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The submission provides some background context, goes on to make some observations from international research generally, before specifying research from some of the Irish-based research projects, among which I am involved, that should be considered in this Public Consultation.

### Some general points from international research

In terms of climate change impacts, such as flooding or extreme precipitation events, people frequently underestimate their exposure, resulting in a lack of preparedness. Many are overly-optimistic about their capacity to cope while others fail to accomplish their intentions (value-action gap). Others adopt a fatalistic perspective, resulting in non-protective responses.

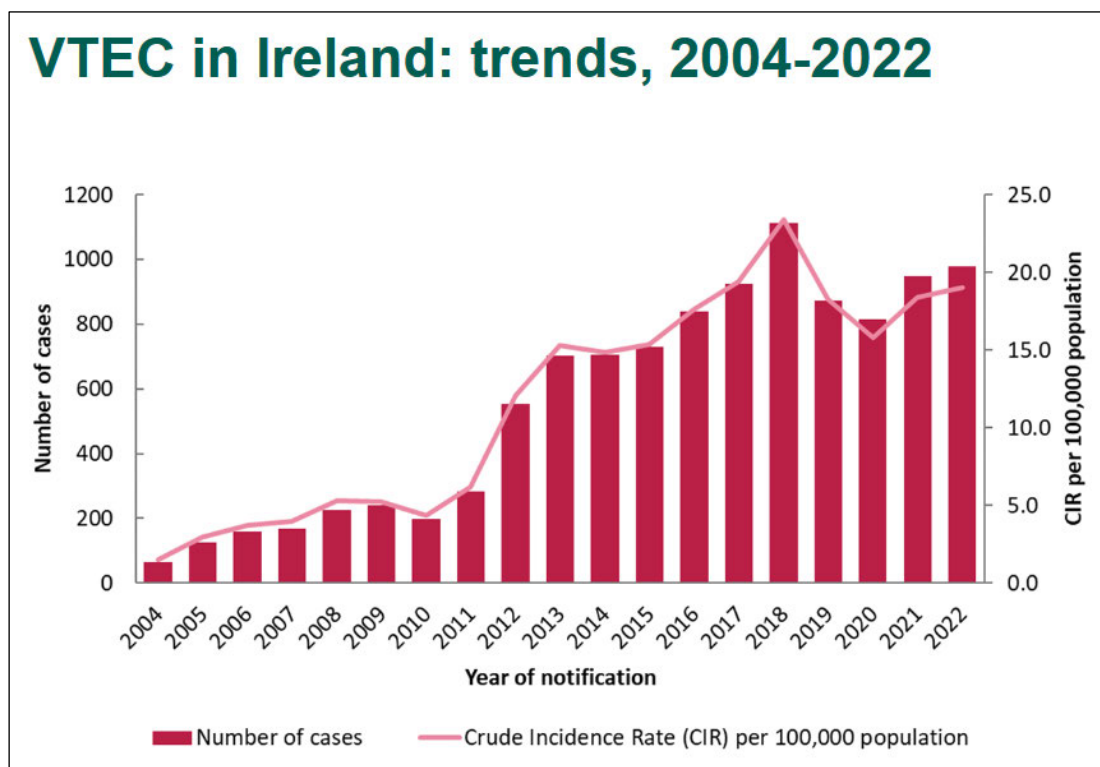
Where extreme events do arise, studies have highlighted individuals' tendency to place more responsibility on public authorities rather than recognising much personal responsibility.

Much of the focus in climate adaptation practices has been on structural solutions (e.g. flood defences).

The communication of risk information significantly influences perceptions, and subsequently, behaviours and actions. Individuals are more likely to engage with information that fits with their beliefs and with those of their peers.

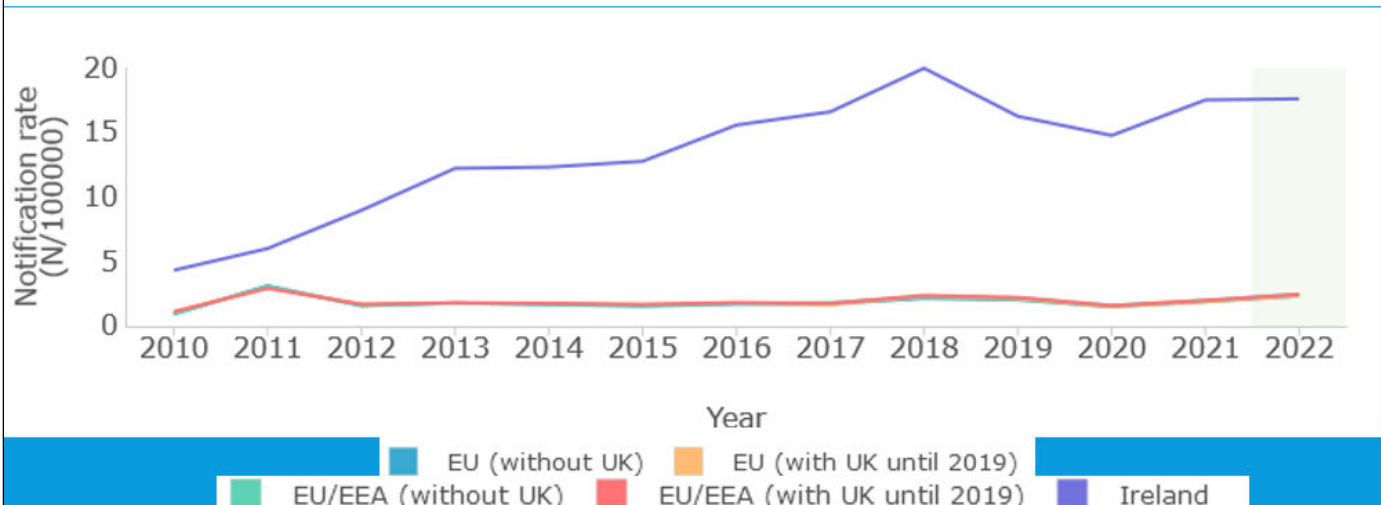
### Background: VTEC/STEC

VTEC are a specific group/strain of *E. coli* (bacterium *Escherichia coli*). Increasingly now referred to as STEC (Shigatoxigenic *Escherichia coli*). Although most strains of *E. coli* are harmless and live in the intestines of healthy humans and animals, the VTEC strain produces a powerful toxin which can cause severe illness, particularly in children under five and the elderly. Complications (Haemolytic Uraemic Syndrome, HUS) can lead to kidney failure. VTEC is highly transmissible and can be passed from person to person, through consuming contaminated food or water or contact with infected animals or contamination in the environment. Ireland is persistently amongst the worst country in the European Union for notification of VTEC, and in terms of Ireland's age specific notification rate. Ireland reports highest rates amongst the most vulnerable i.e. 0-5 years and 65+ years.



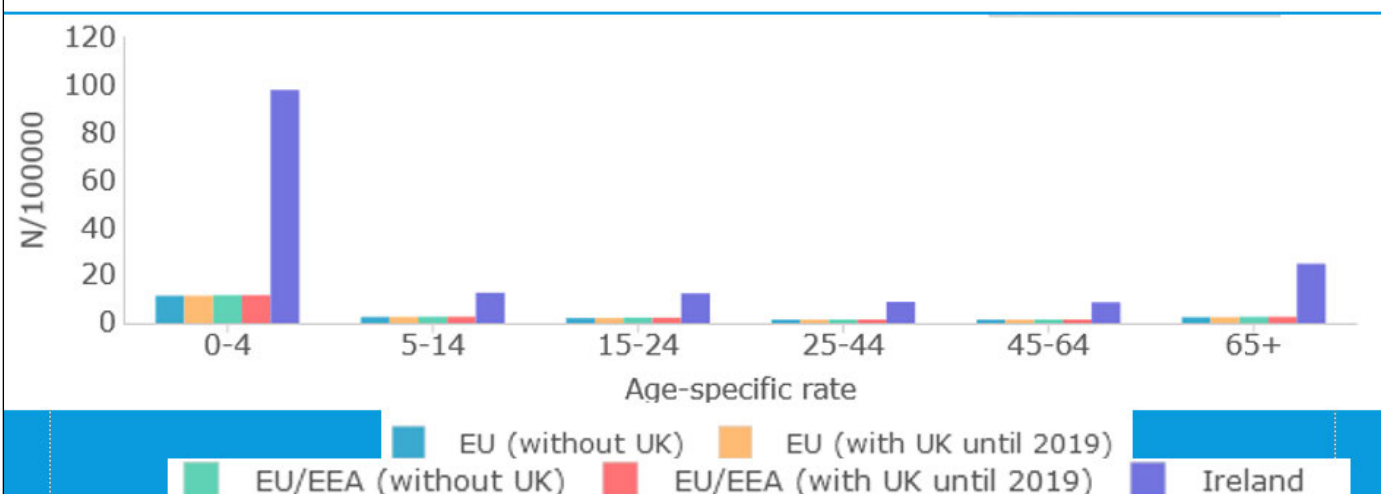
Source: HSPC (2024), Gastroenteric and Zoonotic Diseases in Ireland, 2022.

## EU & IRELAND VTEC TRENDS: NOTIFICATION RATE PER 100,000



Source: ECDC Surveillance Atlas for Infectious Diseases (2024)

## EU & IRELAND VTEC TRENDS: IRELAND'S AGE SPECIFIC NOTIFICATION RATE



Source: ECDC Surveillance Atlas for Infectious Diseases (2024)

### Private Wells and Public Health: Research Evidence

The research evidence in Ireland provides increasing evidence of linkages between waterborne infections and consumption of drinking water from private wells in Ireland, for example:

Hynds *et al.* (2014) models found dug well use and absence of treatment systems to increase the likelihood of VTEC/STEC contraction and groundwater contamination.

O'Dwyer *et al.* (2016) using STEC outbreak notifications, found that recent heavy rainfall events and temperature increases significantly predicted the likelihood of an outbreak.

ÓhAiseadha *et al.* (2017) geostatistical study of notified STEC cases and geography of origin established private well use, septic tank density and cattle density as significant determinants of STEC (VTEC) infection likelihood

Boudou *et al.* (2021) identified associations between the Winter 2015–2016 flood event in Ireland and peaks of cryptosporidiosis and VTEC approx 2–4 months post-event.

O'Dwyer et al. (2021) in field study exploring impact of drought on microbial groundwater quality in private domestic wells found E. coli presence across drought and post-drought sampling regimes underscoring the persistence of microbial contamination in groundwater and ever-present public health threat.

The susceptibility of private groundwater drinking sources (supplying c. 800k Irish people) to contamination is almost certain to increase as a result of climate change, with rainfall representing a driver of environmental pathogen transmission. The impact of extreme weather events on waterborne infection is a critical trigger for waterborne outbreaks of disease.

Previous work by those working in this research area has shown evidence of widespread failure to take appropriate preventative actions at the household level to mitigate against rural drinking water contamination. With increased flooding anticipated, there is likely to be a marked increase in the incidence of waterborne disease outbreaks in rural Ireland. As a case in point, we continue to have amongst the highest VTEC notification rate in the EU, c. 10 times the European average.

Despite acknowledgement of the nature of the problem cited, for example, the ***Irish Government's Climate Action Plan 2023, p.79 states:***

“Projected increases in the frequency of extreme precipitation events will result in increased levels of run-off and potential water quality issues, with implications for slurry storage and land spreading”

“Projected increases in the frequency of extreme precipitation events may result in more water-borne disease (e.g., E. coli) from contamination of drinking water because of overland flows of pollutants. “

**Additionally, the HSE Climate Action Strategy 2023-2050, p.32 states:**

“Beyond the instances of extreme weather events (such as Storm Ophelia in 2017), a fast-changing climate creates risks of a higher prevalence of vector-borne (i.e., diseases that can be transmitted directly or indirectly between animals and humans) and water-borne diseases such as the increased rate of Verocytotoxin-producing Escherichia coli (VTEC) as a result of contaminated drinking water. For instance, Ireland has the highest rate of VTEC in Europe – nearly 10 times the EU average<sup>13</sup> – much of which is an existing vulnerability associated with contaminated drinking water.”

The rural water contamination issue is also acknowledged in adaptation plans *inter alia* Health Sector Climate Adaptation Plan, the Water Quality and Water Services Infrastructure Climate Change Sectoral Adaptation Plan, and the Agriculture, Forest and Seafood Climate Change Sectoral Adaptation Plan.

**However, there is no clear portfolio of response measures or actions specifically to address this rural water contamination and public health issue.**

**However** recent public policy reports commissioned and published by the EPA and the Irish Climate Advisory Council respectively have outlined some potential policy measures to respond:

The recently published Ireland Climate Change Assessment Report (2023), Vol. 3, referring to Adaptation responses required to specifically mitigate the health impacts of floods on populations states:

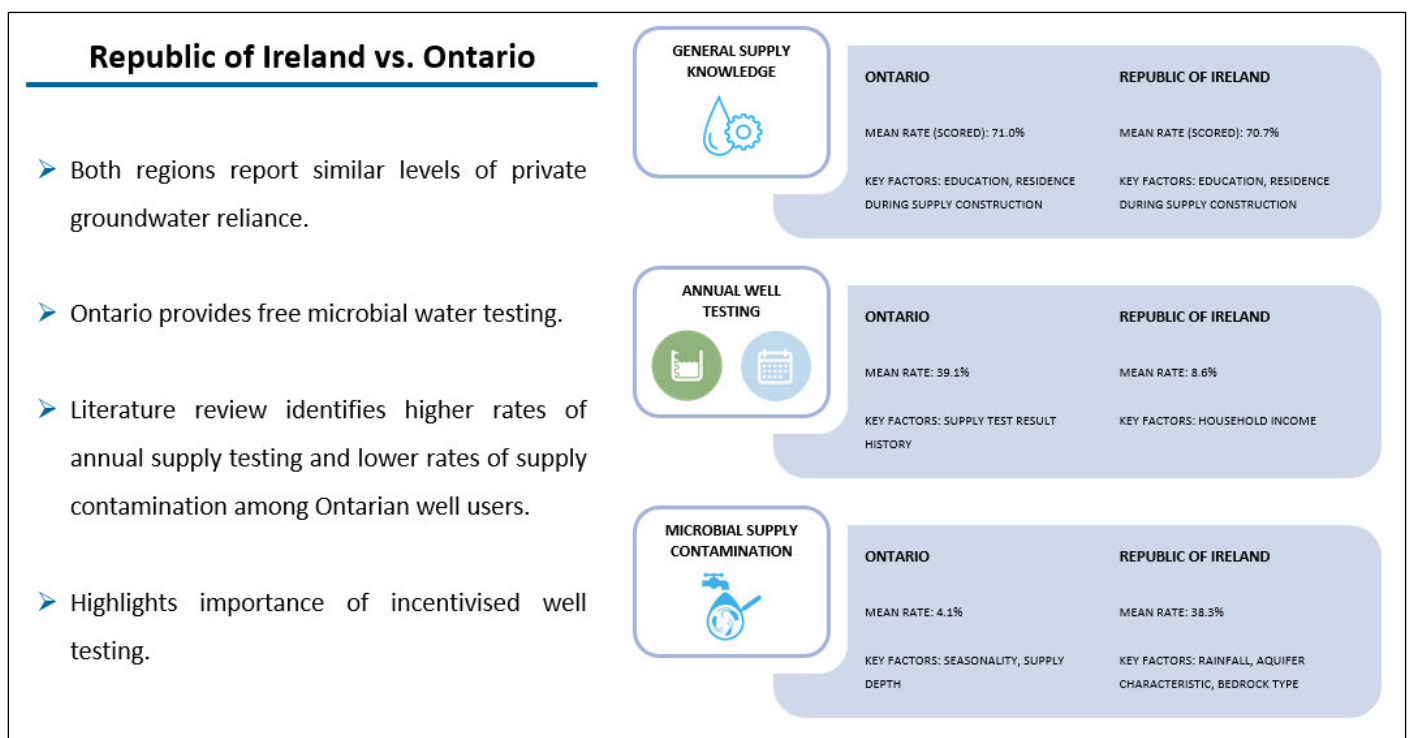
“The impact of floods on water quality, particularly through the **mismanagement of wells, requires a targeted long-term communication strategy**. Evidence suggests that people in non-agricultural areas are less likely to adapt their wells and that women are less likely to know about post-flood management actions than men (McDowell et al., 2020; Musacchio et al., 2021).

A recent study by Musacchio et al. (2021) shows that there is **a general low level of well stewardship, with only around 10% of well users in Ireland [who report] treating water and carrying out regular testing**, highlighting the need for information campaigns that focus on targeted interventions in well management behaviour.”

The Climate Change Advisory Council Working Paper on individual, household and community level climate change adaptation p. 30 states:

**“Recommendations emerging include, inter alia, establishing social norms for DWWTs and private well monitoring and maintenance, targeting communications at vulnerable population sub-groups, provision of free well water testing, increased rate of statutory inspection of DWWTs, and a wider programme of remediation and replacement of deficient DWWTs and installation of treatment at private wells”**

Additionally, a comparative review by Mooney et al. (forthcoming) of the situation in Ireland versus Ontario (Canada) provides interesting policy insights. As illustrated below, Ireland and Ontario report similar awareness levels, however Ontario now reports annual well testing rates that are more than four times higher than Ireland whereas Ireland reports microbial contamination rates that are nine times higher than Ontario. **The principal difference in terms of policy measure/s is free well water testing and well maintenance advice is offered in Ontario.**



Source: Mooney et al. (2024)

**The principal policy recommendation is: to fund a new programme of free private well testing in Ireland; to provide well maintenance and public health advice; and to monitor its effectiveness.**

**Supporting References:**

- Boudou, M., ÓhAiseadha, C., Garvey, P., O'Dwyer, J. and Hynds, P., 2021. Flood hydrometeorology and gastroenteric infection: The Winter 2015–2016 flood event in the Republic of Ireland. *Journal of Hydrology*, 599, p.126376.
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- Scott, M. & O'Neill, E. (2022) Opportunities for Individual, Household and Community Level Climate Change Adaptation in Ireland. *Climate Change Advisory Council Working Paper, No. 11*. Clonskeagh: Climate Change Advisory Council

### **Flood Policy, Awareness and Preparedness**

➤ *Project leads: Prof. Eoin O'Neill & Dr. Finbarr Brereton UCD*

Many people believe they live further away from potential flood risk areas than is actually the case. Moreover, individuals with low risk perceptions are less likely to undertake preventive actions that will reduce the harmful impacts of flooding. Such combinations of factors increase household vulnerability to damaging flood impacts.

Study findings show that the main predictor of household flood preparedness is prior experience. However, flood-risk preparedness can be undermined by low levels of efficacy amongst individuals in terms of the preparedness measures available to them and their own personal capacity to implement them.

Construction of public flood defences affects people's perception of flood risk. Even though a residual flood risk (e.g. overtopping) remains, preparedness levels are reduced.

Public debates in the Irish media on flood management do not fully reflect shifts in contemporary flood policy away from protection towards risk management, with negative implications for the direction of societal adaptation e.g. household preparedness actions.

The most vulnerable households must be identified and initiatives undertaken to increase risk awareness and household preparedness levels so as to reduce the damaging impacts of flooding on people and property. It is not easy to change peoples' perceptions; sustained engagement and effective communication are required.

### **References: Project Publications**

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