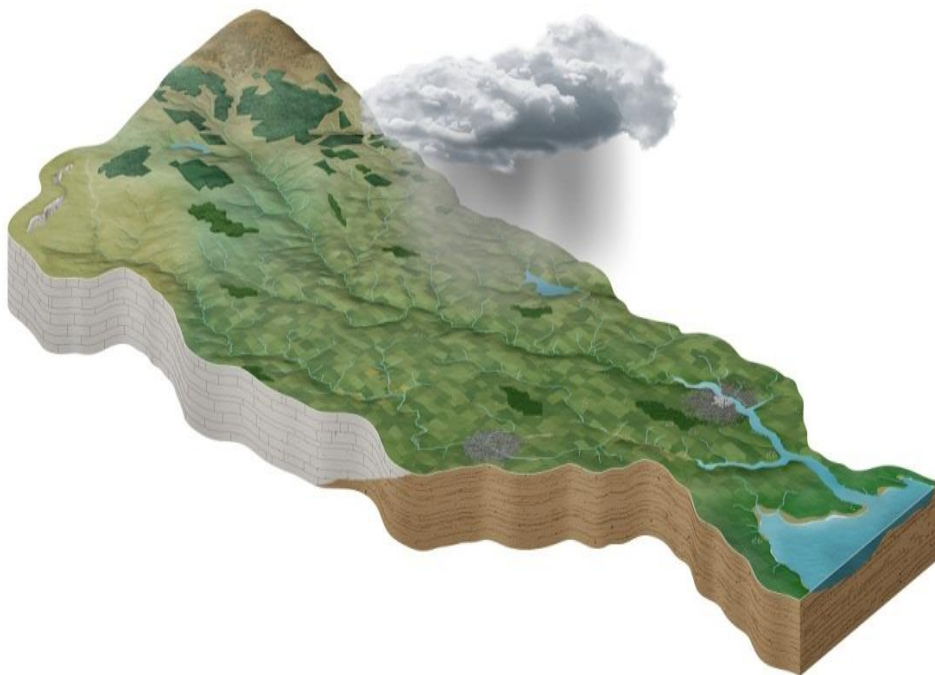


Report series:

Impacts of pressures on water quality

URBAN WASTEWATER



Catchment Science & Management Unit

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Preface

This document is part of a report series that summarises the evidence on each of the main significant pressures that impact on water quality. The series currently includes reports on the following key pressures:

- Agriculture
- Urban waste water
- Hydromorphology
- Forestry
- Domestic waste water
- Industry
- Drained peat

This report series is complemented by a sister series of 46 catchment reports which describe the water quality, risk, pressures and other relevant data for each waterbody in each catchment. All reports are available on www.catchments.ie.

An online interactive mapping system, where the most up to date data can be viewed, is available at [EPA Maps](#).

Data can be downloaded from the EPA geoportal site at <https://gis.epa.ie/GetData>.

Impacts of Urban Wastewater on Water Quality

The implementation of the Urban Wastewater Treatment Directive has led to a significant reduction in nutrients and organic material polluting surface waters. However, Ireland is still not fully compliant with this directive; pollution from some urban wastewater treatment facilities has not yet been adequately addressed, including pollution from smaller agglomerations, storm water overflows and micropollutants that damage the environment.

Discharges from urban wastewater treatment plants and agglomeration networks (UWW) have been identified as the fourth most prevalent significant pressure in the country. Nearly 200 waterbodies or 12% of all waterbodies 'At Risk' of not achieving their environmental objective under the Water Framework Directive (Table 1 and Figure 1) have UWW as a significant pressure. Waterbodies are categorised as being 'At Risk' of not achieving its WFD objectives where the monitoring data shows evidence that water quality is impacted, and actions are required to deliver water quality improvements. This is based on the most recent characterisation assessment using data up to 2021.

Table 1: Number of 'At risk' waterbodies with urban wastewater as a significant pressure

Waterbody Type	No. Waterbodies	No. At Risk waterbodies	No. Waterbodies with UWW identified as a significant pressure	% At Risk waterbodies (with UWW identified as a significant pressure)
River	3192	1337	161	12
Lake	812	142	10	7
Transitional	196	60	22	36.7
Coastal	112	16	4	25
Groundwater	514	94	0	0
Total	4826	1649	197	12%

Water quality impacts arising from urban wastewater

Direct discharge of nutrients from UWW treatment plants and discharge from combined storm overflows (CSOs) or storm water overflows (SWOs) from the sewer network are the most common water quality problems associated with UWW¹. The excess nutrients can cause eutrophication which is an overgrowth of algae and aquatic plants, which in turn impacts other species and the ecosystem balance. Emissions of elevated concentrations of phosphorus and ammonia from UWW are the key nutrients for rivers and lakes, while emissions of nitrogen and phosphorus are the focus for transitional and coastal waters. Elevated concentrations of microbes, such as *E.coli*, viruses and other pathogens in the waste water may impact public health at bathing and shellfish waters. Chemical impacts associated with pharmaceutical/personal care products, and microplastics, may not be removed by wastewater treatment plants and can also be emitted into surface waters.

¹ Runoff from paved areas and misconnections are classified as urban runoff rather than UWW; they are the responsibility of Local Authorities.

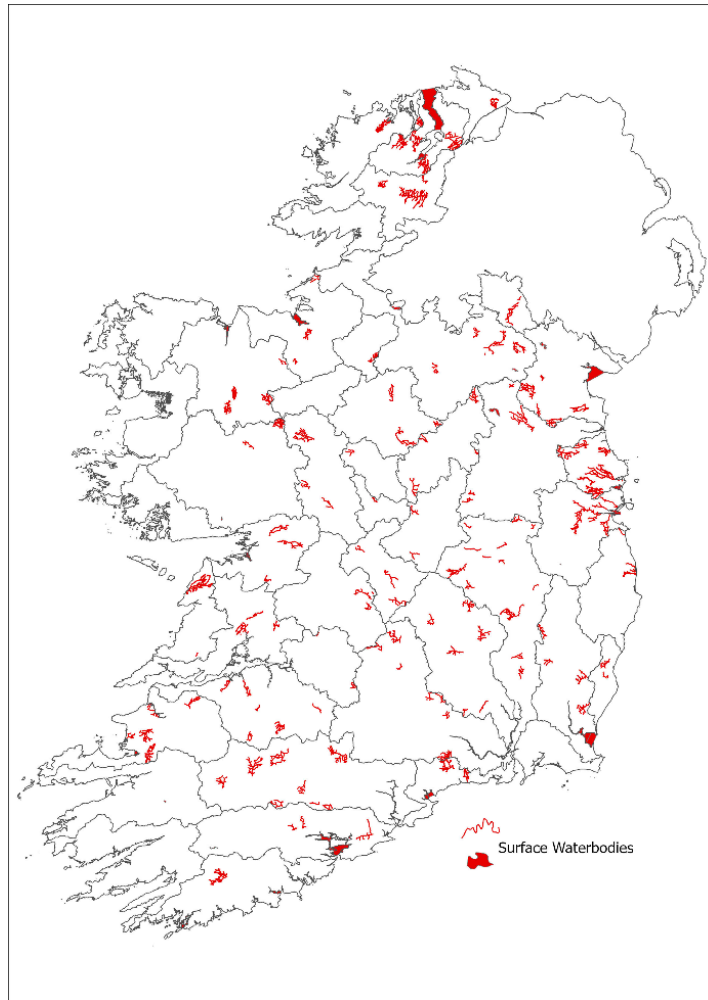


Figure 1: Surface waterbodies where UWW is a significant pressure (August 2023).

Nutrient impacts

EPA assessments have shown that the proportion of nutrients from UWW in Irish rivers varies according to nutrient type. For nitrogen, the contribution from UWW is relatively small (8%) in comparison to the load coming from agriculture (84%) (Figure 2). For phosphorus, the proportion of the load is higher at (45%). However, it must be noted that 40% of the Irish population lives within 5km of the coast, which means the majority of their wastewater is predominantly discharged into marine waters, including the Ringsend UWW plant which takes over 40% of the national wastewater generated. This means that in the rural environment, the proportion of the phosphorus load coming from UWW is lower than at the national scale, though it can be very important immediately downstream of urban areas at the local scale.

Figure 3 shows the annual average concentrations of phosphate (blue) and ammonia (green) in rivers from 2007 to 2023 for waterbodies currently 'At risk' with UWW identified as a significant pressure and those waterbodies considered 'Not at risk'. The dashed lines represent the environmental quality standard for phosphate (0.035 mg/l) and ammonia (0.065 mg/l) associated with good status. Mean concentrations below the standard are typically required to support good ecological status. For both parameters, annual averages of both nutrients in 'At risk' rivers are consistently above these standards and below those assessed as 'Not at risk'. At high concentrations ammonia is particularly toxic to river invertebrates. There can be considerable variation from year to year in both nutrients highlighting the

impact often caused by, for example, overflows during heavy rain. Overall, the concentrations of both are consistently too high.

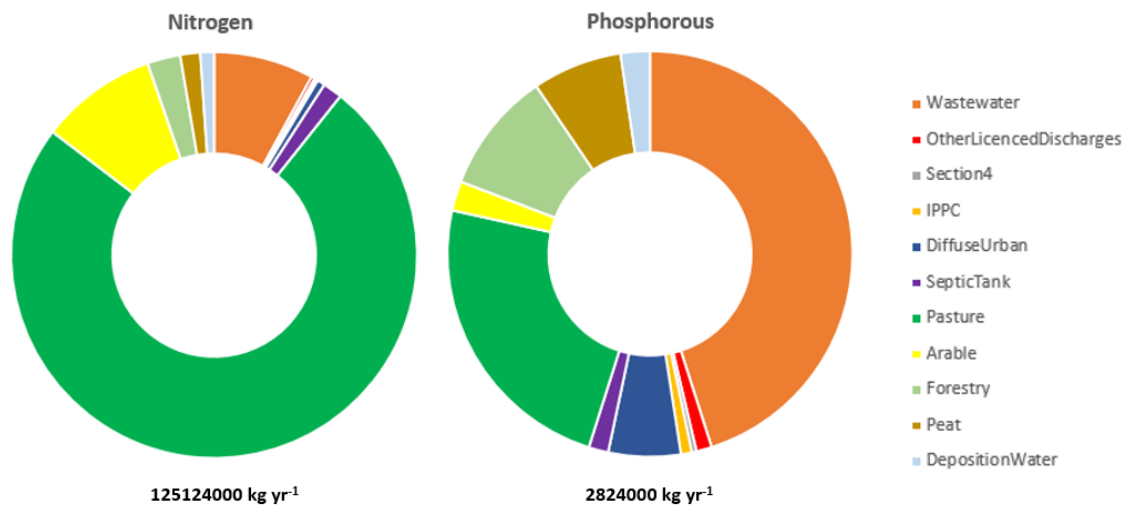


Figure 2: Load apportionment of nitrogen and phosphorous emissions to water (based on data up to 2018). Note that this is at national scale and proportions will differ for rivers and lakes at waterbody, subcatchment and catchment scales.

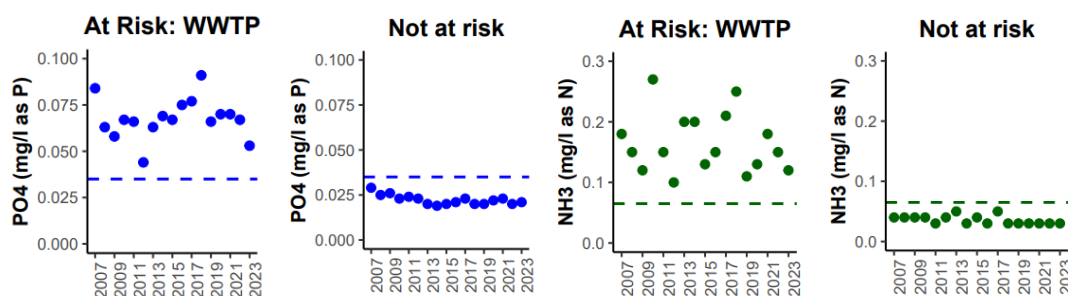


Figure 3: Average annual phosphate (blue) concentrations, and ammonium (green) concentrations in Rivers from 2007-2023 for waterbodies 'At risk' from urban wastewater and those considered Not at risk. Note that some waterbodies are also impacted by other pressures.

Protected areas

UWW has been identified as being the main source of microbial pollution for the three bathing waters classified as Poor in Ireland in 2022. When a bathing water is classified as Poor it means there is a risk of periodic pollution, with the potential to cause illness such as stomach upset, skin rash and infections of the eye, ear, nose and throat. While wastewater adversely affects some bathing waters from time to time, the overall quality of Ireland's identified bathing waters remains good, with 97% of our beaches meeting the basic water quality standards in 2022. However, there were three bathing waters that did not meet the minimum standards because of impacts from UWW – these are Lady's Bay Bunrana in Co Donegal, Front Strand Beach in Balbriggan in Co. Dublin², and Trá na mBan in An Spidéal, Co Galway. Works are ongoing since 2023 to mitigate these impacts.

Wastewater released into some coastal areas has the potential to contaminate shellfish such as oysters, mussels, cockles and clams. Viruses and other microbes can contaminate the shellfish which

² Note multiple pressures are impacting Front Strand Beach. For more information, see [Bathing-Water-Quality-in-Ireland-2022.pdf \(epa.ie\)](https://www.epa.ie/publications-and-reports/water/water-quality/bathing-water-quality-in-Ireland-2022.pdf).

can cause illness if consumed. Uisce Éireann are required to carry out assessments of the impacts of wastewater discharges on 23 shellfish waters to assess if additional treatment is required. It was reported in the [EPA's latest urban wastewater report](#), that based on assessments carried out to date, additional treatment is required to protect four shellfish waters. These include Donegal Bay, Drumcliffe Bay, Dungarvan Harbour and Killary Harbour.

The freshwater pearl mussel is a critically endangered mollusc that requires clean, fast flowing, well oxygenated rivers with little nutrient or organic content and a clean river bed. Populations of freshwater pearl mussels are under threat, both nationally and internationally. Deteriorating river water quality has resulted in the failure to produce new generations of mussels. Thirteen areas, in Cork, Kerry and Laois require improved wastewater treatment to protect freshwater pearl mussels.

Micropollutants

Micropollutants are found at trace concentrations in the environment and include pharmaceuticals, personal care products (PPCPs), per- and polyfluoroalkyl substances (PFASs), nanomaterials, microplastics, steroid hormones, pesticides, and plasticisers. Micropollutant exposure can have a range of adverse effects on wildlife. Although these effects are not always easily observable, these changes may impact the overall survival rate of the species.

UWW discharges are a significant pathway for these substances into our waters as existing treatment systems are unable to fully remove the wide variety of products from both effluent and/or sludge. To date in Ireland, UWW has not been identified as a significant pressure associated with a failure to achieve good chemical status in the 2016-2021 period. This reflects the focus of the initial EU priority substances list on pesticides (many of which have subsequently been banned), industrial chemicals and metals.

Recently the Commission has moved towards regulating a wider variety of micropollutants. The EU chemicals strategy proposes a transition to chemicals and products that are safe by design, the phasing out of harmful substances (such as per- and poly-fluoroalkylated substances (PFAS)) and improved risk assessment procedures. However, these source controls are not viable for all micropollutants, such as some pharmaceuticals, so improved treatment (quaternary) at wastewater facilities is required. In an Irish context about 50% of the ≈ 300 plants serving a PE > 1000, currently have tertiary treatment and none have quaternary treatment. Of the seven larger wastewater treatment plants (> 100000 PE) only one has tertiary treatment. This highlights the challenge in meeting these treatment objectives over the next two decades, notwithstanding the provision in proposed regulations for the producers to pay for much of the additional cost in upgrading these plants. Campaigns aimed at changing consumer behaviour can also be effective in optimising usage, storage, and disposal of certain chemicals, however, substance specific regulations and information campaigns are unlikely to ease the overall burden given the variety of substances so in conjunction with source controls, improved wastewater treatment are the most important measures for reducing the risk to surface waters of micropollutants. This has been highlighted as an action as part of the EU review of the Urban Wastewater Treatment Directive.

Change since the second river basin management cycle (2016-2021)

Overall, the number of *At Risk* waterbodies with UWW identified as a significant pressure reduced from 289 based on an assessment in 2015, to 197 in the recent 2021 assessment (Figure). Of the 289 waterbodies with UWW identified as a significant pressure in 2015, 247 had still not achieved their environmental objectives in 2021, however objectives were met in 42 waterbodies. This improvement

reflects the ongoing investment by Uisce Éireann in improving the wastewater treatment infrastructure.

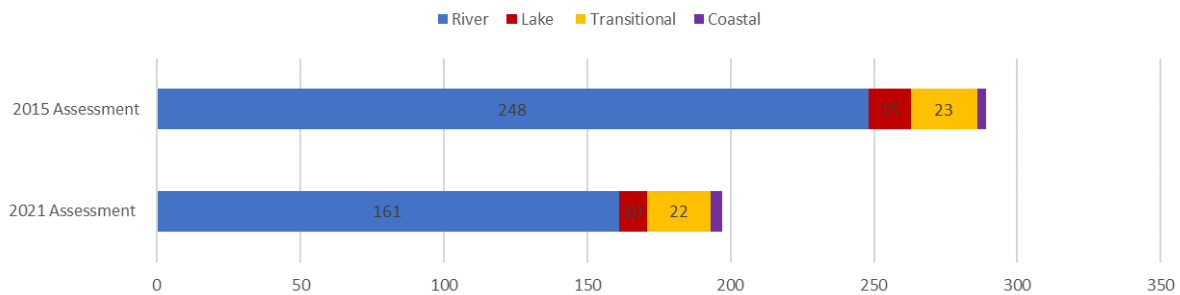


Figure 4: Change in UWW Pressures between the end of the first cycle in 2015 and the end of the second cycle in 2021

What is being done?

Mitigation actions include putting in place or upgrading deficient wastewater treatment infrastructure which will require investment, and getting the best performance from existing systems by improving how they are operated and maintained. Nutrient removal that is already in operation in 30% of treatment plants needs to be extended to some large towns and cities discharging into sensitive areas.

While considerable progress has been made to date, substantial work needs to be done to improve the UWW network in Ireland and it will take many years of sustained investment to bring all treatment infrastructure up to standard and also provide for future needs. It will take a multi-billion euro investment and, based on current investment levels, at least two decades to get all treatment systems up to standard.

In the 2022 report on UWW, the EPA has identified 89 priority areas where action is needed to protect the environment. These include the following:

- treatment at 15 large urban areas that did not comply with EU standards;
- 26 towns and villages discharging raw sewage into our seas and rivers;
- upgrading of the network collection systems in 6 areas;
- 39 areas where improvements are most needed to protect inland and coastal waters adversely impacted by wastewater discharges;
- 12 towns and villages where treatment must be improved to protect the endangered freshwater pearl mussel; and
- Assessments of the 23 shellfish areas are urgent.

Uisce Éireann’s next capital investment plan, which will run from 2025 to 2029, has the potential to deliver significant benefits for our environment and it is critical that investment is directed to the priority areas. The plan must have a strong focus on protecting and improving waters most at risk from wastewater discharges. Details of investment projects currently underway are available on the Uisce Éireann website at [Capital Investment Plan | Strategic Plans | Uisce Éireann \(formerly Irish Water\)](#).

Additional actions have been highlighted in the third River Basin Management Plan to address UWW pressures. These include for example, securing additional funding, under the Enhanced Ambition Programme, for Uisce Éireann to advance priority projects where UWW is a significant pressure, and review of the criteria for the performance of combined storm water overflows. Further details are available in the third River Basin Management Plan (Water Action Plan 2023).

Find out more

See how the impacts of pressures on waters, including UWW, are assessed at www.catchments.ie/download/water-framework-directive-guidance-on-characterisation-methodology-v5-0-2024.

You can view the individual waterbodies where UWW is a significant pressure on [EPA Maps](#).

EPA's Urban Wastewater Treatment in 2021 report is found here: [Urban-Waste-Water-Treatment-in-2021-report.pdf \(epa.ie\)](#)

EPA's Urban Wastewater Treatment in 2022 report is found here: <https://www.epa.ie/publications/monitoring--assessment/waste-water/uww-report-2022.php>