RESEARCH
SERIES
NUMBER 195
OCTOBER
2024

DRINKING WATER AND DOMESTIC WASTEWATER TREATMENT: MAINTENANCE, PERCEPTIONS, AND PRIORITIES

JOHN CURTIS

AN INSTITIÚID UM THAIGHDE EACNAMAÍOCHTA AGUS SÓISIALTA
ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

Drinking water and domestic wastewater treatment: Maintenance, perceptions, and priorities

John Curtis

October 2024

RESEARCH SERIES
NUMBER 195

Available to download from www.esri.ie

Whitaker Square, Sir John Rogerson's Quay, Dublin 2

https://doi.org/10.26504/rs195

ABOUT THE ESRI

The mission of the Economic and Social Research Institute is to advance evidence-based policymaking that supports economic sustainability and social progress in Ireland. ESRI researchers apply the highest standards of academic excellence to challenges facing policymakers, focusing on 12 areas of critical importance to 21st century Ireland.

The Institute was founded in 1960 by a group of senior civil servants led by Dr T. K. Whitaker, who identified the need for independent and in-depth research analysis to provide a robust evidence base for policymaking in Ireland.

Since then, the Institute has remained committed to independent research and its work is free of any expressed ideology or political position. The Institute publishes all research reaching the appropriate academic standard, irrespective of its findings or who funds the research.

The quality of its research output is guaranteed by a rigorous peer review process. ESRI researchers are experts in their fields and are committed to producing work that meets the highest academic standards and practices.

The work of the Institute is disseminated widely in books, journal articles and reports. ESRI publications are available to download, free of charge, from its website. Additionally, ESRI staff communicate research findings at regular conferences and seminars.

The ESRI is a company limited by guarantee, answerable to its members and governed by a Council, comprising 14 members who represent a cross-section of ESRI members from academia, civil services, state agencies, businesses and civil society. The Institute receives an annual grant-in-aid from the Department of Public Expenditure and Reform to support the scientific and public interest elements of the Institute's activities; the grant accounted for an average of 30 per cent of the Institute's income over the lifetime of the last Research Strategy. The remaining funding comes from research programmes supported by government departments and agencies, public bodies and competitive research programmes.

Further information is available at www.esri.ie

THE AUTHOR

John Curtis is a Research Professor at the Economic and Social Research Institute (ESRI) and Adjunct Professor at Trinity College Dublin (TCD).

ACKNOWLEDGEMENTS

This report is an output of the Joint Research Programme on Water between the Department of Housing, Local Government and Heritage (DHLGH) and the ESRI. Thanks to the Programme Steering Committee for guidance on the research, and specifically to Mary Gurrie, Stephen McCarthy and Caroline Murphy (Environmental Protection Agency); Triona McGrath (An Fóran Uisce); and anonymous reviewers for detailed comments and suggestions on the report.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

CI	Confidence interval
DHLGH	Department of Housing, Local Government and Heritage
ESRI	Economic and Social Research Institute
LAWPRO	Local Authorities Water Programme
DWWTS	Domestic wastewater treatment systems
EPA	Environmental Protection Agency
GDPR	General Data Protection Regulation

EXECUTIVE SUMMARY

Introduction

The objective of this research is to capture householders' views and experiences related to drinking water and domestic wastewater treatment systems (DWWTS), including public health concerns and experience accessing the septic tank remediation grant. Capturing data on the level of maintenance undertaken by households with respect to their private drinking water supplies and DWWTS provides insight on the extent to which additional policy interventions are required to protect both public health and environmental quality.

Drinking water testing

- Most households sourcing their drinking water from a private well do not regularly send their water for laboratory testing, as recommended by the Environmental Protection Agency (EPA). Just one in five households with a private well supply have had their water tested in the past three years.
- The most common reason given for not having water tested is that there is no (perceived) problem with supplies.
- Cost is not a primary reason why households do not send samples for laboratory testing.

DWWTS desludging

- Almost one in five DWWTS were not desludged in the past five years.
- Among households that desludge their DWWTS, the majority are aware of the operational benefit to their DWWTS of regular desludging, while a substantial minority are also aware of the environmental protection benefits.
- For households that have not emptied their DWWTS, the primary reason for not doing so is a belief that it isn't necessary. Cost was not indicated as a significant contributory reason for not undertaking regular maintenance of DWWTS.
- Households with awareness of environmental pollution risks are not any more likely to have their DWWTS emptied compared to those without any awareness of the pathways and risks of pollution.
- Households with ultraviolet light treatment on their drinking water supplies are half as likely to desludge their DWWTS as those without ultraviolet light treatment.

DWWTS remediation

- DWWTSs can malfunction for a variety of reasons but most households indicated that they have never experienced specified symptoms of a malfunctioning DWWTS.
- Approximately 10 per cent of surveyed households had observed symptoms of poorly functioning DWWTS within the past five years.

- Of households experiencing problems with their DWWTS, 80 per cent have attempted to resolve the problems.
- For the 20 per cent of households that have not attempted to remediate a malfunctioning DWWTS, most report that the problem isn't that severe, or that it's too much hassle to fix the problem. Approximately one in four report that the issue was too expensive to fix.

Attitudes, knowledge, and priorities

- Seven in ten survey respondents were aware of potential environmental impacts of a malfunctioning DWWTS, including pollution of ground and surface water.
- Households with members with a health vulnerability are no more likely to test their drinking water than households without members that have a health vulnerability.
- Households with awareness of environmental vulnerabilities, such as pollution of ground and surface water, are not any more likely to have their water tested compared to those without any awareness of the pollution pathways and risks.

DWWTS inspections and remediation grants

- Just 31 per cent of respondents were aware of the septic tank remediation grant programmes. Among respondents with awareness of grant support, almost half were not aware of the specific grant schemes available.
- While there is relatively little awareness of the remediation grant scheme, in the event remediation works are required, there is almost universal willingness to consider applying for grant aid (up to 85 per cent of approved costs subject to a maximum of €5,000).[1]

Policy recommendations

Drinking Water

- There is a broad deficit among homeowners on the importance of regular testing of drinking water from private supplies. Devising communications strategies on a recurring basis to alert households of the public health risks of not maintaining safe drinking water supplies is necessary.
- Many households report that either they don't know how to get their drinking water tested, or that testing is too much hassle. Making it easier for households to choose a suitable testing laboratory is paramount. Maintaining an approved list of certified testing laboratories would lessen households' concerns about rogue operators. Full transparency on cost and upselling, where it exists, would also help allay households' concerns.

[1] The maximum grant value was subsequently increased to €12,000.

DWWTS

- A recurring communications strategy should be developed to alert households of the public health and environmental damage risks of not undertaking regular DWWTS maintenance. The Protect Our Water register of DWWTS is an ideal resource for communicating with relevant households.
- The primary reason for not desludging is a belief that desludging is not necessary. Cost or inability to pay barely registers as the reason why households do not desludge their DWWTS. However, as desludging costs are typically €250–300, this would be a barrier for many households even if they were behaviourally inclined to undertake regular DWWTS maintenance.
- At present the responsibility for DWWTS maintenance falls on households. That should continue to be the case, in line with the polluter pays principle, but there is also a public good case to reduce the organisational burden on households associated with sourcing a suitable contractor for DWWTS desludging. Desludging services could be organised centrally/regionally with households opting in and paying for the service when it is provided in their locality, providing economies of scale and yielding competitive prices for households.
- While communications strategies, and reducing administrative burden, may encourage households to better maintain their DWWTS, enforcement activity is also critical. At national scale, the equivalent annual inspection rate is approximately 1 in 460 properties, which should be substantially increased if enforcement is to have a deterrent effect. Additionally, if maintenance and desludging records were integrated into the Protect Our Water system, it would provide better data to assist enforcement activity.
- At present the Protect Our Water database is not an up-to-date register of DWWTS owners. The Protect Our Water database could be utilised both to communicate with registered owners of DWWTS, whereas, if maintenance and desludging records were integrated into the Protect Our Water system, it would provide better data to assist enforcement activity.

Grants

- The current scale of grant applications probably reflects the scale of the National Inspection Programme, with most grant applications likely subsequent to a DWWTS inspection, i.e., enforcement activity is driving grant demand. As DWWTS outflows represent a risk to water quality, consideration should be given to increasing the number of inspections of DWWTS, and additionally, minimising barriers facing households that are attempting to remediate their systems.
- If the grant scheme is to be an effective policy tool to combat environmental pollution from septic tanks and mitigate public health risk, a review of the septic tank remediation grant schemes should be considered, including scheme objectives and eligibility criteria.

1 INTRODUCTION

In 2022 there were over 1.8 million private households in permanent housing units in the State. Over 80 per cent of households access drinking water from a public mains supply, 10 per cent (182,000 households) source their drinking water from a private well, and a further 8 per cent (141,000) source water from either private or group water schemes. Just over 68 per cent of households are connected to a public sewerage scheme. For households not connected to a public sewerage system, 527,000 (29 per cent) properties are serviced by either an individual septic tank or treatment system for sewerage facilities, of which just over half source drinking water from either a private well or a group water scheme.

Wastewater discharges, both from urban wastewater treatment facilities and residential wastewater treatment systems (including septic tanks), are among the most significant identified risks to water quality in Ireland (O'Boyle et al., 2019). In rural areas, agricultural pressures on water quality are the most prevalent but domestic wastewater from septic tanks and treatment systems impact water quality too. Domestic wastewater discharges are attributed as the reason why more than 188 individual water bodies are at risk of not achieving their water quality objectives (RBMP, 2022).

Inspections of domestic wastewater treatment systems (DWWTS), including septic tanks, by local authorities occur under either the National Inspection Plan or in relation to grant applications, catchment assessments, complaints or planning/building control. The National Inspection Plan 2022–2026 focuses on inspections near rivers at risk from DWWTS discharges and where DWWTS are co-located with household wells (EPA, 2021). In 2022, local authorities completed 1,143 DWWTS inspections, which is equivalent to an inspection rate of approximately 1 in 460 properties. Half of DWWTS failed inspection in 2022 and 20 per cent were a risk to human health and the environment (EPA, 2023). Of DWWTS inspected, 30 per cent were not maintained and 23 per cent were not desludged. When a DWWTS fails inspection, local authorities issue an advisory notice to the household requiring it be fixed. Of the DWWTS that failed inspection during 2013–2022, 78 per cent were fixed by the end of 2022. Of the remaining advisory notices, approximately half have been outstanding for more than two years (EPA, 2023).

The Government has implemented grant schemes to assist households remediate malfunctioning septic tank or wastewater treatment systems. The remediation grants are available in three situations: following the issuance of an advisory notice subsequent to an inspection by the local authority; if the property is situated in a 'Prioritised Area for Action' within the River Basin Management Plan and the DWWTS owner has received a letter from the Local Authority Waters Programme Office indicating eligibility to apply for a grant; or if it is situated in a High-Status Objective Catchment Area within the River Basin Management Plan. The uptake of DWWTS grants is relatively modest, with approximately 200 grants awarded in 2022 (EPA, 2023).

The risks posed to water quality and public health by poorly maintained, malfunctioning and structurally deficient DWWTS are long established (Hynds et al., 2012; Withers et al., 2014). Experience from inspections by local authorities is that most households respond to advisory notices to fix malfunc-

tioning DWWTS, though a substantial cohort of households fail to respond. A gap in knowledge exists among policymakers in relation to: the extent to which households understand the risks to public health of inadequate or poorly maintained drinking water supplies or DWWTS; the extent to which households regularly maintain their DWWTS; and the motivations behind action or inaction with respect to maintenance. A better understanding of these issues will provide decision makers with guidance on whether policy responses aimed at reducing the risk to water quality from DWWTS focus on educational elements addressing informational deficits, behavioural barriers, or whether poor performance is linked to inability to pay and other financial priorities.

The objective of this research is to capture householders' views and experiences related to drinking water and DWWTS, including public health and experience assessing the septic tank remediation grant. An empirical assessment of the level of maintenance of DWWTS undertaken by households will provide insight into the extent to which additional policy interventions are required. Information on households' motivations and knowledge will provide insight on the nature of policy intervention, i.e., to address knowledge gaps, financial barriers, etc. The research focus includes maintenance of both DWWTS and drinking water supplies. In considering drinking water supplies, we can gauge householders' approach to managing the potential direct risk to their health via their drinking water versus risks to health or the environment that may appear less obvious or immediate via their DWWTS.

2 METHODS

Answering the research questions necessitated directly surveying households with a domestic wastewater treatment system (DWWTS), as it is the only way to collect information on householders' views and behaviours related to the maintenance of wastewater treatment systems and protection of drinking water supplies. The Water Services Act 2007 (as amended) requires water services authorities, i.e., local authorities, to maintain a register of DWWTS in their functional areas and that DWWTS owners register. Households may register via an online portal, Protect Our Water. Protect Our Water is the only register of relevant households that would facilitate undertaking a survey.

The legitimate interest to process Protect Our Water data under Article 6(1)(f) of the General Data Protection Regulation (GDPR) relates to the broader societal benefits that this project would provide, as the research attempts to inform public policies protecting public health and the environment. With more than 0.5 million properties registered, surveying all properties was not considered proportionate or necessary for the research; rather, surveying a sample of properties was seen as sufficient. With the registered properties managed by individual water services authorities, rather than centrally, drawing a random sample across more than 30 water authorities was not practically feasible. Instead, a subset of water services authorities was selected to administer the survey to all registered households, within their functional areas, whose details included an email address. The water authorities included in the survey are those in counties Cavan, Donegal, Kildare, Longford, Meath and Galway city. Individual water authorities emailed an invitation to households to participate in a survey about drinking water and wastewater treatment. The survey was hosted on an online survey platform and was completed anonymously. The water authorities did not share registered households' details with the researchers, nor did the survey questionnaire collect information that could be used to identify respondents.

The response rate for the survey was anticipated to be low for several reasons. While the chosen survey approach was the only economically feasible surveying method, it included a request to potential respondents to click on a hyperlink to an online survey platform. Given the prevalence of fraudulent email requests, many recipients were likely to be reluctant to do so, even if the email invitation originated from a trustworthy source, i.e., their local authority. Furthermore, given that registrations with Protect Our Water are valid indefinitely, and that initial registrations were made over 10 years previously, a proportion of email addresses are likely to no longer exist or no longer be utilised. Also, given the practical arrangements for issuing the survey, it was not feasible to issue a reminder email. The overall sampling frame for the survey was 48,243 households. A total of 6 per cent clicked on the link in the survey, i.e., reached the introductory page on the survey platform, whereas 4 per cent fully completed the survey, totalling 1,897 respondents. In each of the results tables reported later, the relevant subsample size is reported (e.g., N=1,822) and in all cases the subsample is less than 1,897 respondents for several reasons. First, respondents that only partially completed the survey drop out of many tables. Secondly, in many instances the results tables are either cross-tabulations of two survey questions, or tables of responses conditional on an answer to a prior question. In all these instances, the sample size

is conditional on the number of respondents that answered all the relevant questions. Similarly, in the regression model results, observations are lost where no data are available for specific variables.

The questionnaire comprises six sections. Respondents are initially asked about their drinking water supply, as well as any testing or treatment, and motivations for same. The next part of the questionnaire covers domestic wastewater treatment. Respondents who indicated that their home is connected to a public sewer were excluded from subsequent analysis. Such respondents likely have moved home but the Protect Our Water register has not been updated. Questions on the wastewater treatment system included questions about desludging, as well as potential operational issues with the treatment system. The third section asks about respondents' awareness of and experience with the septic tank grant schemes. The fourth section captures information on respondents' awareness of potential environmental damage associated with malfunctioning DWWTS, and information related to the vulnerability of family members from either sub-standard drinking water or a malfunctioning DWWTS. The final section of the questionnaire captures information on respondents' priorities with respect to several public policy issues, their own household spending, and some socio-demographic variables. The questionnaire is included in an appendix.

3 SURVEY FINDINGS

3.1 Drinking water

Table 3.1 reports the source of drinking water supply among the surveyed households, which is 55 per cent from a private well, 35 per cent from a public supply, and 9 per cent from either a public or private group water scheme. A small number of households either purchase bottled drinking water, source their supplies from rainwater or don't know the source of their drinking water. Respondents were also asked about the quality or purity of their drinking water as it comes from the tap, with almost four in five respondents indicating that it was either good or excellent. Up to 7 per cent of households with either a private well or a public supply said that the quality of the water from the tap was of poor quality.

Table 3.1: Drinking water supply and perceived quality, %

	Excellent	Good	Fair	Poor	Total
Private well	21	22	8	4	55
Group water scheme	3	4	2	0	9
Public water supply	11	16	6	2	35
Bottle/rainwater	0	0	0	0	0
Don't know	0	0	0	0	1
Total	35	42	15	7	100
N=1,822					

The Environmental Protection Agency (EPA) recommends that households test their well water supplies at least once a year for microbiological contamination (e.g., E. coli and coliform bacteria), and every three years for chemical contamination. Only 36 per cent of respondents indicated that they ever sent their water for laboratory testing, with just 19 per cent of respondents doing so in the three years prior to the survey, in line with the EPA's guideline for chemical contamination testing, as reported in Table 3.2. For those who ever had their water tested, the most common reasons for doing so are that the household regularly undertakes tests, that they had a concern about the physical appearance of their water supply (e.g., odour or discolouration), or because it was a requirement of a grant application (i.e., under the Rural Water Programme for improvement works to a private water supply). Only 7 per cent of respondents indicated that they had their water tested due to illness concerns either within the family or locally. That there wasn't a problem with their drinking water supply was the most common reason for not having their water tested, as reported by one in two respondents who never had their water tested. Up to roughly one in three respondents indicated that they didn't know how to have their drinking water tested or that testing it was too much hassle. Between 10 and 12 per cent of respondents indicated that either testing was too expensive or that they had other spending priorities.

Table 3.3 reports households' experiences with a broad range of issues that occur in drinking water supplies. Several of the issues listed potentially relate to water treatment (e.g., chlorine or detergent smell), water hardness (e.g., oily film), or reflect the chemical composition of the source water (e.g.,

Table 3.2: Drinking water testing among households with private well supply, %

	%	95% CI
Ever tested drinking water? (N=1,014)	36	+/-3
Reason for test (N=364):		
Regularly test	38	+/-5
Concern re: odour/discoloration	17	+/-3.9
Concern re: illnesses	7	+/-2.6
Awareness of local issues	9	+/-2.9
Grant application	17	+/-3.9
Tested within prior 3 years	19	+/-2.4
Lab tests of those tested within prior 3 years (N=186)		
Within acceptable ranges	80	+/-5.8
Not within acceptable ranges	20	+/-5.8
Recommend disinfection	48	+/-17.6
Recommend treatment	52	+/-17.6
Reasons for not testing in prior 3 years (N=233)		
No problem with water	52	+/-6.4
Too much hassle	7	+/-3.3
Don't know how to get tested	33	+/-6
Too expensive to test	12	+/-4.2
Other spending priorities	10	+/-3.9

Multiple answers were allowed; answers do not sum to 100%.

metallic taste, blue or green stains) and may not necessarily breach drinking water standards. The right-hand side of Table 3.3 reports the primary reasons why households have not had these issues fixed. The most common response was that the issue didn't sufficiently bother the respondent, followed by not knowing how to fix the problem. The cost of remediation or other spending priorities, while important for some respondents, is less common as a reason for not resolving the issue. The broad conclusion from these survey results is that most households sourcing their drinking water from a private well do not regularly send their water for laboratory testing. Just 19 per cent have had their water tested in the past three years. The compliance rate with the EPA recommendation of yearly testing for microbiological contamination is likely to be substantially lower. When households do have their drinking water tested, it is likely triggered by some event that impacts the appearance of the water or a grant application. The most common reason for not having water tested is that there is no (perceived) problem with supplies. Cost is not a primary reason why households do not send samples for laboratory testing.

Table 3.3: Experience of following issues from water as comes from tap, %

	%	95% CI			
Cloudy	17	+/-1.7			
Sediment	7	+/-1.2	**Reasons for not fixing problem (N=719)**		
Brown or orange hue	8	+/-1.2		%	95% CI
Chlorine smell	13	+/-1.5	Too much hassle	3	+/-1.3
Sulphur smell	3	+/-0.8	Don't know how to fix	27	+/-3.2
Oily film on top standing water	2	+/-0.7	Too expensive	9	+/-2.1
Metallic or bitter tasting water	4	+/-0.9	Other spending priorities	11	+/-2.2
Blue or green stains in showers/sinks	3	+/-0.8	Doesn't bother me	35	+/-3.5
Detergent smell	1	+/-0.5			
Poor water pressure	16	+/-1.7			
(N=1,849) Multiple answers were allowed; answers do not sum to 100%.					

3.2 Domestic wastewater treatment systems (DWWTS)

Table 3.4 presents the share of DWWTS among the surveyed sample, including their discharge location. The 76:24 ratio of septic tanks to wastewater treatment plants represents an under-representation of households with septic tanks compared to 2022 Census data, which reports an 89:11 ratio. Given the focus of interest relates to DDWTS maintenance activity and associated behavioural motivations, it is unlikely that the imbalance in ratios between the sample and the wider population would have a sufficient impact to substantially change the research findings and conclusions.

Table 3.5 reports desludging frequency for both septic tanks and wastewater treatment plants, with the latter usually comprising treatment by aeration or biological media. Desludging frequency is not substantially different between septic tanks and wastewater treatment plants, so is not reported separately. Almost one in five DWWTS were not desludged in the prior five years. This figure is broadly consistent with data from Naughton & Hynds (2014), who find that 67 per cent of their respondents had previ-

Table 3.4: Wastewater treatment and discharges, %

	Percolation area	Soak pit	Surface water/drain	Don't Know	Total
Septic tank	47	20	3	7	76
WW treatment plant	21	1	0	1	24
Total	68	21	3	8	100

(N=1,773)

ously desludged their DWWTS.[2] The recommended frequency of desludging depends on tank size and household occupancy or as recommended by the system's manufacturer.

Table 3.5: DWWTS desludging and service frequency, %

No. of times in past 5 years	Desludged (N=1,778)*	Serviced (N=424)**
0	18	17
1	26	25
2	25	23
3	13	15
4	6	4
5	10	13
Don't know	3	2
	100	100

* Includes both septic tanks and treatment systems

** Includes treatment systems only

Table 3.6 reports the primary reasons why households did or did not desludge their DWWTS during the past five years. For those who have emptied their DWWTS at least once in the past five years, the majority, at 74 per cent, do so to ensure that it functions properly. Approximately one-quarter do so for the protection of ground and drinking water. Among those who have not desludged their DWWTS, the primary reasons for not doing so are that they feel such action isn't necessary or that they didn't know that it should be emptied. There are two clear conclusions that can be drawn from these survey results. First, among households that have previously emptied their DWWTS, the majority are aware of the functional benefits of regular desludging, while a substantial minority are also aware of the environmental benefits. For households that have not previously emptied their DWWTS, the primary reason given for not doing so is 'Isn't necessary, working fine'. Some households also indicated that they didn't know that the tank had to be desludged. Cost was not indicated as a significant contributory reason for not undertaking regular maintenance of DWWTS. However, as desludging costs are typically €250–300, this would be

[2] Naughton & Hynds's (2014) survey sampling approach is substantially different and the desluding question is not limited to prior 5 years.

a barrier for many households even if they were behaviourally inclined to undertake regular DWWTS maintenance.

Table 3.6: Reasons for (not) desludging in the past 5 years

Desludging (N=1,465)	%	95% CI	Not Desludging (N=313)	%	95% CI
To ensure it functions properly	74	+/-2.2	Isn't necessary, working fine	70	+/-5.1
To protect ground & drinking water	24	+/-2.2	Didn't know had to desludge	16	+/-4.1
Advised to desludge regularly	31	+/-2.4	It's not a priority	2	+/-1.5
			Don't want to spend money on it	1	+/-1.1

Multiple answers were allowed; answers do not sum to 100%

Table 3.7 lists issues that arise with improperly functioning DWWTS, as well as their reported incidence across the surveyed households. For most households, these issues never arise. A small minority, up to 3 per cent, report these issues occurring on a regular basis. However, it is likely that some of the issues reported as occurring only occasionally are long term issues too. For example, excessive plant growth, greyish slime, or wastewater lying in the garden indicate serious malfunctioning of the DWWTS. Leaving aside slow drainage and odours, which may reflect pipe blockages and tank vents, rather than necessarily a malfunctioning DWWTS, across the other issues listed, approximately 10 per cent of surveyed households had poorly functioning DWWTS that required remedial action at some point in the past five years. From Table 8 we see that 80 per cent of households have attempted to resolve the problems with their DWWTS. For those that have not attempted to remediate a malfunctioning DWWTS the majority, at 58 per cent, report that the problem isn't that severe. People also report that it is too much hassle to fix the problem, or that they don't know how to resolve the issue, while 23 per cent report that the issue is too expensive to fix.

Table 3.7: Experience of issues with wastewater system over past 5 years, %

	N=	Never	On occasion	On regular basis	Total
Slow draining toilets, sinks or drains	1,756	70	27	3	100
The smell of sewage in garden	1,739	72	26	3	100
Overflow of wastewater into garden	1,734	91	8	1	100
Water regularly lying in the garden near wastewater system	1,735	91	7	1	100
Greyish slime growth in nearby drains	1,712	95	4	1	100
Excessive plant growth near wastewater system	1,734	87	10	3	100

Table 3.8: Resolving issues with DWWTS, %

Attempted to resolve issues with DWWTS, as indicated in Table 3.7		
	%	95% CI
Yes	80	+/-2.7
No	20	+/-2.7
(N=844)		
Reasons for not attempting to resolve DWWTS issues		
	%	95% CI
Problem isn't that severe	58	+/-7.5
Too much hassle	5	+/-3.4
Don't know what to do	11	+/-4.8
Too expensive to fix	23	+/-6.4
Other spending priorities	15	+/-5.4
N=168. Multiple answers were allowed; answers do not sum to 100%.		

3.3 DWWTS inspections and remediation grants

The survey asked households whether their DWWTS had been inspected by their local authority within the prior five years. Given the absolute number of inspections undertaken by local authorities each year, the survey sampling frame, as well as the anticipated low response rate to the survey, it was expected that relatively few households would respond affirmatively to that question. In total, 107 households indicated that their DWWTS had been inspected by their local authority in the past five years, with 65 per cent reporting that they passed the inspection without remedial action required. Remedial actions advised to those that failed include ceasing discharge of effluent, repair mechanical or structural defects, diversion of clean water to separate soakaways, and desludging the DWWTS. The EPA publishes more comprehensive information on DWWTS inspections (EPA, 2023).

The survey also asked respondents whether they were aware of a grant scheme administered by their local authority to assist in the remediation, repair or upgrade of septic tank/wastewater treatment systems. Just 31 per cent of respondents were aware of the grant assistance programme. Among respondents with awareness of grant support, almost half were not aware of the three different grant schemes, as reported in Table 3.9. While there is relatively little awareness of the remediation grant scheme, in the event remediation works are required, there is almost universal willingness to consider applying for grant aid (up to 85 per cent of approved costs subject to a maximum of €5,000).[3]

Across the surveyed households, just 3 per cent (50 households) applied for a DWWTS remediation grant. With approximately 200 grants awarded per annum (EPA, 2023), a low affirmative response to this survey question was also anticipated but an open-ended question was included to elicit feedback on their experience with the grant application process, specifically prompting for views on the application process, eligibility criteria and administrative burden, whether positive or negative. All responses to this

[3] The maximum grant value was subsequently increased to €12,000.

question are reported in an appendix for review. With a small number of responses, it is difficult to draw definitive conclusions. Nonetheless, the responses broadly report positive engagement with local authority staff. In several instances, households appreciate local authority staff's expertise and guidance in navigating the remediation process. This suggests that the technical and engineering requirements of septic tank remediation represent a significant challenge to some households. Some households are reluctant to engage with the local authority; one respondent noted, 'we were fearful in contacting the Council originally'. This may reflect fear of what might transpire if they actively engaged. Overall, this suggests that it would be beneficial to provide independent technical advice on remediation options to households with a poorly functioning DWWTS. Other examples from the verbatim responses highlight cases where households are attempting to remediate poorly functioning DWWTS but administrative rules preclude their eligibility.[4] If DWWTS outflows represent a risk to water quality, consideration should be given to minimising the number of administrative barriers facing households that are attempting to remediate their systems.

Three pieces of data from the survey suggest that a review of the remediation grant schemes and their eligibility criteria should be undertaken. There is relatively low awareness of the remediation grant schemes, and almost universal willingness to consider applying for grant aid; whereas there are few successful grant applications per annum. The motivation for the septic tank remediation grant schemes is the protection of the environment and public health. If the grant scheme is to be an effective policy tool to combat environmental pollution from septic tanks and mitigate public health risk, a review of the grant schemes should be considered, including scheme objectives and eligibility criteria.

Table 3.9: Awareness of grants for DWWTS remediation, %

Prior awareness of grant (N=1,818)	31	+/-2.1
Conditional on awareness, knowledge of specific grant types (N=558)		
Following local authority advisory notice	47	+/-4.1
Situated in a Prioritised Area for Action	9	+/-2.3
Situated in a High Status Objective Catchment Area	8	+/-2.2
Not sure/None of above	52	+/-4.1
Willingness to avail of DWWTS remediation grant (N=1776)		
Yes	67	+/-2.2
Possibly	27	+/-2.1
No	6	+/-1.1

3.4 Environmental attitudes, knowledge, health and priorities

Health psychology research offers insight into why people choose to carry out certain behaviours, with Rosenstock (1974) being an early influential paper codifying the Health Belief Model. This model posits

[4] Since the survey was completed eligibility criteria related to DWWTS registration date have been relaxed.

that for behavioural change to occur, individuals need to feel vulnerable to a threat (e.g., malfunctioning DWWTS), believe possible threat outcomes to be severe (e.g., sickness), and believe in their own efficacy to bring about desirable beneficial change without considerable costs. The first two of these factors are easily investigated within a survey. Within the context of the Health Belief Model, Devitt et al. (2016) undertook a small-scale exploratory study to identify drivers and barriers to DWWTS maintenance among Irish households. Relying on focus groups, they find that most households have a limited awareness of the potential risks associated with poorly functioning DWWTS, with most reporting not having a regular maintenance routine in place. They conclude that households' capacity to engage in risk management (i.e., regular maintenance of DWWTS) is limited.

In this survey, 24 per cent of households responded that there are individuals within their family who, from a health perspective, might be especially vulnerable if their water supply is below safe drinking water standards or their DWWTS is malfunctioning. Over two-thirds of households believe that the potential health consequences would be moderate or severe if family members became ill due to either sub-standard drinking water or a malfunctioning DWWTS, as shown in Table 3.10. Moderate was defined as causing substantial discomfort, potentially necessitating a GP visit or prescription medicines, while severe was defined as major discomfort and pain with necessity of medical intervention. In the next section we statistically analyse whether households' perception of vulnerability and threat severity is associated with a higher likelihood of DWWTS maintenance.

Table 3.11 reports respondents' awareness of the environmental impacts associated with a malfunctioning DWWTS. Between six or seven in every ten respondents are aware of each of the environmental impacts listed, including pollution of ground and surface water. Just 13 per cent responded that a malfunctioning DWWTS was unlikely to have any substantial environmental impact.

Table 3.10: Perceived severity of potential health consequences of sub-standard drinking water or a malfunctioning DWWTS, %

Mild	27
Moderate	39
Severe	34
Total	100
N=1,780	

Table 3.11: Awareness of potential environmental impacts of malfunctioning DWWTS, %

	%	95% CI
Ponding in lawn potentially exposing people to sewage & risk of illness	61	+/-2.2
Odours impacting on normal use of own and neighbours' gardens	69	+/-2.1
Polluting groundwater water quality, potentially impacting on drinking water	70	+/-2.1
Affecting surface water quality, potentially damaging wildlife/habitats, etc.	72	+/-2.1
'Unlikely to have any substantial impact'	13	+/-1.5
N=1,849		

The survey asked a series of questions to gauge households' relative priority for a range of both public policy issues related to the environment and society, plus households' own spending priorities. On environmental and societal issues, respondents were asked how much priority the Government should devote to specific issues on a seven-point scale from lower to higher priority. Responses are illustrated graphically in Figure 3.1. Most respondents attach a high priority to Government devoting resources to housing, health and cost of living. Opinions are more diverse with respect to traffic congestion, immigration and litter. Figure 3.2 reports responses with respect to environmental policy issues. Pollution of rivers, the biodiversity crisis and extinction of species are considered with relative higher priority among at least half of households surveyed. A relatively small minority of respondents attach a low priority to these public policy issues. To compare responses across all 12 social and environmental policy issues, Figure 3.3 plots the median response, where the answer options ranged from 1: Higher priority to 7: Lower priority. At least 50 per cent of households expressed a preference of 'higher priority' for public policy in the areas of health, housing and pollution of rivers.

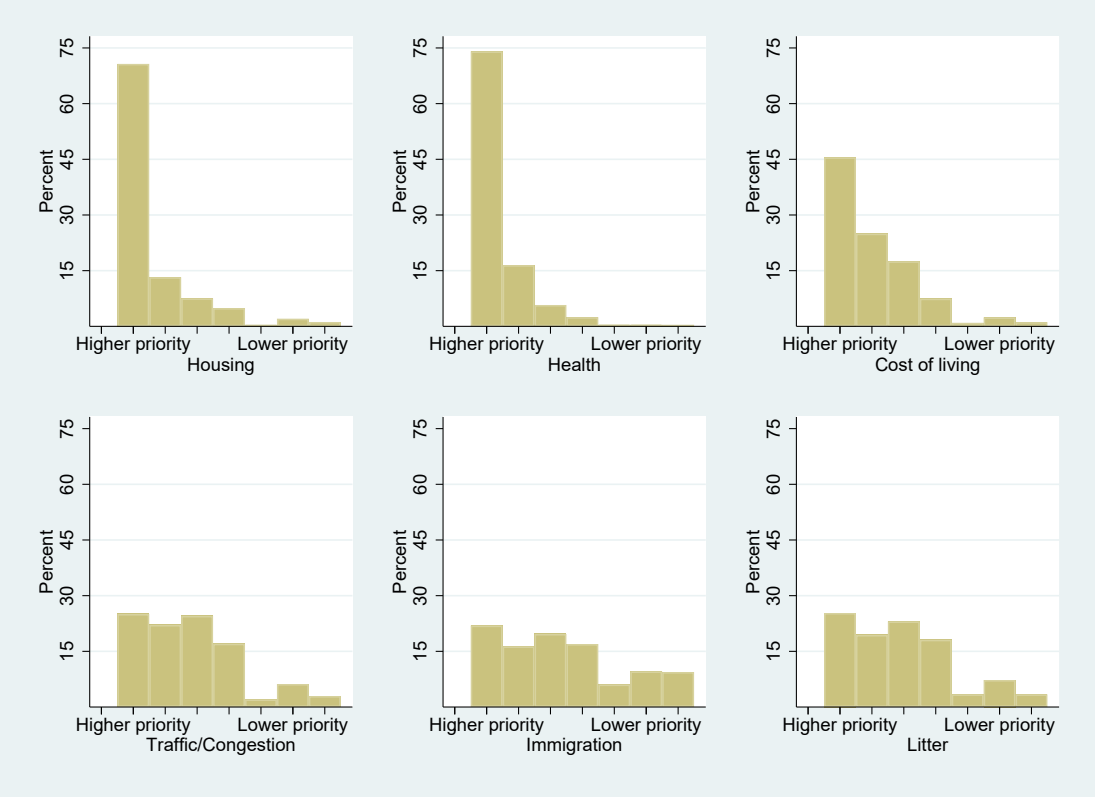
We focus now on households' own personal priorities in terms of household spending. Respondents were asked to rank nine potential household expenditures. In Table 3.12 we report the percentage of households that rank each item among the top three spending priorities. Not surprisingly, heating system maintenance is highest, with 78 per cent of respondents ranking it among the top three priorities. Servicing the car also receives relatively high priority. The other two expenditure items that rank highest are desludging the DWWTS and laboratory testing of well water. For instance, 50 per cent of respondents ranked desludging the DWWTS as a top three priority among the nine listed items. However, of these respondents, 15 per cent report not emptying their DWWTS in the previous 5 years. What this latter statistic suggests is that respondents may have answered this question in a socially desirable manner (i.e., elevating spending priority on DWWTS maintenance and well water testing as the survey was focused on these topics), as the question itself occurs towards the end of the survey after the questions on DWWTS maintenance and well water testing.

3.5 Water testing and DWWTS maintenance: Multinominal analysis

Earlier we reported data on laboratory testing of private well water (Table 3.2) and DWWTS maintenance frequency (Table 3.5), as well as the motivations behind households' testing and maintenance records (Table 3.2 & Table 3.6). In this sub-section we explore whether there are any additional factors associated with a higher likelihood of either laboratory testing of well water or DWWTS maintenance, including whether the Health Belief Model has relevance.

The proposed analytical approach is to estimate the likelihood of either laboratory testing or DWWTS desludging as a function of various household factors, such as education levels, age, income and household occupancy. Additionally, we include variables capturing attitudes relevant to the Health Belief Model, as well as the variables discussed earlier. Modelling results are presented as odds ratios, showing the impact of a variable (e.g., vulnerable household occupants from a health perspective) on testing or

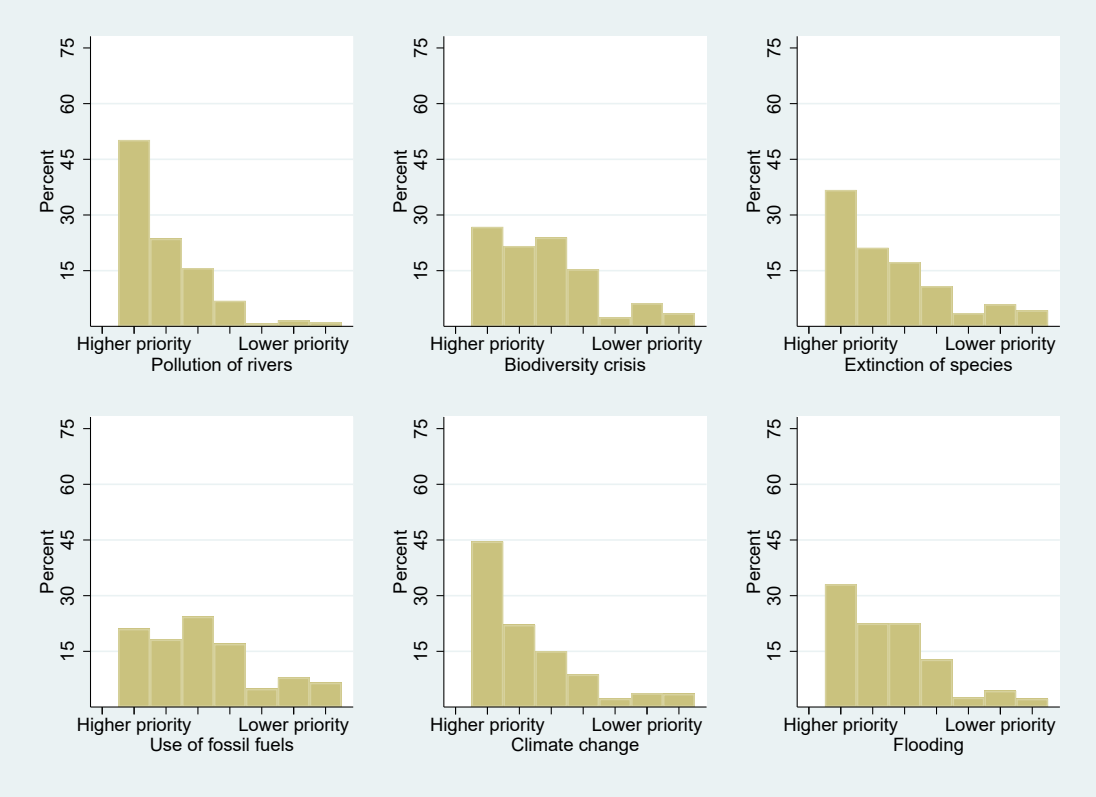
Figure 3.1: Households' priority for social policy issues



maintenance, versus a baseline (e.g., no vulnerable occupants). Estimation results are reported in Table 3.13, which includes only variables with the highest statistical relevance. The full regression model results are reported in an appendix. The odds ratio estimates are a measure of the association between an exposure and an outcome. In the context of the results in Table 3.13, they represent the odds that either well water testing or DWWTS desludging will occur given the presence or exposure of variables describing household characteristics or beliefs, compared to the odds of the outcome occurring in the absence of that exposure.

We start with the well water testing results. Households that possess a water softener are 2.13 times as likely as households without a water softener to have tested their well water in the prior five years. An odds ratio of one would indicate no statistical difference between households with or without a water softener. The p-value relates to a two-tailed test of the hypothesis that the odds ratio is equal to one. Water softeners do not provide any treatment that improves the safety of drinking water, especially with respect to microbial contamination. Ultraviolet light treatment is normally effective against viruses, bacteria and protozoa, though microorganisms such as Cryptosporidium and Giardia can be resilient to some ultraviolet light treatment systems. Households with ultraviolet light treatment systems are almost 3.7 times more likely to have had their well water tested in the prior 5 years than households without ultraviolet

Figure 3.2: Households' priority for environmental policy issues

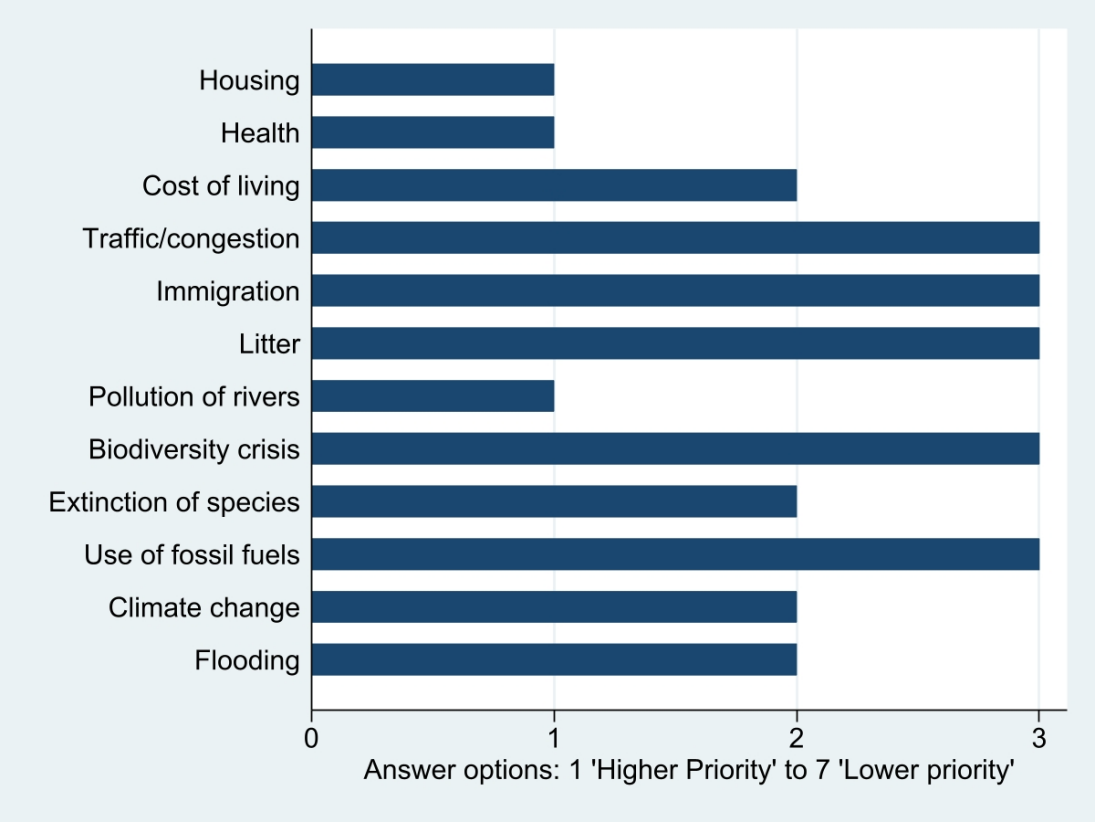


light treatment. What the analysis cannot say is whether the water testing preceded the installation of ultraviolet light treatment.

Households that use either a jug filter or a carbon filter are less likely to have their drinking water tested; only one- to two-thirds as likely, compared to households without such filter systems. The survey did not ask about the reasons why households use these types of water filtration. It could be to improve taste but possibly for prophylactic reasons also. Given the lower likelihood of testing of drinking water among water filter users, there is a risk that householders mistakenly assume that filter systems provide sufficient treatment to protect against potential health hazards.

The full estimated model, reported in the appendix, also includes several variables describing the socio-economic characteristics and attitudes of household members. We find no statistical correlation between the likelihood that the household tested their well water and attributes such as age, education level or income. Households with vulnerable occupants from a health perspective, or where the survey respondent felt that the health impacts of sub-standard drinking water might lead to moderate or severe health impacts are no more likely to test their drinking water than households without vulnerable occupants or households that believe that any health impacts would be mild. This suggests that the Health Belief Model, introduced in the previous section, is not relevant in this instance.

Figure 3.3: Households' priority for environmental and social policy – Median responses



On knowledge of environmental risks, we do not find evidence to suggest that households with awareness of such risks are not any more likely to have their water tested compared to those without any awareness of the pollution pathways and risks. With respect to the questions ranking household spending priorities, only in the instances where testing well water or spending on drinking water treatment systems among the top three priorities are households more likely to have their water tested.

The regression model results examining the likelihood of desludging the DWWTS are also reported in Table 3.13 (with full model results reported in an appendix). The first notable finding relates to several of the variables related to drinking water treatment. For instance, households with ultraviolet light treatment are 0.52 times as likely to desludge their DWWTS, as those without ultraviolet light treatment. Essentially, those that have invested in equipment to sterilise their drinking water supply are half as likely to desludge their DWWTS as those that have not invested. Households with sulphur removal systems are also less likely to desludge their DWWTS compared to those without sulphur removal, whereas those with carbon filters are almost twice as likely to desludge their DWWTS as those without carbon filters.

On knowledge of environmental risks, like well water testing, households with awareness of environmental pollution risks are not any more likely to have their DWWTS emptied compared to those without any awareness of the pathways and risks considered. With respect to household spending priorities,

Table 3.12: Households' spending priorities, %

Of 9 items listed below, % of households with item ranked among top-3 spending priorities	
Heating system maintenance	78
Desludge DWWTS	50*
Car service	47
Test well water	19**
Install treatment on well water	18
Family holiday	18
Home re-decoration	16
Upgrade kitchen or bathroom	12
Replace household items (e.g., TV, etc.)	13
N=1849	
* Of households indicating high priority for desludging DWWTS, 13% did not empty their DWWTS in past 5 years	
** Of households with a private well and indicating high priority for testing well water, 38% did not test their well water in past 3 years	

only households that list desludging DWWTS among the top three spending priorities are more likely to have their DWWTS desludged. However, as noted earlier, there was potentially socially desirability bias among respondents with respect to spending priorities.

As with the well water testing model, an assortment of variables describing the socio-economic characteristics and attitudes of household members were included in the regression model for DWWTS desludging. With just one exception, we find no statistical correlation between the likelihood that the household desludged their DWWTS and attributes such as education level or income. Households that included occupants above 70 years old are less than half as likely to desludge their DWWTS as households without occupants above 70. Households with either vulnerable occupants or those that felt the health impacts of sub-standard drinking water might lead to moderate or severe health impacts are no more likely to desludge their DWWTS than households without vulnerable occupants or households that believe that any health impacts would be mild.

Table 3.13: Logistic regression: odds ratios estimates for well water testing & DWWTS desludging

	Well water testing			DWWTS desludging		
	Odds ratio	Std. error	p-value*	Odds ratio	Std. error	p-value*
Drinking water treatment (ref: treatment not used/installed)						
Water softener	2.13	0.39	0.00	1.41	0.25	0.10
Iron & manganese removal	4.85	1.12	0.00	0.78	0.20	0.26
Ultraviolet light	3.68	0.99	0.01	0.52	0.15	0.00
Sulphur removal	1.13	0.46	0.78	0.53	0.22	0.04
Carbon filter	0.61	0.17	0.02	2.01	0.52	0.05
Jug filter	0.27	0.30	0.02	1.69	1.07	0.52
Awareness of environmental impacts associated with malfunctioning DWWTS (ref: not aware)						
Ponding in lawn - increasing health risk	0.71	0.17	0.08	0.91	0.19	0.64
Odours impacting garden use	0.63	0.16	0.02	0.99	0.22	0.97
Polluting groundwater - impacting well water	1.31	0.37	0.41	1.03	0.24	0.90
Polluting surface waters - impacting wildlife	0.90	0.24	0.66	0.98	0.23	0.93
“Unlikely to have any substantial impact”	0.66	0.21	0.11	0.68	0.18	0.07
Number of household occupants	1.05	0.08	0.50	1.17	0.08	0.03
Items ranked among top-3 spending priorities (ref: not ranked in top-3)						
Heating system maintenance	0.69	0.14	0.02	0.78	0.14	0.12
Home re-decoration	1.09	0.27	0.74	0.63	0.12	0.00
Desludge DWWTS	0.75	0.14	0.07	1.90	0.33	0.01
Family holiday	0.82	0.19	0.36	0.92	0.19	0.66
Test well water	1.97	0.41	0.02	0.63	0.13	0.00
Replace household items (e.g., TV, etc.)	1.03	0.30	0.92	0.95	0.21	0.82
Install treatment on well water	1.74	0.36	0.04	0.75	0.16	0.10
Upgrade kitchen or bathroom	0.62	0.19	0.04	0.60	0.13	0.00
Car service	1.06	0.21	0.79	0.71	0.12	0.01

* p-values relate to a two-tailed test of the hypothesis that the odds ratio is equal to 1.

4 CONCLUSION

4.1 Drinking water

Most households sourcing their drinking water from a private well do not regularly send their water for laboratory testing, as just 19 per cent of our sample had their water tested in the past three years. Conformity with EPA's guidelines that households test their well water supplies at least once a year for microbiological contamination and every three years for chemical contamination is therefore very low. Roughly one-third of respondents indicated that they didn't know how to have their drinking water tested or that testing it was too much hassle. The most common reason given for not having water tested is that there is no (perceived) problem with supplies. Excessive cost is not a prominent reason why households do not send samples for laboratory testing.

Two conclusions arise from the survey data. First is that there is a broad deficit among homeowners homeowners in relation to awareness of the importance of regular testing of drinking water from private supplies. The solution to this challenge will involve surrounds devising communications strategies on a recurring basis to alert households of the public health risks of not maintaining safe drinking water supplies. The second conclusion is that the provision of information around water testing services could be improved. Many households report that either they don't know how to have their drinking water tested, or that testing is too much hassle. Making it easier for households to choose a suitable testing laboratory is paramount. Maintaining an approved list of certified testing laboratories would lessen households' concerns about rogue operators. Full transparency on cost and upselling, where it exists, would also help allay households' concerns.

4.2 Domestic wastewater treatment systems (DWWTS) maintenance

Approximately one in five households with DWWTS have not had their tanks desludged in the past five years. The survey finds that up to 10 per cent of households had poorly functioning DWWTS that merited remedial action at some point in the past five years, with the issues or symptoms in question indicating long-term or ongoing problems (e.g., greyish slime growth in drains, excessive plant growth). Therefore, based on simple self-reporting by households, a substantial number of DWWTS require remedial works. Over 80 per cent of those reporting problems with their DWWTS have attempted in some way to resolve the issues, but the most prominent reason why people have not fixed a malfunctioning DWWTS is that they believe that the problem isn't that severe. These results suggest that maintenance levels, including desludging, of DWWTS, need to improve substantially.

The analysis finds that households with ultraviolet light treatment on their drinking water supply are substantially less likely to desludge their DWWTS. An inference from this finding is that some households in this category are relying on their investment in an ultraviolet light treatment system to counter any health risks associated with a potentially contaminated water source. It is worth noting that ultraviolet light treatment systems are not failsafe and require periodic maintenance, and should be considered as

a backup protection for a safe drinking water source. If a drinking water source is contaminated, the appropriate and immediate action should be to prevent further pollution. Proper maintenance of DWWTS, including regular desludging, is necessary to avert such outcomes. Localised groundwater pollution will migrate, possibly into the zone of influence of neighbouring drinking water supplies, potentially causing public health risks.

Cost or inability to pay barely registers as the reason why households do not desludge their DWWTS. The primary reason for not desludging is a belief that desludging is unnecessary. Among those that have desludged their tank previously, there is a high awareness of the benefit of a properly functioning DWWTS, while approximately one-quarter did so to protect groundwater and drinking water supplies. Consequently, there is no evidence to suggest that subsidy support for DWWTS desludging would yield substantial changes in maintenance practices. However, as desludging costs are typically €250–300, this would be a barrier for many households, even if they were behaviourally inclined to undertake regular DWWTS maintenance. The immediate policy challenge is to address a knowledge deficit among households on the necessity to more regularly desludge their DWWTS, as well as other measures to encourage regular maintenance.

A recurring communications strategy should be developed to alert households of the public health and environmental damage risks of not undertaking regular DWWTS maintenance. The Protect Our Water register of DWWTS is an ideal resource to communicate with relevant households. However, the underlying Protect Our Water database is not an accurate register of DWWTS owners. Numerous households contacted for the survey responded that they had disposed of the associated property and no longer had a DWWTS, with many indicating that the property had been sold several years before.

At present, the responsibility for DWWTS maintenance falls on households. That should continue to be the case, in line with the polluter pays principle, but there is also a public good case to reduce the organisational burden on households associated with sourcing a suitable contractor for DWWTS desludging. Administrative hassle was cited as a key barrier for not testing well water and is likely similarly applicable for DWWTS desludging. For example, in catchments where domestic wastewater discharges are attributed as the reason why water bodies are at risk of not achieving their water quality objectives, desludging services could be organised centrally but paid for by households. Contractors could be invited to provide a desludging service within specific townlands at a fixed price per DWWTS between specified dates. Such an approach would provide economies of scale, yielding competitive prices for households. Households would be offered the opportunity to avail of the service (i.e., opt in) and would contract with and pay the service provider directly, which could be easily facilitated via a bespoke online portal. The Local Authorities Water Programme (LAWPRO) could potentially be tasked with organising this service. Ideally the service would be integrated with the Protect Our Water system, which would provide better data to scientists involved in undertaking water body assessments.

While communications strategies, and reducing administrative burden, may encourage households to better maintain their DWWTS, greater enforcement activity is also critical. Inspections under the National Inspection Plan focus on locations where water quality is at risk from DWWTS discharges, but

the overall number of inspections is relatively low. At national scale, the equivalent annual inspection rate is approximately 1 in 460 properties, which should be substantially improved if enforcement is to have a deterrent effect. Additionally, if maintenance and desludging records were integrated into the Protect Our Water system, it would provide better data to assist enforcement activity.

4.3 Septic tank grant scheme

There are currently three separate grant schemes to support households with remediation costs of a malfunctioning DWWTS. General awareness of the grant schemes lies at 31 per cent of respondents, which given the nature of the grant and the relatively low number of recipients (e.g., approx. 200 in 2022) is comparatively strong. However, households' capacity to distinguish between grant schemes is relatively low, with most unaware of the schemes specifically for Prioritised Area for Action or High-Status Objective Catchment Areas. Even if a large majority of households expressed no awareness of the remediation grant scheme, there is almost universal willingness to consider applying for grant aid in the event remediation works are required.

Among households that had applied for a grant, their experience of the application process was generally positive. What was notable in the qualitative feedback from some respondents is their appreciation of council staff's guidance and support in navigating the remediation works, which for many households would be administratively and technically challenging. Where feedback is negative, it is generally related to grant ineligibility criteria. In several instances, respondents attest to efforts to improve their inadequate DWWTS yet being ineligible for grant support due to administrative criteria.[5] If DWWTS outflows represent a risk to water quality, consideration should be given to minimising the number of barriers facing households attempting to remediate their systems.

Demand for the grant scheme is relatively low, with approximately 200 grants processed in 2022. With the largely positive feedback from grant applicants, the reason for the low grant uptake levels must fall elsewhere. It is likely that most grant applications are subsequent to a DWWTS inspection; i.e., enforcement activity is driving remediation activity. Although councils may initiate inspections for other reasons, the current scale of the National Inspection Programme is unlikely to generate advisory notices substantially beyond the current scale of grant applications.[6]

References

Devitt, C., O'Neill, E., & Waldron, R. (2016). Drivers and barriers among householders to managing domestic wastewater treatment systems in the Republic of Ireland; implications for risk prevention

[5] The grant scheme rules have recently been changed to remove a pre-2013 registration requirement.

[6] In 2022 of the 1,143 DWWTS inspections under the National Inspection Plan approximately half failed, of which 30 per cent were not maintained and 23 per cent were not desludged (EPA, 2023), which means that the balance of those failing potentially fall within the criteria of the grant schemes.

behaviour. *Journal of Hydrology*, *535*, 534–546. (https://doi.org/10.1016/j.jhydrol.2016.02.015)

EPA. (2021). *National Inspection Plan for Domestic Waste Water Treatment Systems 2022–2026*. Environmental Protection Agency, Wexford. (https://www.epa.ie/publications/compliance--enforcement/waste-water/2022-2026-NIP---Final.pdf)

EPA. (2023). *Domestic Waste Water Treatment System (DWWTS) Inspections 2022*. Environmental Protection Agency, Wexford. (https://www.epa.ie/publications/compliance--enforcement/waste-water/2022-NIP-Report---Final.pdf)

Hynds, P. D., Misstear, B. D., & Gill, L. W. (2012). Development of a microbial contamination susceptibility model for private domestic groundwater sources. *Water Resources Research*, *48*(12). (https://doi.org/10.1029/2012WR012492)

Naughton, O., & Hynds, P. (2014). Public awareness, behaviours and attitudes towards domestic wastewater treatment systems in the Republic of Ireland. *Journal of Hydrology*, *518*, 108–119. (https://doi.org/10.1016/j.jhydrol.2013.08.049)

O'Boyle, S., Trodd, W., Bradley, C., Tierney, D., Wilkes, R., Longphuirt, S. N., ... Gurrie, M. (2019). *Water quality in Ireland 2013–2018*. Environmental Protection Agency, Wexford. (https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/Water-Quality-in-Ireland-2013-2018-(web).pdf)

RBMP. (2022). *Draft river basin management plan for ireland 2022-2027*. Department of Housing, Local Government and Heritage. (https://assets.gov.ie/199144/7f9320da-ff2e-4a7d-b238-2e179e3bd98a.pdf)

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, *2*(4), 328–335. (https://doi.org/10.1177/109019817400200403)

Withers, P. J., Jordan, P., May, L., Jarvie, H. P., & Deal, N. E. (2014). Do septic tank systems pose a hidden threat to water quality? *Frontiers in Ecology and the Environment*, *12*(2), 123–130. (https://doi.org/10.1890/130131)

Appendix I

Verbatim responses to the following question to household that applied for a septic tank remediation grant: "Could you describe in a few words your experience with the grant application process? We'd like to hear your views on whether you found the application process easy or not, the eligibility criteria, the application forms and paperwork, etc., both the positives and the negatives."

1980 as part of building house & laborious.
25 years ago but cannot recollect any problems
Application was submitted and I had no problem. My septic tank supplier was invaluable in helping me fill out application
Easy enough to apply, criteria too strict as previous owner may not have registered in time to receive grant.
Excellent and easy to apply for.
Found the whole system very very expensive. The grant didn't cover 85%. Not even close. So much expense even before we got to apply for grant. Was mostly un necessary and new system is ridiculously evasive percolation area takes up our whole garden. Ridiculous
Got grant for percolation but it wasn't enough money to cover job. It should be increased by at least 2 thousand. Some contactors wanted 12k. Had to wait a year to get the money as the budget was gone for 2022.
Grant application was easy and efficient
Grant application was straight forward. The inspector was very helpful and recommended several installers for the system installation. The new treatment sysyem was installed as per regulations by a recommended installer, inspected on completion and operating trouble-free to date. Overall a very positive experience.
Grant process was fine. It would have been helpful to have been advised that prior to engaging a contractor, I would be responsible for ensuring the contractor had an up to date tax clearance certificate. This has resulted in an inordinate delay with the grant being paid over which i am still waiting for.
Grant process was very good.
Very important,
co co should recommend a list of approved contractors for customer to choose from as i firmly believe that there are a lot of cowboys out there.
Had to replace old septic tank to Biocycle treatment one all paperwork completed by installers and eventually obtained grant with not too much issues
Happy
Have no complaints on any issue .
I don't recall any particular problems.

I found it very stressful as you had to get quotations from different well drillers and it took a long time to have it finalised

I found the whole process very easy. Once the information that was asked was give there was absolutely no issues. It was actually excellent

I installed a new bathroom in my home and extension which needed planning permission. I received retention in the normal way which necessitated the upgrade ie. replace existing septic tank . I installed a new septic tank and percolation area at a cost of €10,000. I applied for a grant to the local authority – Meath and provided all the necessary supporting documentation required. My application was refused and when I enquired why, I was told because I did not fail the septic tank test which was never carried out.

I missed out house was built in 2011 and tank wasn't registered till 4-5 years ago

I was served with an Improvement notice in 2005 by Meath County Council. I was given two weeks to rectify the problem. While the house and associated septic tank was built in 1969 by Meath County Council, they refused to entertain an application for grant assistance. The installation of a replacement treatment system c/w percolation system cost me in the region of €10,500.

Meath County Council refused to communicate with me with respect to a grant application. The outcome was obviously very negitive. I presume there was no grant available?

Initially efficient. Process following completion and settlement of award onerous, in efficient and effectively obstructive requiring perseverance to see through.

It's a while ago so don't remember details. It doesn't stick out as particularly painful so must have been okay.

It's okay but it covered very little of the total cost–about a third, I think. And a third of the grant was spent on water testing necessary to claim the grant.

It's a long time ago when we put in our system

It's very good but it's still only a septic tank which is very rudimentary treatment.

It leaves sewerage treatment in the hands of homeowners.

That's wrong.

What's really needed is for the Govt. and Irish Water to take on their responsibilities for providing proper sewerage treatment that complies with the Europen Directives.

Gweedore in Co. Donegal is currently being provided with an innovative sewerage treatment plant.

The experience there should be used to start an annual programme, ridding the Island of septic tanks.

My application for grant was declined as the septic tank was not registered in time. I acquired the house after the registration dead line date.

The septic tank is very old and needs to be replaced but I can not do so without grant funding.

No major problems

No problems
Ok
Positive experience once we clarified correct address. Money was released once works were inspected
Process is good. Approved quickly but waiting a bit too long for the grant.
Process very straight forward with LA
Quick and efficient
Simple
So long since I can't remember , but it was installed as per council instructions 50 years ago
Straight forward although tendering well digging contractors are very selective in how they present their estimate quotes so the estimates are very close to max value of the grant values. Upon completion of well digging, all the extras appear with the homeowner bearing a large extra cost above the grant value.
Straightforward
The application process took about 5 months which involved some paperwork, emails and calls to the Water Services Division. All officers were very helpful and advised me of what I needed to do. It was all relatively straightforward. As the water quality was so poor, I think this fulfilled the eligibility criteria. I had the water tested and was told the issues with it. Had it tested again after the treatment system was installed to show it was now fit to drink.
The application wasn't difficult and I can't say there were any negatives during the process :)
The grant application process is easy enough. Supporting documentation was provided by the Site Suitability Assessor and Works Contractor. Engagement with the County Council Inspector was very positive, helpful and supportive.
A voluntary inspection regime and increased level of grant aid is advised.
The person I dealt with from Meath County Council was very sympathetic to my situation and was very accessible when I asked for advice or guidance. His professional approach made the process a lot easier than it might have been.
The process is not very clear as on the application forms some of the questions asked were a bit confusing. Also no where on the form was I asked for my bank details or informed as to when I will be repaid for my work done as I had to pay for it when the work was carried out. Also I don't have contact details for someone to update me on my repayment date?
The process was very straight forward... following inspection we got [redacted] and his crew who did the job...
My son-in-law and my daughter landscaped the area and sowed a new lawn... now every thing is good & [redacted]'s people inspect it annually
Took a few weeks as water had to be sent to the lab twice but overall it was worth it

Very disappointing. My septic tank was very clearly not fit for purpose. It was inspected by the drain company and explained my septic tank was basically just a hole in the ground. When I asked for the council to inspect for grant purposes they refused citing it was not dangerous/unfit for purpose, yet it was less than 5m from a stream and as above stated not even a proper septic tank. Had to replace it fully at my own cost

Very simple and straightforward and cant remember as real issue, albeit it is over 10 years ago now

We are both old age pensioners'. We were delighted to meet, [redacted] of Meath Co Council. [redacted] immediately put our minds and explained what type would suit us best. We installed the recommended system and have not had a problem since. It has been examined and passed its test since instillation.

We were fearful in contacting the Council originally

We have just completed the work and have yet to apply for the grant. We are awaiting the receipt from the installer before we can proceed.

We installed an upgrade in 2010. This was provided by the local authority as part of CPO of part of our site for road development.

We needed a new system and wanted to be proactive befire pollution occurred. asked for assistance but even on appeal were refused as we had not been Inspected. Not a fair process at all.

straightforward

Appendix II

Table II.1: Logistic regression: odds ratios estimates for well water testing & DWWTS desludging

	Well water testing			DWWTS desludging		
	Odds ratio	Std. error	p-value*	Odds ratio	Std. error	p-value*
Drinking water treatment (ref: treatment not used/installed)						
Water softener	2.13	0.39	0.00	1.41	0.25	0.10
Iron & manganese removal	4.85	1.12	0.00	0.78	0.20	0.26
Ultraviolet light	3.68	0.99	0.01	0.52	0.15	0.00
pH balancing units	1.21	0.81	0.80	6.27	6.64	0.43
Sulphur removal	1.13	0.46	0.78	0.53	0.22	0.04
Reverse osmosis	0.74	0.20	0.19	0.84	0.23	0.48
Sediment filter	1.80	0.46	0.08	1.11	0.28	0.70
Carbon filter	0.61	0.17	0.02	2.01	0.52	0.05
Jug filter	0.27	0.30	0.02	1.69	1.07	0.52
Income (Ref: <€2,000/month)						
€2-3,000	1.45	0.50	0.38	1.33	0.37	0.38
€3-4,000	1.74	0.63	0.24	0.82	0.23	0.44
€4-5,000	1.12	0.44	0.79	1.08	0.33	0.81
€5-6,000	1.53	0.62	0.39	1.76	0.61	0.21
€6,000+	1.25	0.50	0.62	0.90	0.29	0.74
Prefer not say	1.28	0.50	0.57	1.26	0.39	0.51
Overall financial status (ref: “Struggling to make ends meet”)						
“Just about coping”	0.72	0.26	0.27	1.39	0.44	0.37
“Living comfortably”	0.78	0.30	0.46	1.08	0.35	0.81
Any household occupants with education level (ref: no occupants with education level)						
Primary	1.37	0.58	0.53	1.25	0.44	0.57
Secondary	1.02	0.27	0.95	1.48	0.35	0.17
Undergraduate	1.21	0.29	0.47	0.99	0.21	0.94
Post-graduate	1.30	0.33	0.37	1.20	0.27	0.46
Any household occupants in age category (ref: no household occupants in category)						
18–29	1.10	0.43	0.81	0.77	0.29	0.43
30–49	0.87	0.26	0.61	0.83	0.22	0.42
50–70	1.06	0.30	0.84	1.02	0.24	0.92
70+	0.88	0.28	0.68	0.46	0.12	0.00
Household members vulnerable from health perspective						
Yes	1.29	0.25	0.26	0.94	0.16	0.71

Table II.1: continued from previous page

Perception of health consequences of sub-standard drinking water or malfunctioning DDWTS (ref: Mild)						
Moderate	0.84	0.18	0.35	1.21	0.21	0.31
Severe	0.88	0.19	0.53	1.17	0.22	0.42
Perception of health consequences of sub-standard drinking water or malfunctioning DDWTS (ref: Mild)						
Moderate	0.84	0.18	0.35	1.21	0.21	0.31
Severe	0.88	0.19	0.53	1.17	0.22	0.42
Awareness of environmental impacts associated with malfunctioning DWWTS (ref: not aware)						
Ponding in lawn - increasing health risk	0.71	0.17	0.08	0.91	0.19	0.64
Odours impacting garden use	0.63	0.16	0.02	0.99	0.22	0.97
Polluting groundwater - impacting well water	1.31	0.37	0.41	1.03	0.24	0.90
Polluting surface waters - impacting wildlife & habitats	0.90	0.24	0.66	0.98	0.23	0.93
“Unlikely to have any substantial impact”	0.66	0.21	0.11	0.68	0.18	0.07
Number of household occupants	1.05	0.08	0.50	1.17	0.08	0.03
Items ranked among top-3 spending priorities (ref: not ranked in top-3)						
Heating system maintenance	0.69	0.14	0.02	0.78	0.14	0.12
Home re-decoration	1.09	0.27	0.74	0.63	0.12	0.00
Desludge DWWTS	0.75	0.14	0.07	1.90	0.33	0.01
Family holiday	0.82	0.19	0.36	0.92	0.19	0.66
Test well water	1.97	0.41	0.02	0.63	0.13	0.00
Replace household items (e.g., TV, etc.)	1.03	0.30	0.92	0.95	0.21	0.82
Install treatment on well water	1.74	0.36	0.04	0.75	0.16	0.10
Upgrade kitchen or bathroom	0.62	0.19	0.04	0.60	0.13	0.00
Car service	1.06	0.21	0.79	0.71	0.12	0.01

Appendix III

Drinking water & Wastewater treatment

The purpose of this survey is to collect your views and experiences related to drinking water and domes c wastewater treatment systems (septic tanks), as well as public health and the environment.

The Economic & Social Research Institute (ESRI) is undertaking this survey and the information collected will underpin their research related to Ireland's water resources. The ESRI's research is funded by Department of Housing, Local Government and Heritage (DHLGH).

The ESRI does not hold your contact information. The invitation to participate in this survey was issued by your local authority, as the registered owner of a domes c wastewater treatment system. Survey responses are anonymous plus any data you provide in the survey will only be used for research purposes by the ESRI and will not be shared with any other organisation. Read on the ESRI's website (https://www.esri.ie/privacy-policy)how ESRI manages and protects data collected for research purposes. Please contact John Curtis (john.curtis@esri.ie (mailto:john.curtis@esri.ie?subject=ASSAP%20farmer%20survey)) if you would like further information about the survey or research.

The survey should take about 6-10 minutes to complete. Thanks for your me and input.

There are 40 questions in this survey.

Your drinking water supply

From where do you get your drinking water supply?

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Private well
- ◯ Group water scheme (private or public)
- ◯ Public water supply
- ◯ Don’t know
- ◯ Other

How would you rate the quality or purity of your home drinking water as it comes from the tap? Would you say it is excellent, good, fair, or poor?

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Excellent
- ◯ Good
- ◯ Fair
- ◯ Poor

Which, if any, of the following treatments do you use for your drinking water supply? (i.e., treatments occur within your home or garage, etc.)

❗ Check all that apply
Please choose **all** that apply:

- [ ] Water softener
- [ ] Iron & manganese removal units
- [ ] Ultraviolet light
- [ ] Chemical disinfectant
- [ ] pH balancing units
- [ ] Sulphur removal system
- [ ] Reverse osmosis system
- [ ] Sediment filter
- [ ] Activated carbon filter
- [ ] None of the above
- [ ] Other:

The Environmental Protection Agency (EPA) recommend that you test your well water at least once a year for microbiological contamination (e.g., E. coli and Coliform Bacteria) and every three years for chemical contamination. Have you ever sent your well water for laboratory testing?

Only answer this question if the following conditions are met:
Answer was 'Private well' at question ' [Q2]' (From where do you get your drinking water supply?)

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Yes
- ◯ No

What was the reason that you submitted a drinking water sample for testing?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question ' [Q5]' (The Environmental Protection Agency (EPA) recommend that you test your well water at least once a year for microbiological contamination (e.g., E. coli and Coliform Bacteria) and every three years for chemical contamination. Have you ever sent your well water for laboratory testing?)

❗ Check all that apply
Please choose **all** that apply:

- ☐ Regularly test water
- ☐ Concern about odour or discoloration in water
- ☐ Concern about incidences of illness in family (e.g., stomach upset, gastroenteritis)
- ☐ Awareness of drinking water issues locally
- ☐ To enable application for grant from the council
- ☐ Other: [ ]

Was your drinking water tested within the past 3 years?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question ' [Q5]' (The Environmental Protection Agency (EPA) recommend that you test your well water at least once a year for microbiological contamination (e.g., E. coli and Coliform Bacteria) and every three years for chemical contamination. Have you ever sent your well water for laboratory testing?)

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Yes
- ◯ No, not to my knowledge

Was your most recent tested water sample within acceptable ranges for drinking water?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question ' [Q5]' (The Environmental Protection Agency (EPA) recommend that you test your well water at least once a year for microbiological contamination (e.g., E. coli and Coliform Bacteria) and every three years for chemical contamination. Have you ever sent your well water for laboratory testing?) *and* Answer was 'Yes' at question ' [Q6]' (Was your drinking water tested within the past 3 years?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Yes
◯ No
◯ Don't Know

Which type of remediation measures were advised to address your drinking water not being within safe drinking water standards?

Only answer this question if the following conditions are met:
Answer was 'No' at question ' [Q7]' (Was your most recent tested water sample within acceptable ranges for drinking water?)

❗ Check all that apply
Please choose **all** that apply:

☐ Disinfection of the water supply to tackle microbiological contamination
☐ Install treatment system for metals, chemical, pH, etc. outside the safe drinking water standards
☐ Other:

What are the primary reasons that you did not have your drinking water tested within the past 3 years?

Only answer this question if the following conditions are met:
Answer was 'No' at question ' [Q5]' (The Environmental Protection Agency (EPA) recommend that you test your well water at least once a year for microbiological contamination (e.g., E. coli and Coliform Bacteria) and every three years for chemical contamination. Have you ever sent your well water for laboratory testing?)

❗ Check all that apply
Please choose **all** that apply:

- [ ] There's no problem with the water
- [ ] Too much hassle to organise a test
- [ ] Don't know how to go about testing
- [ ] Investigated testing but was too expensive
- [ ] Other spending priorities
- [ ] Other:

Do you experience any of the following issues with your drinking water as it comes from the tap?

❗ Check all that apply
Please choose **all** that apply:

- [ ] Cloudy
- [ ] Sediment
- [ ] Brown or orange hue
- [ ] Chlorine smell
- [ ] Sulphur smell
- [ ] Oily film on top standing water
- [ ] Metallic or bitter tasting water
- [ ] Blue or green stains in showers/sinks
- [ ] Detergent smell
- [ ] Poor water pressure

What are the primary reasons that you have not had the problem fixed?

Only answer this question if the following conditions are met:
Answer was 'Detergent smell' *or* 'Blue or green stains in showers/sinks' *or* 'Metallic or bitter tasting water' *or* 'Oily film on top standing water' *or* 'Sulphur smell' *or* 'Chlorine smell' *or* 'Brown or orange hue' *or* 'Sediment' *or* 'Cloudy' at question ' [Q11]' (Do you experience any of the following issues with your drinking water as it comes from the tap?)

❗ Check all that apply
Please choose **all** that apply:

- [ ] Too much hassle to fix it
- [ ] Don’t know how to go about fixing it
- [ ] Investigated resolving it but was too expensive
- [ ] Other spending priorities
- [ ] It doesn't bother me too much
- [ ] Other:

Wastewater treatment at your home

We'd now like to ask you a few questions about wastewater treatment for your home

You registered a domestic wastewater treatment system with “Protect Our Water”, possibly as much as 10 years or so ago. What type of domestic wastewater treatment do you currently use?

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Septic tank

◯ Wastewater treatment plant (usually comprises treatment by aeration or biological media)

◯ Public sewer

◯ Don't Know

◯ Other

Where does your septic tank/wastewater treatment system discharge to?

Only answer this question if the following conditions are met:
Answer was 'Septic tank' *or* 'Wastewater treatment plant (usually comprises treatment by aeration or biological media)' at question ' [W1]' (You registered a domestic wastewater treatment system with “Protect Our Water”, possibly as much as 10 years or so ago. What type of domestic wastewater treatment do you currently use?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Percolation area

◯ Soak pit

◯ Surface water/drain

◯ Don't know

Sludge must be removed from all septic tanks and domestic wastewater treatment systems to ensure that they work properly. The recommended frequency of desludging depends on tank size and household occupancy.

How many times over the past 5 years have you had your tank emptied?

Only answer this question if the following conditions are met:
((W1.NAOK (/questionAdministration/view/surveyid/895519/gid/1170/qid/35823) == "A1") or (W1.NAOK (/questionAdministration/view/surveyid/895519/gid/1170/qid/35823) == "A2") or (W1.NAOK (/questionAdministration/view/surveyid/895519/gid/1170/qid/35823) == "A3") or (W1.NAOK (/questionAdministration/view/surveyid/895519/gid/1170/qid/35823) == "A4"))

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Not emptied
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ Don't Know

As well as emptying your tank, how many times over the past 5 years have you had your wastewater treatment plant serviced? (e.g., for filter replacement, etc

Only answer this question if the following conditions are met:
((W1.NAOK (/questionAdministration/view/surveyid/895519/gid/1170/qid/35823) == "A3") or (W1.NAOK (/questionAdministration/view/surveyid/895519/gid/1170/qid/35823) == "A4"))

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Not serviced
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ Don't Know

What are the primary reasons that you had your septic tank/wastewater treatment system emptied within the past 5 years?

Only answer this question if the following conditions are met:
Answer was '1' *or* '2' *or* '3' *or* '4' *or* '5' *or* 'Don't Know' at question ' [W2]' (Sludge must be removed from all septic tanks and domestic wastewater treatment systems to ensure that they work properly. The recommended frequency of desludging depends on tank size and household occupancy. How many times over the past 5 years have you had your tank emptied?)

❗ Check all that apply
Please choose **all** that apply:

- ☐ Understand that emptying it ensures it continues to function properly
- ☐ To protect groundwater and drinking water supplies
- ☐ Was advised to have it emptied regularly
- ☐ Other:

What are the primary reasons that you did not have your septic tank/wastewater treatment system emptied within the past 5 years?

Only answer this question if the following conditions are met:
Answer was 'Not emptied' at question ' [W2]' (Sludge must be removed from all septic tanks and domestic wastewater treatment systems to ensure that they work properly. The recommended frequency of desludging depends on tank size and household occupancy. How many times over the past 5 years have you had your tank emptied?)

❗ Check all that apply
Please choose **all** that apply:

- ☐ Emptying isn't necessary, it’s working fine
- ☐ Didn’t know I had to empty it
- ☐ It’s not a priority for me
- ☐ Don’t want to spend my money on that
- ☐ Other:

Have you experienced any of the following issues with your wastewater system over the past five years?

Please choose the appropriate response for each item:

	Never	On occasion	On regular basis
Slow draining toilets, sinks or drains	◯	◯	◯
The smell of sewage in your garden	◯	◯	◯
Overflow of wastewater into your garden	◯	◯	◯
Water regularly lying in the garden near wastewater system	◯	◯	◯
Greyish slime growth in nearby drains	◯	◯	◯
Excessive plant growth near wastewater system	◯	◯	◯

Given that you've had some issues with your septic tank/wastewater system have you acted to solve the problems?

Only answer this question if the following conditions are met:
-------- Scenario 1 --------
Answer was 'On occasion' *or* 'On regular basis' at question ' [W6]' (Have you experienced any of the following issues with your wastewater system over the past five years? (Slow draining toilets, sinks or drains))
-------- or Scenario 2 --------
Answer was 'On regular basis' *or* 'On occasion' at question ' [W6]' (Have you experienced any of the following issues with your wastewater system over the past five years? (The smell of sewage in your garden))
-------- or Scenario 3 --------
Answer was 'On regular basis' *or* 'On occasion' at question ' [W6]' (Have you experienced any of the following issues with your wastewater system over the past five years? (Overflow of wastewater into your garden))
-------- or Scenario 4 --------
Answer was 'On occasion' *or* 'On regular basis' at question ' [W6]' (Have you experienced any of the following issues with your wastewater system over the past five years? (Water regularly lying in the garden near wastewater system))
-------- or Scenario 5 --------
Answer was 'On occasion' *or* 'On regular basis' at question ' [W6]' (Have you experienced any of the following issues with your wastewater system over the past five years? (Greyish slime growth in nearby drains))
-------- or Scenario 6 --------
Answer was 'On occasion' *or* 'On regular basis' at question ' [W6]' (Have you experienced any of the following issues with your wastewater system over the past five years? (Excessive plant growth near wastewater system))

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Yes
◯ No

What are the primary reasons why you haven't resolved the issues with your septic tank/wastewater treatment system?

Only answer this question if the following conditions are met:
Answer was 'No' at question ' [W7]' (Given that you've had some issues with your septic tank/wastewater system have you acted to solve the problems?)

❗ Check all that apply
Please choose **all** that apply:

- ☐ The problem isn't that severe
- ☐ Too much hassle to organise getting it fixed
- ☐ Don't know what to do
- ☐ Investigated fixing problem but it but was too expensive
- ☐ Other spending priorities
- ☐ Other: _____

Septic tank inspections & remediation grants

In this section we'd like to ask you a few questions about your septic tank/wastewater treatment system

Over the past five years has your wastewater treatment system been inspected by your local authority?

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Yes
- ◯ No
- ◯ Don't Know

Following the local authority inspection what were the remedial measures, if any, recommended for your wastewater treatment system to bring it back to proper working order?

Only answer this question if the following conditions are met:
(S1 (/questionAdministration/view/surveyid/895519/gid/1171/qid/35839) == "A1")

❗ Check all that apply
Please choose **all** that apply:

- [ ] Passed inspection, no remediation actions
- [ ] Cease existing discharge of effluent (e.g., to surface waters, onto the surface)
- [ ] Repair mechanical/structural parts
- [ ] Desludge the tank or treatment system
- [ ] Divert roof water or yard water to separate soakaway
- [ ] Other:

What is the status of the remedial actions recommended by the local authority inspector?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question ' [S1]' (Over the past five years has your wastewater treatment system been inspected by your local authority?) *and* Answer was NOT 'Passed inspection, no remediation actions' at question ' [S2]' (Following the local authority inspection what were the remedial measures, if any, recommended for your wastewater treatment system to bring it back to proper working order?)

Please choose the appropriate response for each item:

	Completed	Not yet completed
{S2_SQ002.shown}	◯	◯
{S2_SQ003.shown}	◯	◯
{S2_SQ004.shown}	◯	◯
{S2_SQ005.shown}	◯	◯
{S2_other}	◯	◯

What is the primary reason that you haven't been able to implement the remedial actions on your wastewater treatment system?

Only answer this question if the following conditions are met: (S3_SQ001 (/questionAdministration/view/surveyid/895519/gid/1171/qid/35841) == "A2") OR (S3_SQ003 (/questionAdministration/view/surveyid/895519/gid/1171/qid/35841) == "A2") OR (S3_SQ002 (/questionAdministration/view/surveyid/895519/gid/1171/qid/35841) == "A2")

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ I've yet to find a suitable contractor
- ◯ It's not a priority for me
- ◯ I don't believe the recommendations are necessary
- ◯ I can't afford to have the work completed
- ◯ Other [ ]

At present, where eligible, grant aid is available up to 85% of the approved cost of the septic tank/wastewater treatment remediation works subject to a maximum of €5,000. In the event your wastewater treatment system needed remediation works, would you seek to avail of the government grant knowing that you would still have to pay a share of the costs?

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ Yes
- ◯ No
- ◯ Possibly

Septic tank/wastewater treatment system

Grant Scheme

In this section we ask whether you've tried to access grant funding for septic tank remedial works and your experience applying for the grant

Prior to today were you aware of a grant scheme administered by your local authority to assist in the remediation, repair or upgrade of septic tank/wastewater treatment systems?

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Yes
◯ No

Septic tank/wastewater treatment grants are available under a number of schemes. Which, if any, of the following grant schemes are you aware?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question ' [G0]' (Prior to today were you aware of a grant scheme administered by your local authority to assist in the remediation, repair or upgrade of septic tank/wastewater treatment systems?)

❗ Check all that apply
Please choose **all** that apply:

☐ Grant available following issue of an advisory notice subsequent to an inspection by local authority
☐ Grant available due being situated in a Prioritised Area for Action within the River Basin Management Plan
☐ Grant available due being situated in a High Status Objective Catchment Area within River Basin Management Plan
☐ Not sure which
☐ None of the above

Have you ever applied for a septic tank/treatment system grant?

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Yes
◯ No
◯ Don't Know

What was the outcome of your grant application?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question ' [G1]' (Have you ever applied for a septic tank/treatment system grant?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Received grant funding
◯ Ineligible for funding (e.g., grant doesn’t cover my location/circumstance)
◯ Grant declined (e.g., due to inadequate supporting documentation)
◯ Still awaiting a decision
◯ Other

Could you describe in a few words your experience with the grant application process? We'd like to hear your views on whether you found the application process easy or not, the eligibility criteria, the application forms and paperwork, etc., both the positives and the negatives.

Only answer this question if the following conditions are met:
((G1.NAOK (/questionAdministration/view/surveyid/895519/gid/1172/qid/35843) == "A1"))

Please write your answer here:

Health & Environment

Everybody is vulnerable to contaminated water, particularly children, older people, and the immunosuppressed. Are there any individuals in your household that from a health perspective might be especially vulnerable in the event that your water supply is below safe drinking water standards or your septic tank/wastewater treatment system is malfunctioning?

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Yes
◯ No

How severe would you think the potential health consequences might be if you or any of your family became ill due to either sub-standard drinking water or a malfunctioning septic tank/wastewater treatment system?

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Mild – e.g., minor discomfort, some slight gastrointestinal issues

◯ Moderate – e.g., substantial discomfort, gastrointestinal issues, possibly needing to see a GP or prescription medicines.

◯ Severe - e.g., major discomfort and pain, severe gastrointestinal issues, unable to maintain normal daily routines (i.e., work, school, etc.), medical support necessary

Are you aware of the following environmental impacts associated with a malfunctioning septic tank/wastewater treatment system?

❗ Check all that apply
Please choose **all** that apply:

☐ Ponding in lawn potentially exposing people (e.g., children) to sewage and subsequent risk of illness

☐ Odours from malfunctioning waste-water treatment/septic tank system impacting on normal use of your own and neighbours' gardens

☐ Polluting groundwater (sub-surface) water quality, potentially impacting on drinking water supplies sourced from private wells

☐ Affecting water quality in streams/rivers/lakes, potentially damaging wildlife (fish, insects, etc) and their habitats or contributing to algal blooms, etc.

☐ Unlikely to have any substantial impact

Household

Finally, we'd like to ask a few general questions about your views and family to enable us to categorise and analyse the survey responses.

Below is a list of topics that the government has to address. In your opinion rank each topic in terms of how much priority the government should devote to each?

Please choose the appropriate response for each item:

	1: Higher priority	2	3	4	5	6	7: Lower priority
Housing crisis	◯	◯	◯	◯	◯	◯	◯
Air pollution	◯	◯	◯	◯	◯	◯	◯
Pollution of rivers	◯	◯	◯	◯	◯	◯	◯
Health services	◯	◯	◯	◯	◯	◯	◯
Flooding	◯	◯	◯	◯	◯	◯	◯
Use of fossil fuels	◯	◯	◯	◯	◯	◯	◯
Litter	◯	◯	◯	◯	◯	◯	◯
Cost of living	◯	◯	◯	◯	◯	◯	◯
Traffic/congestion	◯	◯	◯	◯	◯	◯	◯
Climate change	◯	◯	◯	◯	◯	◯	◯
Extinction of species	◯	◯	◯	◯	◯	◯	◯
Immigration	◯	◯	◯	◯	◯	◯	◯
Biodiversity crisis	◯	◯	◯	◯	◯	◯	◯

Rank the order in which you'd spend your money on the following potential household expenditures from highest priority to lowest priority

❗ All your answers must be different and you must rank in order.

❗ Please select at most 9 answers

Please number each box in order of preference from 1 to 9

- [ ] Maintenance of your heating system to improve performance
- [ ] Re-decoration of your home (e.g., painting/wall paper, flooring, etc.)
- [ ] Empty/desludge septic tank/wastewater treatment tank
- [ ] Go on family holiday away
- [ ] Test your well water
- [ ] Replace older household items (e.g. furniture, TV, etc.)
- [ ] Install treatment on your well water
- [ ] Upgrade kitchen or bathroom
- [ ] Service your car

How many people live in your home (i.e., sleep there most nights)?

❗ Choose one of the following answers
Please choose **only one** of the following:

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6+

Among the adults within the household that are primary decision makers (i.e., bill-payers), what is the highest level of education or training successfully completed?

❗ Check all that apply
Please choose **all** that apply:

- ☐ Primary School
- ☐ Secondary school
- ☐ Undergraduate degree / Diploma / Apprenticeship
- ☐ Post-graduate degree

Among the adults living within your household that are primary decision makers (i.e., bill-payers), in what age categories are they?

Check all that apply
Please choose **all** that apply:

- [ ] 18-29
- [ ] 30-49
- [ ] 50-70
- [ ] 70+

What is the approximate level of the take-home pay within your household?

We'd like to assure you once again that all information you give is entirely confidential.

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Less than €1999 per month
- ◯ €2000 - €2999 per month
- ◯ €3000 - €3999 per month
- ◯ €4000 - €4999 per month
- ◯ €5000 - €5999 per month
- ◯ Greater than or equal to €6000 per month
- ◯ Prefer not to say

This means income, after tax and PRSI, of ALL MEMBERS of the household including wages, social welfare, child benefit, rents, interest, pensions etc.

Finally, in terms of your household income, how would you rate your financial status?

Choose one of the following answers
Please choose **only one** of the following:

- ◯ Struggling to make ends meet
- ◯ Just about coping
- ◯ Living comfortably

Your response has been saved. Thanks for participating. Data collected in the survey will be held by ESRI and will be used for research purposes only. For any queries you can contact John Curtis (john.curtis@esri.ie)

Submit your survey.
Thank you for completing this survey.

Whitaker Square,
Sir John Rogerson's Quay,
Dublin 2
Telephone **+353 1 863 2000**
Email **admin@esri.ie**
Web **www.esri.ie**
Twitter **@ESRIDublin**

AN INSTITIÚID UM THAIGHDE EACNAMAÍOCHTA AGUS SÓISIALTA
ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE