment and of protecting human health.

(4) In December 2000, the Commission adopted a Communication to the European Parliament and the Council on the development of a new bathing water policy and initiated a large-scale consultation of all interested and involved parties. The main outcome of this consultation was general support for the development of a new Directive based on the latest scientific evidence and paying particular attention to wider public participation.

(5) Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the Sixth Community Environment Action Programme ⁽⁵⁾ contains a commitment to ensuring a high level of protection of bathing water, including by revising Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water ⁽⁶⁾.

(6) Pursuant to the Treaty, in preparing policy on the environment the Community is, *inter alia*, to take account of available scientific and technical data. This Directive should use scientific evidence in implementing the most reliable indicator parameters for predicting microbiological health risk and to achieve a high level of protection. Further epidemiological studies should be undertaken urgently concerning the health risks associated with bathing, particularly in fresh water.

(7) In order to increase efficiency and wise use of resources, this Directive needs to be closely coordinated with other Community legislation on water, such as Council Directives 91/271/EEC of 21 May 1991 concerning urban waste-water treatment ⁽⁷⁾, 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources ⁽⁸⁾ and Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy ⁽⁹⁾.

Where do we need to be?

Real-time prediction of bathing water

(1.5-5.4 billion UK£ and we keep present Blue-Flag numbers)

black box

hydrodynamic

Scottish Approach

(Calum McPhail and Ruth Stidson, SEPA)

Water and Environment Journal
Promoting Sustainable Solutions

Water and Environment Journal, Print ISSN 1524-6460

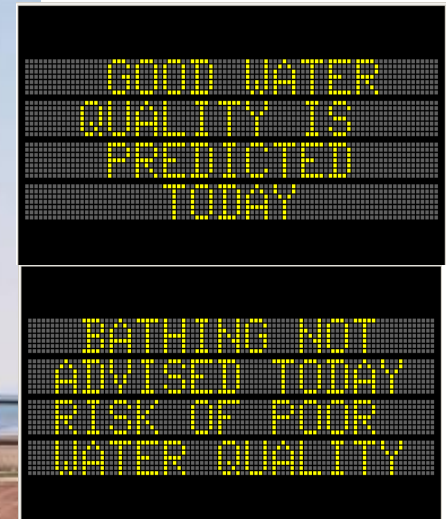
Development and use of modelling techniques for real-time bathing water quality predictions

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Abstract

Real-time prediction of bathing water quality is suggested as an appropriate regulatory approach in recent WHO Guidelines and new European Union (EU) standards for bathing water quality. This research has developed a real-time indicator



Problems (outwith Scotland)

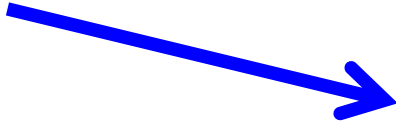
- **Model calibration data**

- ‘**Bathing Day**’ is the modelling unit
- Spot compliance samples provide the calibration data

- **Diurnality** introduces variation and increase model error reducing explained variance
- **Censored data** (< and >) and measurement imprecision in cfu and/or MPN counts would further reduce model utility

- **Data precision?**

Table 5.1 Estimated count and 95% confidence intervals for the number of organisms in a 100 ml sample, where, after dilution, a subsample is examined



Organisms observed in the subsample	10-fold dilution		100-fold dilution	
	EC	CI	EC	CI
10	100	50-180	1000	480-1830
50	500	380-650	5000	3750-6640
100	1000	820-1200	10000	8190-12200

EC = estimated count.

CI = 95% confidence interval.

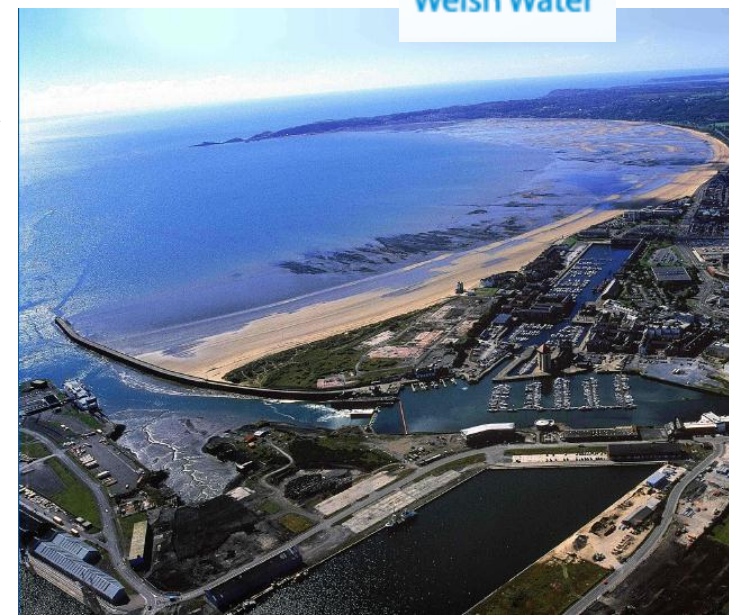
Solutions



Ireland's EU Structural Funds
Programmes 2007 - 2013
Co-funded by the Irish Government
and the European Union



- Characterise the ‘**bathing day**’ water quality for model building
 - **multiple sampling events** during daylight
 - 07:00 to 19:00
 - Measure FIOs with **enhanced accuracy** through the bathing day
 - Triplicate enumeration / >100+ml filtered

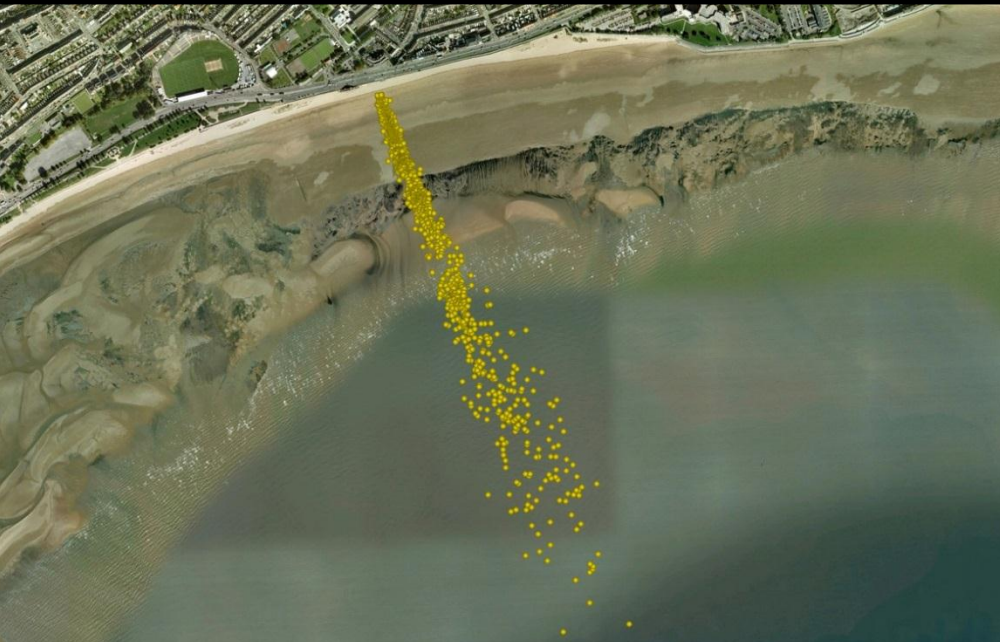


Sample collection

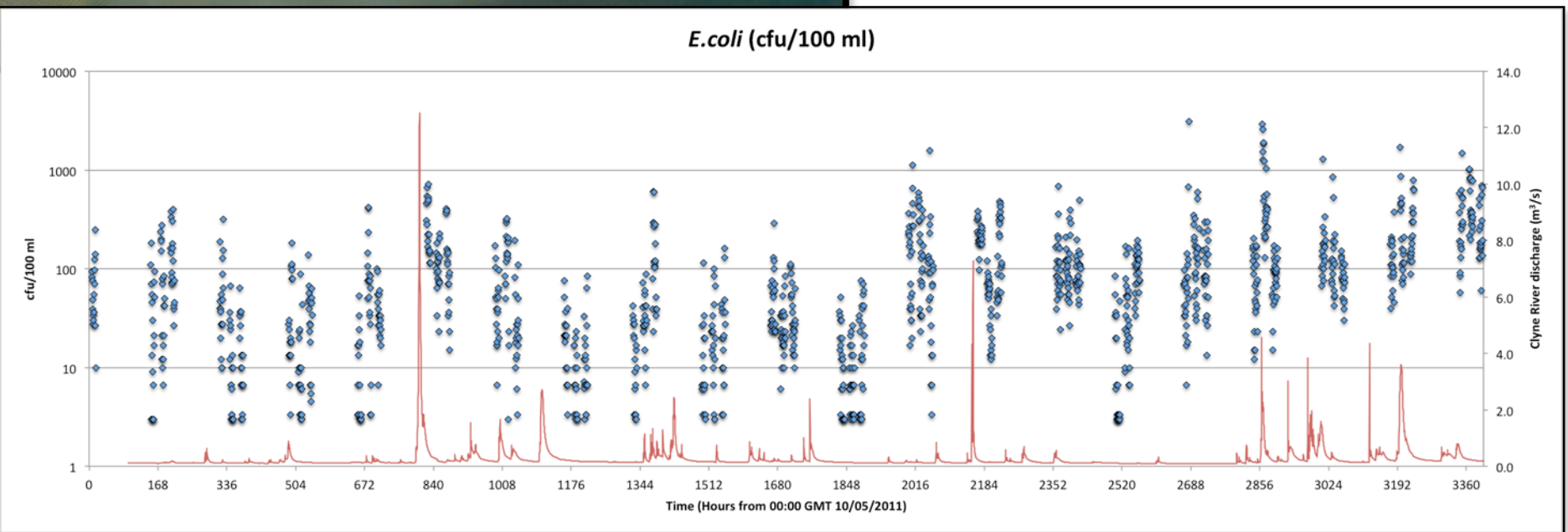


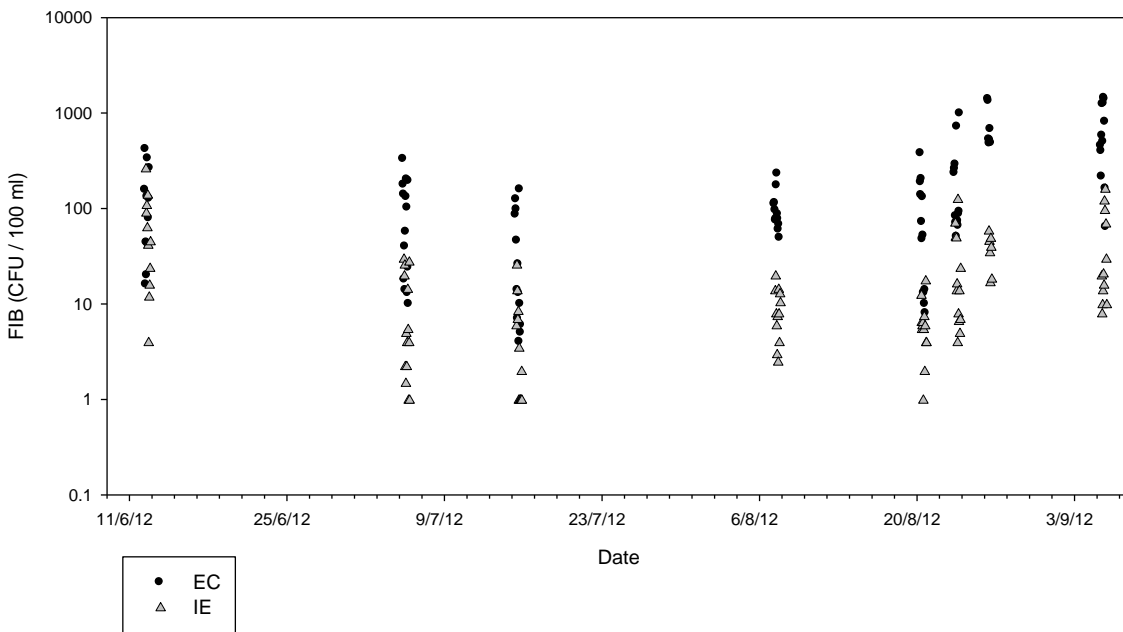
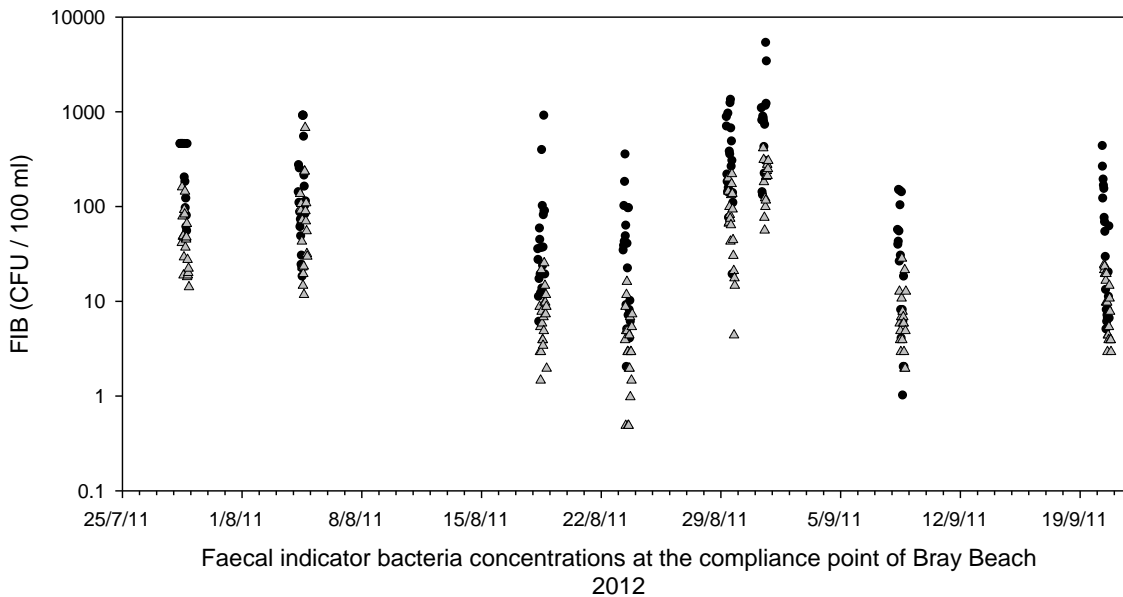
Sample collection





DSP intensive sampling





UCD Data from Bray Beach

(reproduced with permission of Prof Wim Meijer)



Confirmed enterococci – Model 1

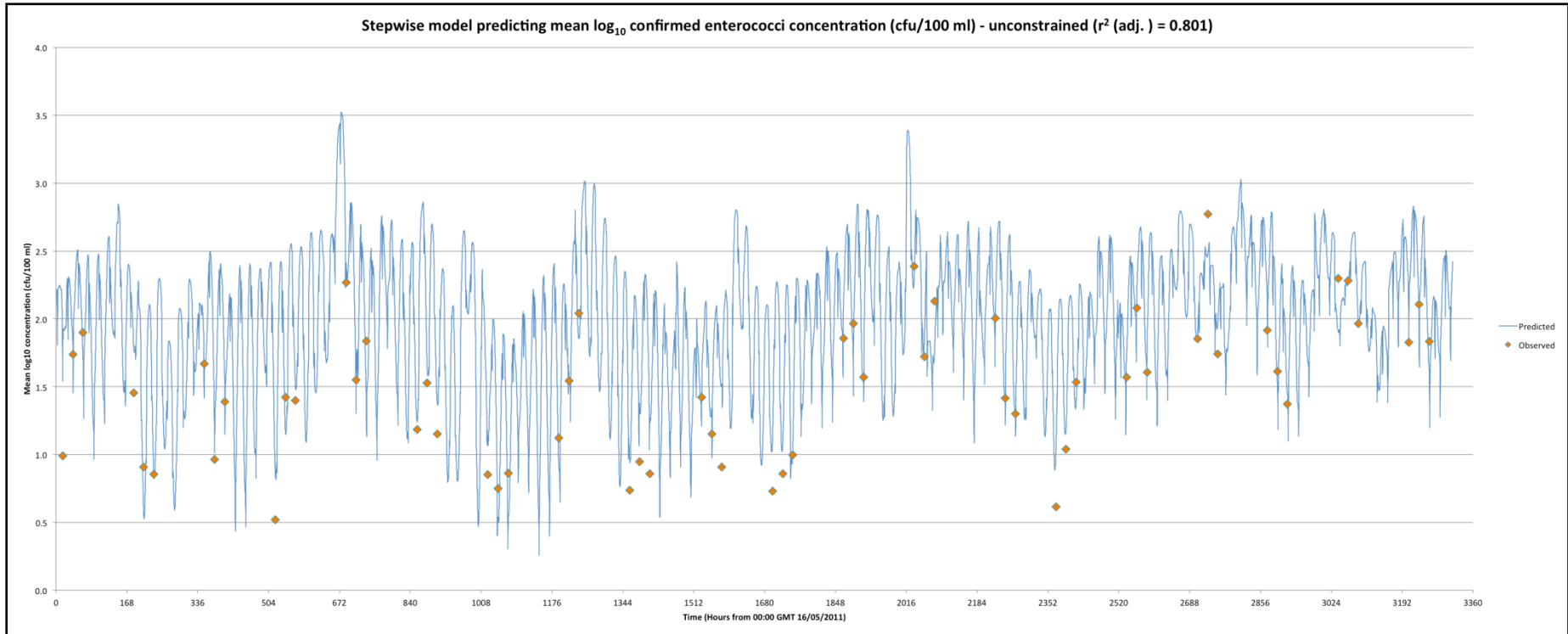
Model 1 - Tolerance 0.0001

Dependent (Y): Mean log₁₀ Confirmed enterococci (cfu/100 ml)

Step	Predictor		r ² (adj.)	Change in r ² (%)	Partial r	Sig.	Tolerance
1	UVB Radiation on sampling day (kJ/sq. m)	X ₁	0.440				
2	Log ₁₀ Brynmill Str. Max. Q in previous 48 Hrs (cub. m)	X ₂	0.589	14.894	0.528	0.000	0.916
3	Max. Tide Height on sampling day (m)	X ₃	0.643	5.455	0.385	0.003	0.934
4	Log ₁₀ Afan STW Q in previous 48 Hrs (cub. m)	X ₄	0.686	4.250	-0.368	0.006	0.509
5	Mean Wind Sp. in previous 48 Hrs (m/s)	X ₅	0.742	5.615	-0.441	0.001	0.686
6	Min. Tide Ht. in previous 12 Hrs. (m)	X ₆	0.775	3.329	0.382	0.005	0.081
7	Log ₁₀ Clyne R. Gauge Q in previous 24 Hrs (cub. m)	X ₇	0.801	2.606	0.365	0.008	0.351

$$Y = 10.551 - 0.038X_1 + 0.440X_2 + 0.522X_3 - 2.992X_4 - 0.236X_5 + 0.366X_6 + 0.405X_7 \pm 0.229$$

Intestinal enterococci



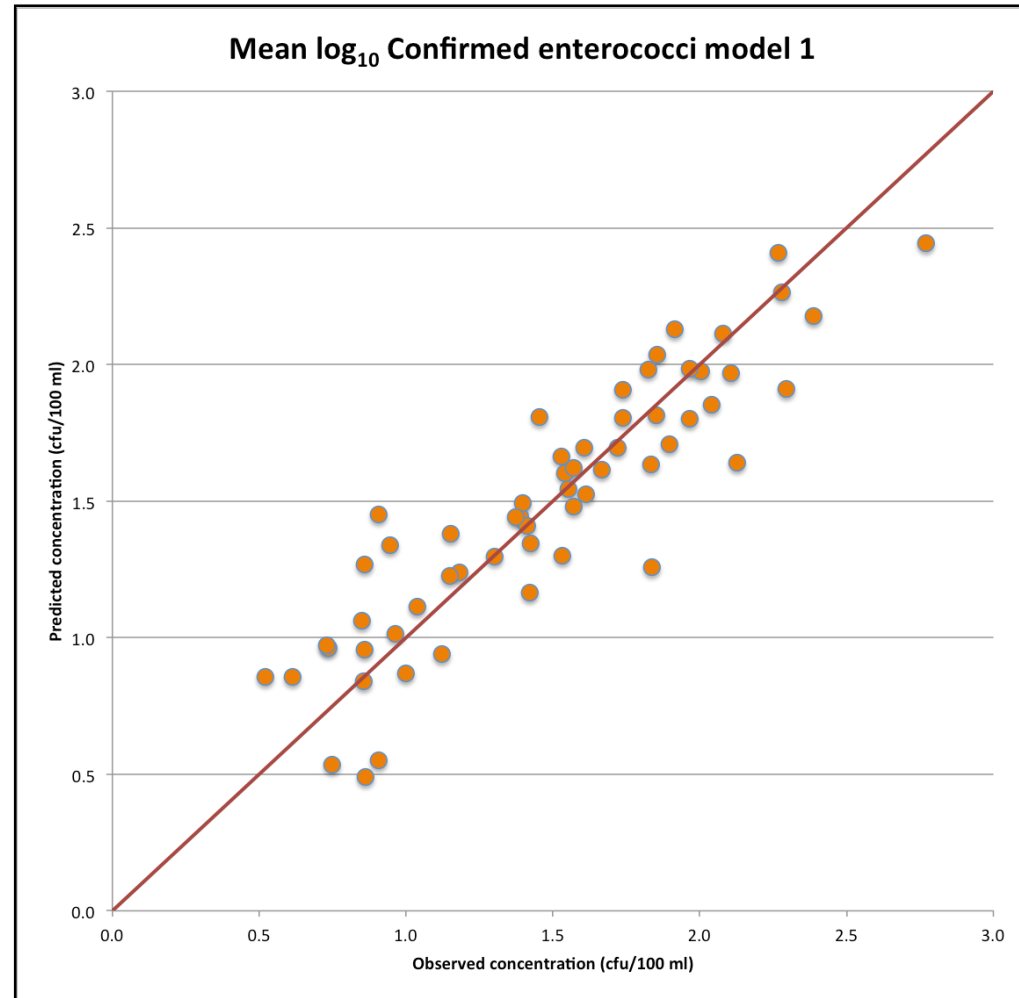
7 predictors

smart coasts

Intestinal enterococci

7 predictors

r^2 80.1%



FIO Diurnality

- UV Irradiance is the main predictor
- Temporal pattern examination prudent
- Two sets of comparisons were made:
 - 61 days (10/05-28/09/2011), split into 07:00-11:00 and 11:30-16:00 groups – Student's t-test
 - 24 days (18/07-07/09/2011), split into 07:00-11:00, 11:30-15:00, and 15:30-19:00 groups - ANOVA

Hourly Compliance outcomes – all data

Hour (GMT)	rBWD <i>E. coli</i> Outcome	rBWD enterococci Outcome	rBWD Overall Outcome
07:00	Sufficient	Poor	Poor
08:00	Sufficient	Poor	Poor
09:00	Sufficient	Poor	Poor
10:00	Good	Poor	Poor
11:00	Good	Sufficient	Sufficient
12:00	Good	Sufficient	Sufficient
13:00	Good	Sufficient	Sufficient
14:00	Good	Good	Good
15:00	Sufficient	Sufficient	Sufficient
16:00	Sufficient	Poor	Poor
17:00	Sufficient	Poor	Poor
18:00	Sufficient	Poor	Poor
19:00	Sufficient	Poor	Poor

Compliance outcome changes through the sampling day



Model performance tested against a new
data set collected in 2014

‘no deterioration in performance’

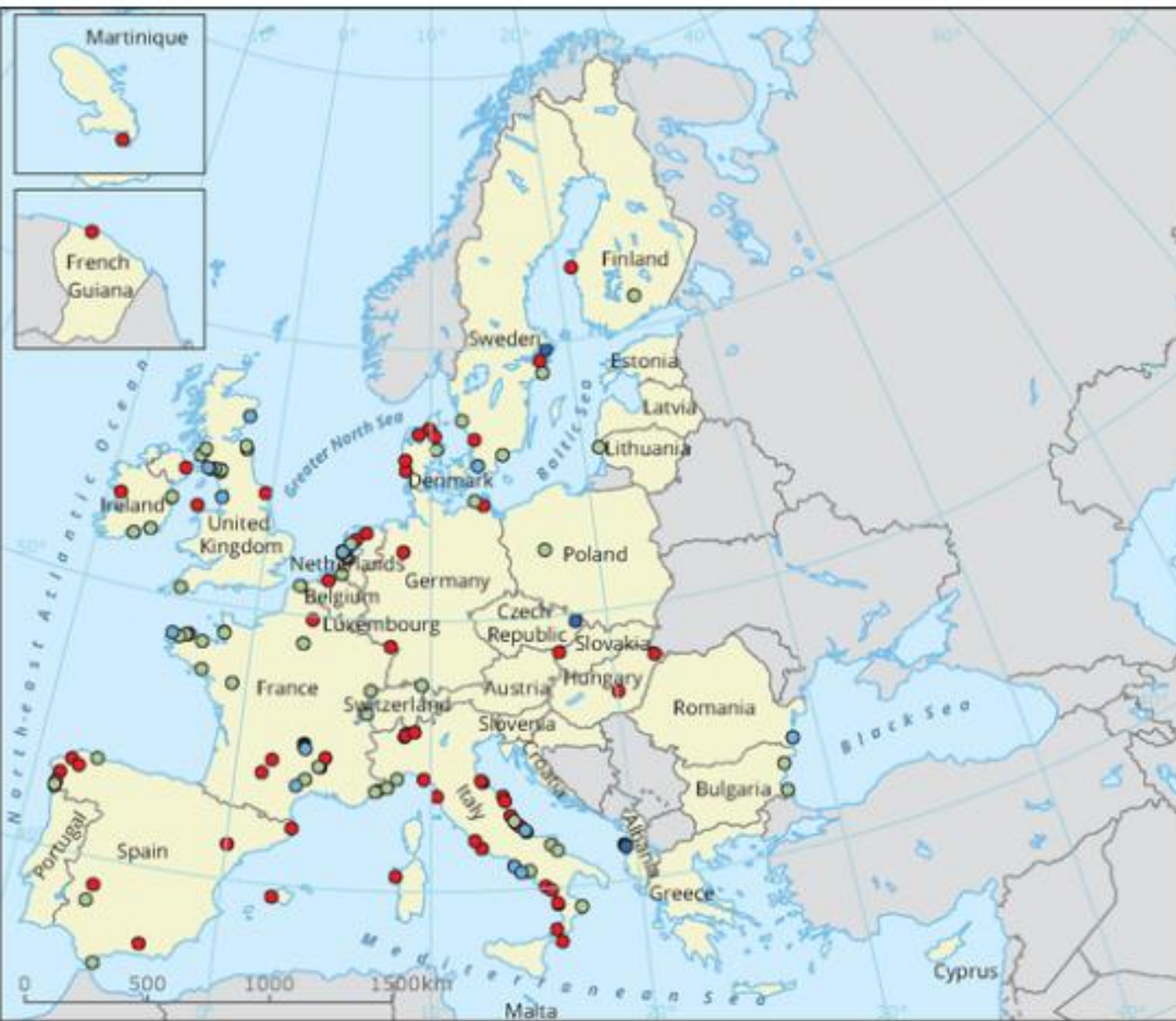
But is Swansea an anomaly?



Acclimatize



Cemaes Bay Results – to August 2017 Dr Mark Wyr



Improvements and deteriorations in bathing water quality

Bathing water quality improved from poor in 2015 to sufficient, good or excellent in 2016

- Excellent
- Good
- Sufficient

Bathing water quality deteriorated from sufficient, good or excellent in 2015 to poor in 2016

- Poor

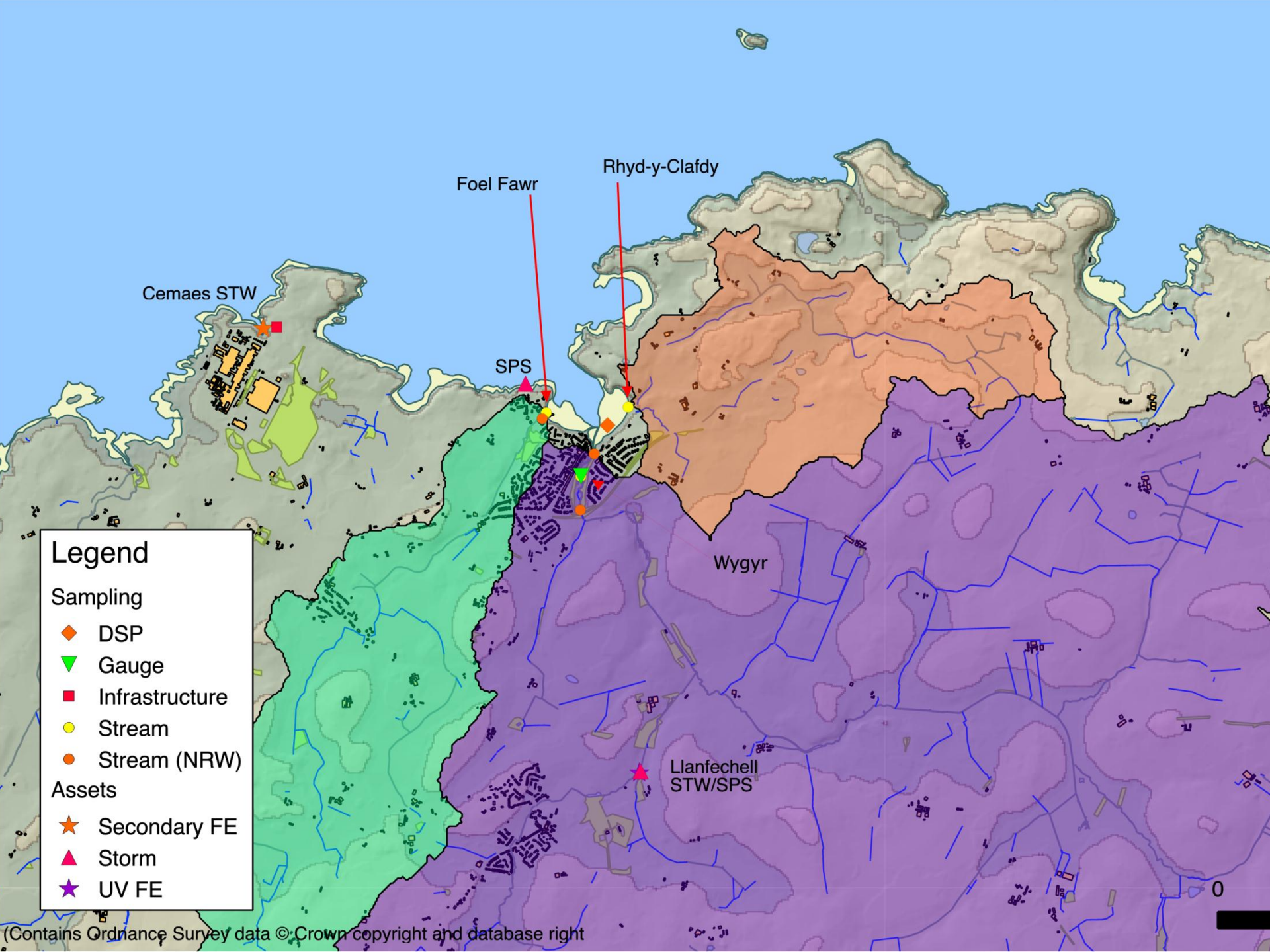
■ EU Member states and other countries with results

■ Outside coverage

Sources:

National boundaries from EEA.

Bathing water data and coordinates by reporting countries' authorities.



Cemaes STW

Foel Fawr

Rhyd-y-Clafdy

SPS

Wygyr

Llanfechell
STW/SPS

Legend

Sampling

- ◆ DSP
- ▼ Gauge
- Infrastructure
- Stream
- Stream (NRW)

Assets

- ★ Secondary FE
- ▲ Storm
- ☆ UV FE

Instrumentation/sampling

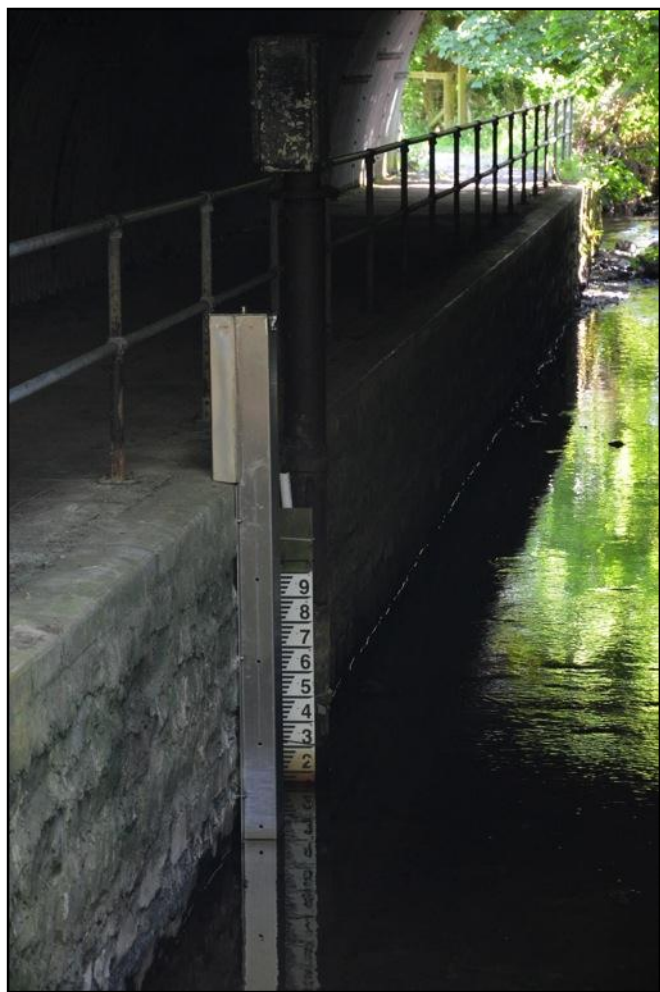


Instrumentation



- Harbour met station
- Level gauge – Traeth Bach stream

Instrumentation



- Level gauge – Afon Wygyr
- Back up met station

Sampling

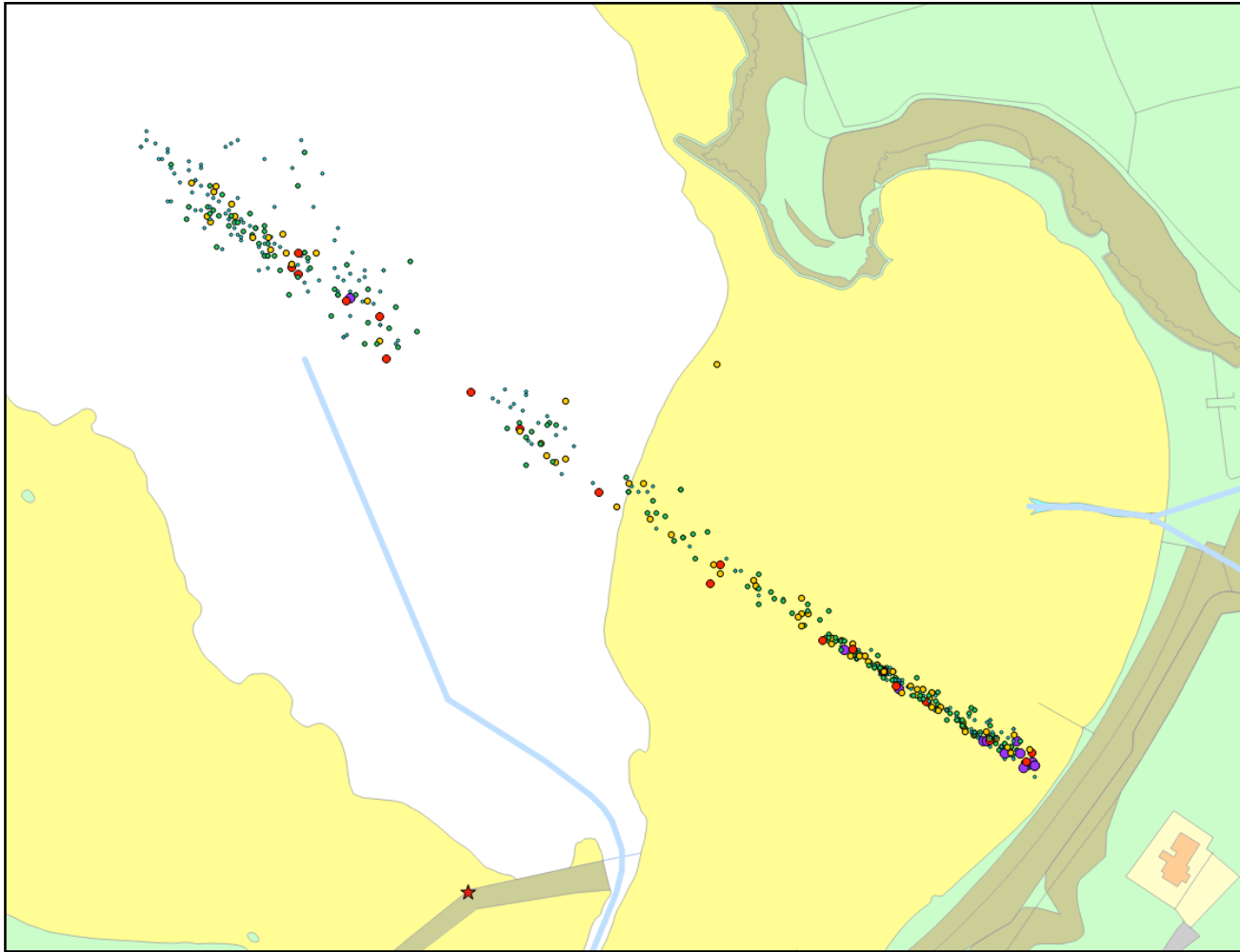


- Replicate compliance sampling in 1m water depth

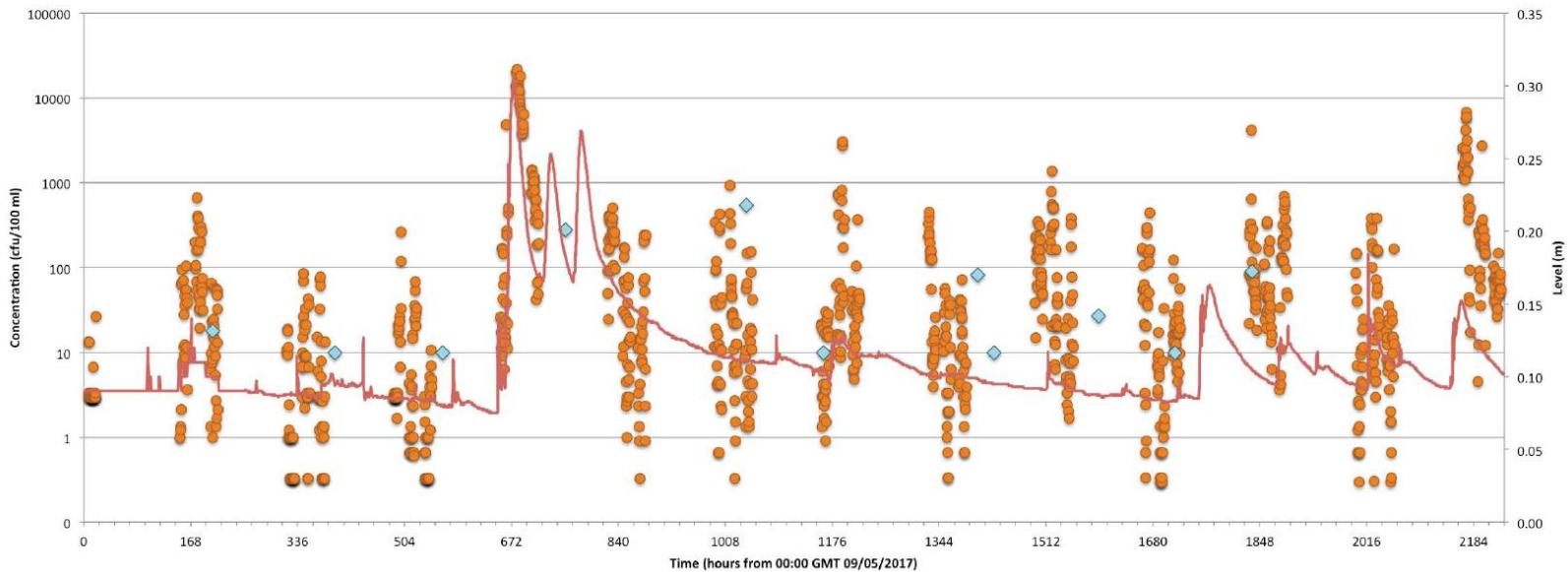
Results

- 1485 samples taken at Cemaes DSP between 9th May and 13th September 2017 – 55 sampling days
- Results reported for 1404 samples to 6th September 2017 – 52 sampling days
- 730 samples taken from river and stream inputs:
 - Traeth Bach stream
 - Afon Wygyr
 - Rhyd-y-Clafdy stream (AKA Pig-y-Barcud stream)
 - Caffi Bach SWO (when flowing)
- Results reported for 700 samples to 6th September 2017

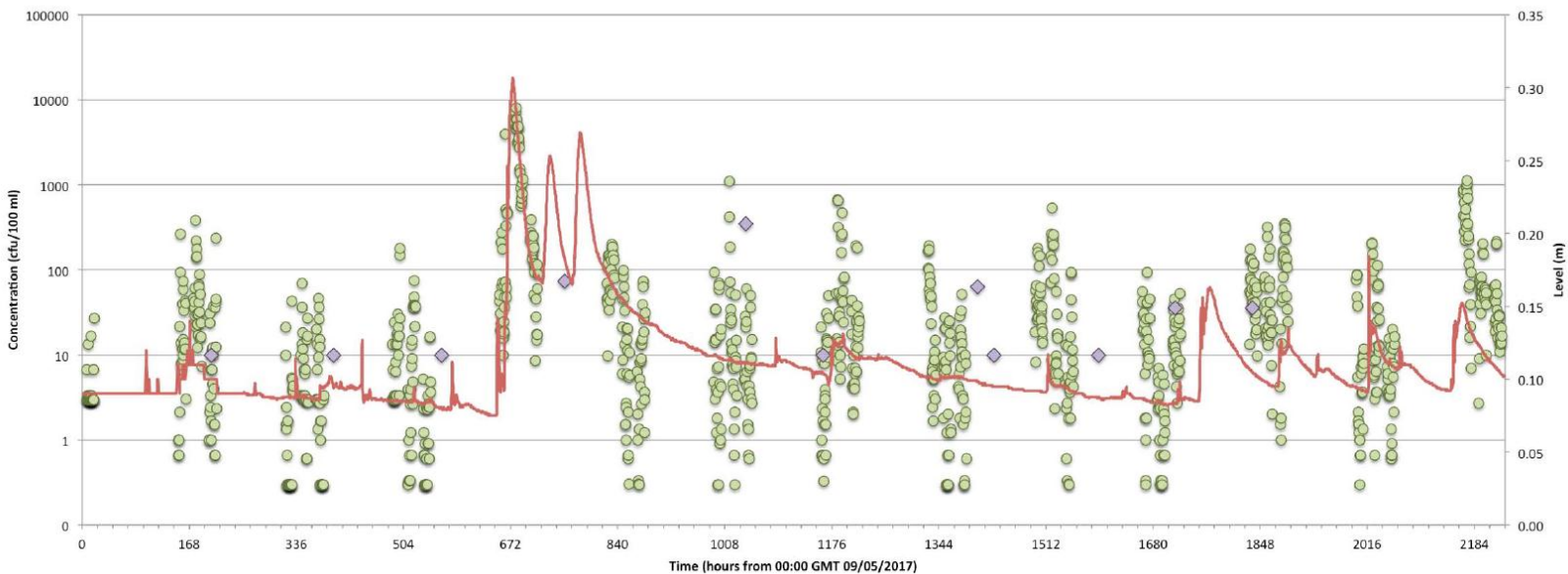
Spatial results DSP – *E. coli*



***E. coli* concentration (cfu/100 ml) at Cemaes DSP and level (m) at Traeth Bach stream gauge**



Enterococci concentration (cfu/100 ml) at Cemaes DSP and level (m) at Traeth Bach stream gauge



Tentative Conclusions

- Spot (compliance) measurements cannot index the ‘bathing-day’ risk even on the day.
 - *Decisions to post or close a beach should not be based on the concentration of indicator bacteria in a single grab sample. (Boehm et al., 2002)*
 - *The results of this study show that single samples do not adequately characterize the quality of beach waters and that temporal variability must be given serious consideration when developing sampling plans for beach waters. (Wymer et al., 2007)*
- Weekly sampling for bathing season compliance may (will?) exhibit significant bias and not index bather health risk
- Compliance data are unsuitable for black box, and possibly, hydro-dynamic model calibration.



Many thanks for celebrating the
start of this exciting new project
with us.

for more information

www.acclimatize.eu

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