

WATER QUALITY ISSUES IN IRELAND AND A NEW APPROACH TO RIVER BASIN MANAGEMENT PLANNING

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Abstract

Ireland's water quality is comparatively good when compared with other countries in the European Union. However, there are still some significant water management issues to tackle: 43% of rivers, 54% of lakes, 69% of estuaries, 24% of coastal waters and 9% of groundwaters are not achieving their ecological water quality objectives, as required by the EU Water Framework Directive (WFD). The key issue is eutrophication, driven by excess phosphorus in freshwaters and excess nitrogen in estuarine and marine waters. Changes to the physical habitat including excess sediment (hydromorphology) is the next biggest issue, but is less well understood. Agriculture is the most important significant pressure, followed by urban discharges, channel maintenance and other physical habitat changes, forestry, peat cutting and domestic waste water. Diffuse pollution is widespread and presents the greatest challenge.

Under the WFD, Ireland must develop river basin management plans to address these issues every 6 years. The first plan proved less effective than expected and resulted in no nett improvement in water quality, despite significant investment in agri-environmental schemes, on-farm storage and urban waste water treatment. Three key learnings from the first plan were used to shape a new approach for the second plan:

1. Inadequate governance structures resulted in no clear leadership or mechanisms for delivery
2. Multiple river basin districts led to disjointed and ineffective planning and implementation
3. Targets and objectives were not founded on a solid evidence base.

Ireland's 2nd cycle river basin management plan was published in April 2018. A key innovation is a move to a more collaborative and evidence-based problem solving approach with an objective of identifying and implementing 'the right measure in the right place' to achieve better water quality, whilst encouraging and supporting local communities to get involved in protecting their water resources. There is also much greater clarity about who does what, how things are done, when they are done and at what level. Three new inter-connected implementation teams (the boots on the ground) have been established and resourced (89 new staff in total) to progress actions in 190 priority Areas for Action between 2018 and 2021. These teams are working together to drive measurable and sustainable improvements in water quality in these areas by (a) engaging with the public, state agencies, landholders and other stakeholders to identify the problems that need to be tackled; (b) carrying out local catchment science assessments to investigate the specific issues and pressures, and to identify the actions needed to fix the problems; (c) working with other public sector bodies that have responsibility for carrying out the actions identified and (d) where agriculture is the pressure, working with farmers to tailor and implement the right measure in the right place. The EPA is providing these teams with the tools, science and training needed to support their work and will also be tracking and reporting on progress.

Context

Ireland is a relatively small country at approximately one quarter the size of New Zealand, although both countries have similar sized populations. The average rainfall ranges from over 2 m per annum on the western seaboard, to approximately 750 mm on the eastern side around the capital city Dublin. Rainfall intensity is relatively low resulting in a ‘little and often’ rainfall distribution.

Ireland has a wide variability in underlying geology from poorly transmissive mudstones and sandstone, to very productive karst limestones, and that, coupled with the extensive subsoil deposits from our rich glacial history, has resulted in a complex distribution of soils. The stream network density is high with a dominance in terms of channel length of small headwater streams (Strahler stream orders 1 and 2). This has significant consequences for the pathways delivering flow and nutrients throughout the Irish landscape.

The structure of farming in Ireland (Central Statistics Office, 2016) is quite different to New Zealand with a total of 137,000 farms, of an average size of 32 ha. Over 90% of the agricultural area is grassland, with arable (cereals) being the majority of the remainder. Within the grassland sector, there are 7.2 M cattle, 5.1 M sheep, 11.1 M poultry and 1.6 M pigs. Dairying is the most profitable enterprise at present — Ireland’s 15,000 dairy farmers manage 40% of the herd. Beef and sheep farmers are dependent on EU subsidies and are often part time farmers with off-farm income. The average age of Irish farmers is 57 and only 5% of farmers are classed as young farmers under 35 years of age. These factors all have implications for implementing changed practices and new measures on farm.

Water quality in Ireland

Ireland’s water quality is relatively good by European standards but there are nevertheless significant challenges in approximately half of monitored river and lake water bodies, and three quarters of monitored estuaries. The main problem is loss of nutrients leading to eutrophication. Ireland’s freshwaters are phosphorus limited while estuaries are largely, but not always, limited by nitrogen.

The Irish phosphate standard to support Good Ecological Status is 0.035 mg/l as P. Phosphorus concentrations often exceed the standards in urban areas and in those parts of the rural environment where soils are poorly drained. There are no ecological nitrogen standards in freshwaters, so the drinking water standard of 50 mg/l as NO₃ (or 11 mg/l as N) is the primary freshwater management standard. There are just two monitoring points where mean nitrate concentrations are higher than the drinking water standard, which means there has effectively been a greater focus on phosphorus mitigation to date.

Ireland has a marine ecological nitrogen standard, which varies depending on salinity. In the lowest salinity waters in the estuaries, the environmental quality standard is <2.6 mg/l as N (dissolved inorganic nitrogen). Nitrate concentrations are highest in the estuaries in southeast of the country, where the soils, subsoils and geology are well drained, farmland is relatively good, farming intensity is highest, and there is less dilution from rainfall.

Macroinvertebrates are the primary indicator of ecological status in rivers in Ireland using the Irish assessment methodology known as the Q-Value. The distribution of satisfactory macroinvertebrate condition does not correspond exactly with high phosphate or nitrate concentrations, indicating that there are also impacts from other stressors, such as excess fine sediment, modified habitat condition, and pesticides for example. Of particular concern is the loss of almost half of the remaining highest ecological quality sites over the last three decades.

Preliminary analysis indicates that in these areas, excess fine sediment and habitat modification are key issues.

Developing a plan to address the problem

Like all EU member states, Ireland is obliged to develop river basin management plan(s) for river basins under the Water Framework Directive (WFD). The plans are developed on a 6-year planning cycle which comprises the following:

- characterising the impact of human activities on waters and carrying out pressure-impact analyses to determine the significant pressures;
- defining environmental objectives for each water body which set out the target water quality and the date by which it will be achieved;
- defining a programme of measures which is a series of actions designed to achieve the objectives;
- developing a river basin management plan setting out how the programme of measures will be implemented;
- implementing the programmes of measures;
- carrying out monitoring programmes and tracking progress with implementation.

The outcome of each cycle then informs the subsequent cycle. There are currently three river basin management planning cycles allowed for under the WFD (2009-2015, 2016-2021 and 2022-2027), by which time all environmental objectives are supposed to have been achieved. A review of the WFD is currently underway and as it is unlikely that the objectives of the WFD will be met by 2027, further action will be required after 2027 to address water quality challenges across Europe.

Ireland's first cycle plans

In the first cycle, Ireland had seven river basin districts including three international districts shared with Northern Ireland. This meant there were seven river basin management plans, which were developed primarily by different consultancy firms working on behalf of local authorities, at a cost to the State of over €50M. This approach led to inconsistencies between the plans and a lack of ownership by the local authorities who were tasked with implementing them. The plans were very ambitious in terms of the target objectives for water quality improvements but were not founded on a solid evidence base about human impact at a water body and sub-catchment level. While there was some good groundwork laid in the first cycle, there was poor implementation of these plans with little overall improvement in water quality other than a marked reduction in serious pollution (mainly through investment in urban waste water treatment). Taking all these factors into consideration, it was clear that a new approach was needed for the second cycle.

Ireland's second cycle plans

For the second cycle, Ireland consolidated to just one national river basin management plan which was developed by the Minister with responsibility for water protection and supported by the Environmental Protection Agency (EPA) and local government. New dedicated resources were established within the EPA to develop the national evidence base, lead the technical and scientific aspects of the plan development process, and put in place the necessary working arrangements with local authorities and other public agencies to facilitate plan development and implementation. There were three key innovations for the second cycle: (a) the robust evidence base; (b) a new three tier inter-locking governance model; and (c) local scale implementation supported by significant new resourcing of local government. The approach adopted has been collaborative, evidence based and targeted, and combines top-down and bottom-up approaches.

The improved evidence base

Considerable resources have been directed over the last 4 years in Ireland towards developing a robust evidence base for the purposes of targeting the right action in the right place to achieve the right outcome for water quality. For each of Ireland's 4,829 water bodies, an assessment has been carried out to identify the risk of the water body not achieving its water quality objectives. For those water bodies that have either not currently achieved their targets, or that have trends indicating a deterioration, an assessment is then carried out to identify the significant issue(s) causing the problem, e.g. excess nitrogen, phosphorus, ammonium, sediment, pesticides, heavy metals, chemicals, etc. The next step is to determine the significant pressure(s) or landuse activities causing the significant issue(s). While there are many pressures in all catchments, the assessments have focussed on identifying the significant pressures, i.e. those that must be addressed in order to achieve the required water quality improvements. For example, if the monitoring data indicate that the waterbody is being impacted by excess ammonium, then the focus needs to be on the pressures that are the most significant sources of that ammonium.

The initial assessments were carried out by the EPA at the waterbody scale using over 140 datasets and a range of new modelling tools that had been developed through the National Environmental Protection Research programme that is run by the EPA. The source-pathway-receptor model was used as a framework. Data on point sources and their impacts were compiled, checked and discussed with the relevant regulatory authorities. One of the new modelling tools, the pollution impact potential maps, was developed to assess the likely contribution from diffuse agriculture. The map combines the hydro(geo)logical susceptibility of the landscape for losing phosphorus to surface waters via overland flow, with the load from agricultural activities from Department of Agriculture information, to develop a critical source area map. Finally, the relative contributions of all sources within each waterbody was considered using a new source load apportionment model (SLAM).

The assessments showed that agriculture impacts on the greatest number of waterbodies, due in part to agriculture being the dominant landuse. The most prevalent problem arising from agriculture is excess nutrients from fertilisers and manures; followed by soil erosion and sediment from drainage works which impact on habitat condition; excess ammonium from fertilisers, manures and drainage of peaty soils; and impacts from pesticides, in particular MCPA, which has exceeded drinking water standards in some areas.

In waters where agriculture is a key significant pressure, mean phosphate concentrations are consistently higher than the ecologically based standard. Although mean phosphorus and nitrate concentrations did improve in these water bodies with the introduction of new regulations in the mid 2000s, and were at their best in 2012 and 2013 respectively, the trends have been going in the wrong direction since then. This demonstrates that further improvements in agricultural catchments need to be made.

An integral part of developing the new evidence base has been sharing it and publicising it through two new purpose built IT systems – the WFD Application which is a working tool housing all the data and assessments that is shared by all public agencies with an interest in water; and an award-winning website called www.catchments.ie which is the public facing window into the WFD Application and a platform for sharing water information and stories with the wider community. Catchments.ie is also supported by the Catchments Newsletter which is a thrice-annual magazine that shares science and community stories about integrated catchment management.

The strength of the new evidence base, together with improved and more timely reporting on water quality by the EPA, has played a significant role in generating a sense of ownership and urgency around water quality issues in Ireland, particularly amongst the sectors that have been identified as significant pressures.

New governance model

In view of the difficulties with implementation in the first cycle, a new governance model (Figure 1) has been developed to prepare and implement the river basin management plan to ensure that there is clarity around roles and responsibilities (who does what, how it is done, when it is done and at what level). There are three tiers of governance. Tier 1, the Water Policy Advisory Committee (WPAC), comprises representation at a very senior level from 12 different government departments or Agencies with an interest in water. WPAC is chaired and led by the Government Department with responsibility for overseeing water policy and implementation in Ireland. WPAC provides advice to the Minister on the overall direction of water policy and strategic oversight of both plan preparation and implementation. It is supported by the National Coordination and Management Committee (NCMC), which is chaired by the same Department. The NCMC essentially project manages the preparation and implementation of the river basin management plan and is made up of senior representatives from the Minister’s Department, the Local Authority Sector and the EPA.

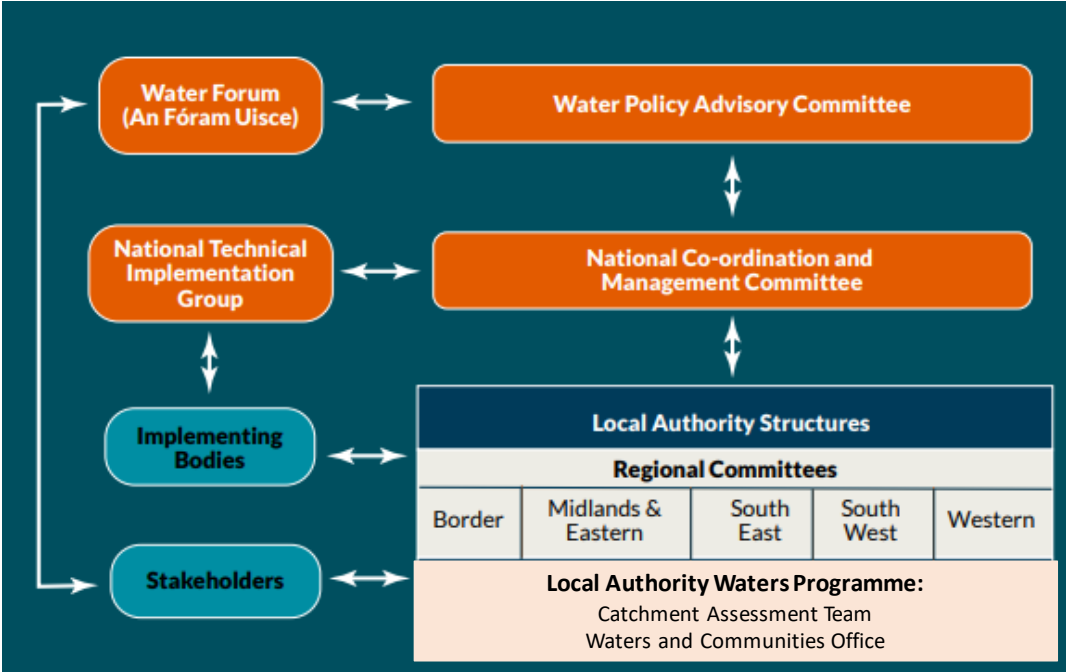


Figure 1. The new governance structure for implementing the river basin management plan

An independent Water Forum has also been established on a statutory basis which is made up of community representatives, farming organisations, angling bodies, environmental eNGOs and others. The Water Forum has an important role to play in raising public awareness of water as an environmental, social and economic public good and resource. It has discretion to determine its own work programme and means of communicating its views and analysis.

At Tier 2, which is led by the EPA, WPAC and the NCMC activities are supported by the EPA chaired National Technical Implementation Group (NTIG) . The NTIG is made up of national

representatives of all the implementing bodies such as Inland Fisheries, Office of Public Works, An Bord Pleanála (the Planning Authority), the Forest Service, Department of Agriculture, the Geological Survey, National Parks and Wildlife, etc. The NTIG also has a number of sub groups with defined terms of reference which work to provide national guidance on particular technical issues, such as protecting high status waters, natural water retention measures, carrying out local catchment assessments, and hydromorphology.

Tier 3 is about implementation and is led by the local authority sector in five regions. Each region has a Regional Management Committee made up of senior staff from all the relevant local authorities, and a Regional Operational Committee made up of regional representatives from the same implementing bodies that are represented at the NTIG, as well as operational staff from the local authorities. The purpose of these committees is to oversee implementation of actions in 190 Priority Areas for Action identified in the second cycle river basin management plan. These areas were selected during a series of regional workshops jointly led by the EPA and local government with over 600 representatives from all the implementing bodies and the local authorities. Participants at the workshops worked through each of the water bodies in the region that were ‘*At Risk*’ and discussed the evidence base for the significant pressure assessments. They agreed on realistic and achievable environmental objectives and prioritised the areas for action based on a number of criteria, including consistency with the objectives and priorities of the draft river basin management plan, together with local priorities. Many of the participants at these regional workshops became members of the five Regional Operational Committees which has helped to maintain consistency and momentum throughout the process.

The WFD is a Framework Directive, which is an ‘umbrella’ directive that depends upon the implementation of underlying pieces of European Union legislation such as the Drinking Water Directive, the Urban Waste Water Directive, the Nitrates Directive, the Industrial Emissions Directive, and the Habitats and Birds Directives. Many of these Directives are the responsibility of a range of different Government Departments and Agencies (all of whom are represented on the Water Policy Advisory Committee) which means that there are a lot of actors in the water space in Ireland that need to be able to work together towards common goals. The new governance model has been instrumental in clarifying the role and responsibilities for all these actors and in encouraging more ‘cross-silo’ collaborative working which is essential for developing a strong foundation and appropriate structures to deliver better water quality.

Local scale implementation

A new local government shared service called the Local Authority Waters Programme has been established to support implementation in the priority Areas for Action across the five regions. The Programme is made up of two sister teams. The first is the Communities Team who hold local events and encourage local communities to get involved in managing their local waters. They hold community meetings for example in the Areas for Action before any actions are undertaken. The second is the Catchments Team who do localised catchment assessments in the Areas for Action. They carry out stream walks to find the localised problems, propose local solutions, and then work with the regional operational committee members to get ‘the right measure implemented in the right place’.

Where the significant pressure is agriculture, the Catchments Team refer to a newly established sustainability advisory support service for farmers known as ASSAP – the Agricultural Sustainability Support and Advice Programme. The ASSAP programme is co-funded by two different government departments and the dairy industry. ASSAP farm advisors work with farmers inside priority Areas for Action to co-design appropriate actions for the farm that will

address the specific issues identified by the Catchments Team. A key aspect of the ASSAP programme is that it is voluntary and is separate from the regulatory system. Farmers are provided with free advice on how to address the water pollution occurring on their farms. The approach is to focus on achieving environmental outcomes by helping people to understand the issues and to make the necessary changes. Several grant schemes are in place to assist with implementation, such as a new septic tanks improvement scheme and the farm modernisation scheme (TAMS).

Progress with local implementation, and the river basin management plan in general, is being tracked and reported on by the EPA through the WFD Application, Catchments.ie, and its annual and multi-annual water quality assessments and reports. This will allow relationships between actions and water quality improvements to be assessed, which in turn, will inform future development of new targeted schemes or policies as necessary to ensure those relationships are improved and the desired water quality outcomes achieved. For the period 2019-2021, a key objective to be tracked by the EPA is to see what measurable and sustainable improvements in water quality are achieved in the 190 Areas for Action.

Conclusion

In response to the lessons learned from the first cycle river basin management plans, Ireland has adopted a new strategy for the second cycle. The strategy is based on an approach that recognises that a collaborative, bottom-up, targeted and adequately resourced approach to the identification and implementation of measures (particularly to address diffuse pollution pressures and where a water body is impacted by multiple pressures) is necessary to support the more top-down regulatory approaches (for example, urban and industrial waste water treatment and the regulation of point-source pressures). The new approach is underpinned by an improved evidence base, and new governance structures and resources have been put in place to drive implementation. So far the responses to the new approach from all sectors, including the public, has been positive. Progress is being tracked and reported on by EPA which will allow the overall success of this approach in achieving improvements in water quality and status to be critically assessed.