

EPA RESOURCE KIT: BRIDGING THE GAP BETWEEN SCIENCE AND POLICY

Relay Risk: Examining the
Communication of Environmental Risk
through a Case Study of Domestic
Wastewater Treatment Systems in the
Republic of Ireland

EPA RESEARCH Report No. 167

Authors

Eoin O'Neill, Catherine Devitt,
Richard Waldron and Craig Bullock,
University College Dublin



ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

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- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiological Protection
- Office of Communications and Corporate Services

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by

UCD Planning and Environmental Policy
University College Dublin

Authors:

Eoin O’Neill, Catherine Devitt, Richard Waldron and Craig Bullock

ENVIRONMENTAL PROTECTION AGENCY
An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland

Telephone: +353 53 9160600 Fax: +353 53 9160699
Email: info@epa.ie Website: www.epa.ie

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Project Partners

Craig Bullock

UCD Planning and Environmental Policy
University College Dublin
Belfield
Dublin 4
Ireland
Email: craig.bullock@ucd.ie

Catherine Devitt

UCD Planning and Environmental Policy
University College Dublin
Belfield
Dublin 4
Ireland
Email: catherine.devitt@ucd.ie

Eoin O'Neill

UCD Planning and Environmental Policy
University College Dublin
Belfield
Dublin 4
Ireland
Email: eoin.oneill@ucd.ie

Richard Waldron

UCD Planning and Environmental Policy
University College Dublin
Belfield
Dublin 4
Ireland
Email: richard.waldron@ucd.ie

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Executive Summary

Understanding the public's perception of risk is central to the effective communication and regulation of risk. However, there is often considerable divergence between expert and lay perceptions of risk, which has proved a challenge in devising effective risk communication strategies (Slovic, 1987; Black and Baldwin, 2012). Risk communication provides a means of addressing this divergence, while helping to ensure that policy objectives are achieved, and, when carried out effectively, it can lead to the smoother implementation of risk regulation. This comprehensive report outlines the findings of the small-scale study "Relay Risk: Examining the Communication of Environmental Risk through a Case Study of Domestic Wastewater Treatment Systems in the Republic of Ireland", which set out to identify how to communicate risk-based environmental regulation effectively.

Chapter 1 of this synthesis report provides an introduction to the concept of risk, identifies how risk can be perceived differently by people depending on various factors, including how it is communicated, and provides background context to the study. Chapter 2 highlights how risk perception is influenced by demographic, cultural and societal factors, and by the perceived nature of a particular hazard. Consequentially, the risk management behaviour of individuals is influenced by such factors as knowledge, previous exposure, perceptions about the severity and likelihood of the risk, worry or concern about the risk, and efficacy and control over the risk and risk mitigation action. Based on a review of the literature and on an assessment of national and international campaigns on risk management and risk communication, Chapter 3 presents those features necessary to achieve effective risk communication. These include public participation and engagement, partnering with credible organisations, understanding the audience, engaging with the media, monitoring and evaluating progress, and sustaining trust and credibility.

To understand what is required for effective risk communication, this study took domestic wastewater treatment systems (DWWTSs) in the Republic of Ireland as a case study, to establish the perceptions of householders towards the risks associated with DWWTSs and

related risk management. Four focus groups and two semi-structured interviews were conducted, with a combined total of 28 householders. Sixteen stakeholders were also consulted, to identify what they understand as necessary for effective risk communication. In brief, the case study results identified barriers and motivations to DWWTS maintenance among Irish householders, householder beliefs concerning DWWTS maintenance, householder preferences in terms of communication, and the variables involved in influencing their trust in regulation, authorities and communicators. Consultation with stakeholders ascertained what they believe is required to communicate risk successfully, the drivers to risk awareness and risk management, the beliefs and barriers among householders towards risk awareness and risk management, and the perceptions and reaction of householders towards public engagement and regulatory enforcement. Results show that the capacity for householders to, first, recognise and be alerted to the risks of a poorly operating DWWTS, and, second, to manage these risks, is undermined and limited by a range of factors, which include:

- householders' beliefs about what constitutes a functioning DWWTS and their approach to maintenance (i.e. a problem-oriented approach aimed at removing an inconvenience);
- a reliance on sensory perception to detect a problem (i.e. a reliance on environmental cues such as ponding and odour to suggest a malfunctioning system);
- risk perception and the perceived severity and likelihood of the risk occurring; and
- gaps in knowledge and information.

Barriers such as the perceived and real financial costs of DWWTS maintenance and upgrading further limit the potential for risk acknowledgement and reduce the capacity to carry out risk-management practices. Results point to the need for a comprehensive engagement strategy that:

- informs risk perception, to enable an understanding of DWWTSs from a risk, rather than a problem, perspective, and to reduce a reliance on environmental cues to indicate a malfunctioning DWWTS;

- builds regulatory and best-practice compliance, to encourage the adoption of risk management behaviours in line with regulatory requirements, and regardless of the threat of enforcement;
- enables public trust, to create a favourable environment for risk communication and compliance and to facilitate public support towards other areas of risk-based regulation.

These objectives should seek to draw on the guiding principles for effective risk communication, as identified in Chapter 2. Results from the case study contribute to

a baseline understanding of householder perceptions and build on existing work carried out by Naughton and Hynds (2013). The findings from this project have been applied to the development of a set of guidelines (presented separately) on how to effectively communicate risk. The authors envisage that, although drawing on the example of DWWTS risk perception and risk management, these guidelines will be transferable to other areas of risk-based regulation, particularly policy contexts that require public involvement to achieve regulatory objectives.

1 Introduction

Increasingly, society is being faced with a variety of risks across a range of social, economic, financial and environmental sectors. Broadly, risk is defined as “a numerical measure of the expected harm or loss associated with an adverse event” (Adams, 1995: 8) or as a “probabilistic event of various magnitudes that can be augmented or mitigated by various actions or circumstances” (Palenchar and Heath, 2007: 120). Although definitions of risk vary widely, risk calculability, probability and consequences are central to any risk definition. However, there is often considerable divergence between expert and non-expert or lay perceptions of risk. Risk perception draws on people’s evaluations and interpretations of their exposure or potential exposure to hazards or threats and the resulting consequences (Slovic, 2000; Aven and Renn, 2010). According to Slovic (1987) and Slovic and Peters (2006), expert definitions and assessments of risk draw on the quantitative aspects of risk, whereas lay definitions of risk are influenced by emotions, experiences and social or value-laden determinants concerning the likelihood of a risk occurring.

Divergence in risk perception can create challenges for the increasing number of sectors that employ a risk-based approach to regulation and policy implementation. The manner in which risks are communicated can assist in addressing the variance in risk perception, and important factors for communication include the relationship between communicators and the target audience; the extent to which people trust and give credence to risk managers; the nature of public involvement and engagement in decision-making; and how people respond emotionally to risk. The process of risk communication can be defined as:

an interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management

Covello and Sandman, 2001

Overall, risk communication has become a crucial element in the implementation of risk-based regulatory approaches and can lead to more successful risk-management behaviours, better decision-making among the public and the smoother implementation of risk-management strategies (Mythen *et al.*, 2000; Muro *et al.*, 2012). For risk communication to be effective, it requires co-ordination, including an understanding of the communication needs and preferences of the target audience; public engagement and participation; trust in the communicators; and transparency in decision-making processes (Covello and Sandman, 2001; Covello, 2003).

This synthesis report summarises the social science project “Relay Risk: Examining the Communications of Environmental Risk through a Case Study of Domestic Wastewater Treatment Systems in the Republic of Ireland” (hereafter “Relay Risk”), the objective of which was to explore and identify how to effectively communicate risk-based environmental regulation, by using a case study of domestic wastewater treatment systems (DWWTSs) in the Republic of Ireland. This report is aimed at regulators, national and local authorities and policymakers, particularly those involved in environmental risk communication, management and assessment. An overview of the theoretical models applicable to understanding approaches to risk, and literature explaining risk perception and risk behaviour, is presented. An introduction to the case study of DWWTSs in Ireland provides a useful backdrop to results on qualitative research carried out to explore householder and stakeholder perceptions towards DWWTSs and risk communication. The synthesis report concludes with a discussion of the case study results, contextualising the results within the theoretical literature on risk perception.

2 Communicating Risk: Risk Perception and Risk Behaviour

The “Risk Perception Model” contends that myriad factors affect how individuals perceive risks, influencing emotional, cognitive and behavioural responses (Fischhoff *et al.*, 1993; Bennett, 1998; Covello *et al.*, 2001). Lower perceived risks are those that are voluntary, domestic, random, familiar and of natural origin. Higher perceived risks are involuntary, exotic and catastrophic in nature, direct, unfamiliar and of human or industrial origin (Sandman, 1987; Aakko, 2004). Risk perceptions are also heightened when the source of the risk is considered untrustworthy or where the impacts of the risk are considered to be unfair (Sandman, 1987). Broadly:

- risks that are poorly understood, are irreversible or have high levels of uncertainty with longer term or delayed effects are considered more objectionable;
- risks that produce feelings of “dread” but demonstrate low probability produce stronger feelings of aversion than common risks with high probabilities;
- risks that have the potential to harm individuals personally or to produce identifiable victims are considered more dangerous than abstract risks or risks that produce statistical victims (Covello and Sandman, 2001).

A number of other theoretical models also explain lay approaches to risk (Table 2.1).

How a risk is perceived is often crucial in determining whether or not an individual engages in risk-management behaviour; however, risk perception can exist alongside a range of other behavioural predictors. The perception of a particular risk’s severity and the likelihood of a risk occurring are commonly drawn upon to explain risk-management behaviour (Table 2.2). Other important behavioural predictors include perceived control over the risk; a sense of efficacy and confidence in risk management; worry; a weighing up of the benefits of risk management versus the perceived costs of risky behaviour; and optimistic bias (the belief that a negative event is more likely to happen to someone else than to oneself) (Klein and Helweg-Larsen, 2002). Knowledge alone is not always a key predictor of risk-management or risk-prevention behaviour (Table 2.2). A number of other behavioural frameworks, particularly relating to explaining environmental behaviour, help to explain how attitudes, values and norms influence behaviour. For example, Blake (1999) uses the notion of a Value Action Gap to explain instances in which the values held by an individual do not always correlate with their behaviour. Three barriers identified by Blake (1999) to explain this gap, which range from the individual level to

Table 2.1. Theoretical approaches to understanding lay responses to risk

Risk model/objective	Outcome for risk perception
Mental Noise Model: examines how non-experts process risk information under stress conditions and how changes in the way information is provided can affect communication (Glik, 2007)	When individuals perceive direct threats, they experience a wide range of emotional responses, or mental noise, which impairs their ability to process information. Impaired risk perceptions may therefore impede risk communication, as people may misconstrue scientific or probabilistic information (Baron <i>et al.</i> , 2000; Neuwirth <i>et al.</i> , 2000)
Negative Dominance Model: examines the processing of negative and positive information in high-concern situations, where people put greater value on losses (negative outcomes) than on gains (positive outcomes)	Negative messages (e.g. <i>no, never, not or nothing</i>) tend to have a greater impact than positive messages. However, the use of unnecessary negative messages in dialogue with citizens in high-concern situation can damage trust and credibility between an institution and the public and can potentially cloud out positive or solution-oriented information (Covello <i>et al.</i> , 2001).
Trust Determination Model: emphasises the importance of ongoing education and consensus building around risks. Trust must be established, and maintained, over time and is the result of ongoing actions	Risk perception and institutional trust can be diminished as result of disagreement between expert sources, poor co-ordination among expert groups, ineffective public involvement in decision-making and poor information distribution. Furthermore, when people are distressed, they often become distrustful and are less accepting of the validity of risk communications (Peters <i>et al.</i> , 1997; Renn, 2006)

Table 2.2. Predictors of risk behaviour from three risk topic areas

Risk topic	Predictors of risk behaviour ^a	References ^a
Tick control/Lyme disease prevention	Perceived severity of the risk	Shadick <i>et al.</i> (1997); Brewer <i>et al.</i> (2004); Brewer <i>et al.</i> (2007); Beaujean <i>et al.</i> (2013); Aenishaenslin <i>et al.</i> (2015)
	Perceived likelihood of the risk occurring	
	Perception of the benefits of risk avoidance versus the cost of risk management action	
	Belief and confidence in the effectiveness of risk-taking action in preventing the risk	
	Self-efficacy and confidence in risk recognition (i.e. ability to recognise the signs)	
	Level of knowledge and levels of worry	
	Knowing persons who got ill after a tick-bite	
Cancer prevention and screening behaviour	History of the risk and levels of exposure	Katapodi <i>et al.</i> (2004); Bränström <i>et al.</i> (2005); Bowen <i>et al.</i> (2004); Hay <i>et al.</i> (2006); Denny-Smith <i>et al.</i> (2006); Kim <i>et al.</i> (2008); Kasparian <i>et al.</i> (2009); Fort <i>et al.</i> (2011)
	Level of knowledge	
	Perceived risk and risk severity	
	Worry and anxiety levels	
	Optimistic bias	
Radon testing	Perceived benefits of risk management	Weinstein <i>et al.</i> (1988); Klein and Helweg-Larsen (2002); Brewer <i>et al.</i> (2007); Clifford <i>et al.</i> (2012)
	Risk likelihood, susceptibility and severity	
	Perceived control over the risk and risk mitigation behaviour	
	Perceived susceptibility and optimistic bias	

^aOne or more of these behavioural predictors were observed in each of the associated references listed.

social/institutional barriers, are individuality (e.g. a lack of interest in carrying out the action); responsibility (e.g. a lack of trust or a lack of self-efficacy); and practicality (e.g. a lack of time, money or resources). Another example – the Health Belief Model – may explain why some people fail to participate in risk-prevention behaviours, outlining the influence of perceived susceptibility of a risk occurring, the perceived severity or seriousness of the risk and the perceived benefits and barriers to undertaking risk-prevention behaviours. Cues to action, or stimuli, are important in triggering the motivation to carry out risk prevention (Rosenstock, 1974; Straub and Leahy, 2014).

Elsewhere, reporting on how to foster environmental behaviour, Vugt *et al.* (2014) explain how the likelihood

of undertaking environmental behaviour is influenced by a prioritisation of personal interests over collective ones; a preference for immediate rewards over long-term, delayed outcomes; a prioritisation of value over absolute status; imitating the behaviour of others; and an over-reliance on sensory mechanisms to recognise a problem. Consequently, attempts to promote desirable environmental behaviour should seek to use the sensory mechanisms that individuals rely on when responding to threats [Vugt *et al.* (2014)]. Furthermore, understanding the influence of social and cultural norms is also important – evidence suggests that individuals are more likely to engage in information that fits with their particular belief and value system and with those of their peers (Kollmuss and Agyeman, 2002).

3 Achieving Effective Risk Communication

As theories regarding risk perception have evolved from psychometric analyses to more social constructionist approaches, so have theories surrounding risk communication (Fischhoff et al., 1993). Traditional conceptions of risk communication were formulated around an “information deficit” model, whereby information was exchanged from expert sources (i.e. scientists, academics, policymakers) to the non-expert public, and risk was conveyed in the language of probabilities. Individuals’ failure to alter their behaviour in response to an (expert-defined) risk was attributed to a lack of information, and, with better information, it was suggested, the public’s understanding of risk would improve and align with expert judgements (Arnoldi, 2009; Nisbet, 2010). Such approaches to public engagement are often typified by one-way, expert-led communication, overly technical language, informational intensity and dissemination through traditional print media (Richardson et al., 2003; Nisbet and Scheufele, 2009). These approaches often failed, as non-expert groups are confounded by technical and complex environmental monitoring, and the “disconnect” between scientific communicators and the public can leave individuals feeling isolated from decision-making (Muro et al., 2012).

Risk communication can be viewed as a means by which to make a partner of the public in a mutual attempt to manage risks (Mythen et al., 2000), and, consequently, risk communication is not an end in itself, but an enabling agent to facilitate the continual evolving relationship between risk managers and the public (Mythen et al., 2000). When exercised effectively, risk communication can lead to better public decision-making, empowerment and a smoother implementation of risk-management strategies. Based on a review of the theoretical literature and an identification of critical success factors from a number of risk-based and public engagement campaigns,¹ Table 3.1 presents the principles for effective risk communication, their rationale and the communication processes involved.

¹ These included the Digital Switchover campaign in Ireland; road safety campaigns in a number of jurisdictions; the 2001 foot and mouth disease crisis in the UK and Ireland; farm safety awareness campaigns; the response of the UK government to the 2007 floods; and the Netherlands’ authorities’ response to the H1N1 influenza pandemic of 2009.

Table 3.1. Principles for effective risk communication, their rationale and communication processes

Principle	Rationale	Process
Public participation and engagement	Forms an integral component of effective risk communication, particularly where risk information is disclosed in a timely, transparent and clear manner, and where uncertainty in risk estimates is acknowledged (Covello, 2003) Facilitates interaction, conflict resolution and consensus building between different interest groups Helps to promote democratisation within environmental decision-making and provides an educational function by enabling and empowering citizens to become involved in risk governance	Risk communication must be conceived of as a two-way dialogue that seeks to understand different perceptions of risk among the public When helping the audience to understand the nature of the risk and role of risk management, it is necessary to communicate the nature and severity of the risk, and its relevance to the audience and, also, practical recommendations on how to mitigate and manage the risk Clear, non-technical language that is appropriate to the target audience should be used, and risk data should be personalised through the use of stories and examples. Information should demonstrate that the audience are capable of carrying out risk-mitigation behaviour
Partnering with credible organisations	Can provide access to the target audience, and provide a trusted mechanism for education, engagement and the provision of information (Groffman et al., 2010)	All inter- and intra-organisational communications should be co-ordinated as an initial step among risk stakeholders – linking in with other trustworthy sources, including scientists, citizen advisory groups, trusted local officials and national/local opinion leaders – and resources should be made available to build partnerships with other organisations (Covello, 2003)

Principle	Rationale	Process
Understanding the audience	<p>Can help in segmenting the audience into different audience profiles, identifying what works best in terms of communicating the message; this allows for the tailoring of risk messages and communication approaches to meet audience needs</p> <p>Can help when establishing trust, credibility and a solution-orientated approach to risk management</p>	<p>Use interviews, focus groups and/or surveys to identify who is at risk (i.e. who is the target audience), how are they affected and how they respond to the risk topic and risk management. Identify challenges and opportunities to risk communication and risk management. Determine the communication needs and preferences of the target audience and assess how these fit with the theoretical literature on risk communication. Identify the communicators who are trusted, and why</p>
Targeted communication	<p>Can markedly improve message penetration (Lang <i>et al.</i>, 2001)</p> <p>Targeting social belief systems through mechanisms such as social nudging (using for example, targeted risk messages) can influence social behaviour (Lang <i>et al.</i>, 2001; Nisbet and Mooney, 2007)</p> <p>Message-framing effects occur when two differently phrased but logically equivalent messages produce systematic differences in the audiences' response to the message (Linville <i>et al.</i>, 1993)</p> <p>Messages differ in their effectiveness depending on whether they are framed as gains or losses and whether they focus mainly on detection or prevention behaviour (Rothman and Salovey, 1997)</p>	<p>Loss-framed messages can impact positively on detection behaviour, and gain-framed messages on prevention behaviour (Rothman and Salovey, 1997)</p> <p>Positive frames describe positive consequences for performing an action (e.g. in the context of the case study of DWWTS risk management: "de-sludge your DWWTS annually and reduce the risk of water contamination"), whereas negative frames describe the negative consequences of not performing an action (e.g. "if you do not de-sludge your DWWTS annually you increase your risk of water contamination")</p> <p>Loss-framed messages increase participants' positive attitudes towards risk engagement when they are more concerned with detection behaviour, but are more sensitive to positively framed messages when seeking a relatively certain, desirable outcome (i.e. prevention behaviour)</p>
Using media channels	<p>Improves risk communication by using multiple information sources, as well as the mass media and recognised access points (e.g. libraries, police stations) (O'Sullivan <i>et al.</i>, 2012)</p>	<p>Be familiar with the communication needs and preferences of the target audience</p> <p>Awareness of changing media technologies and trends can inform how risk messages are presented, particularly considering how low-cost platforms such as the internet are capable of reaching large audiences instantaneously and providing a platform for the two-way exchange of information</p>
Engaging the media	<p>Can be an important ally in the dissemination of information (Slovic, 2000; Lang <i>et al.</i>, 2001; Covello, 2003)</p> <p>Can improve risk communication through the provision of clear and concise, non-technical risk messages (Slovic, 1986)</p>	<p>The challenges of risk reporting (e.g. ensuring accuracy in reporting) in the media should be acknowledged, as should the constraints on journalists' reporting of risk events</p> <p>Provide tailored information pieces for different media forums, involve the media as communication partners and gather their input on risk communication strategies</p> <p>Establish how best the risk should be framed (e.g. political, social, environmental, health) and identify key journalists in the relevant area of framing</p> <p>Risk managers must be accessible to journalists and respect their constraints and work practices; essentially, the approach should seek to use the media as an ally in communication, rather than as an audience</p>
Monitoring and evaluating progress	<p>Helps to ensure that strategy objectives are being reached in line with available resources</p> <p>Can be used to chart progress and to identify where improvements are required, allowing authorities to make necessary changes and tailor communication approaches, if required</p> <p>Robust, methodologically sound evaluation provides scientific evidence that can be applied elsewhere, in other risk communication approaches</p>	<p>Monitoring the process of communication is as important as monitoring its outcome, in order to identify necessary revisions</p> <p>Small-scale focus groups, in-depth qualitative interviews and small scale surveys are effective tools for preliminary assessments of the design and effectiveness of communication strategies and can guide the development of more fulsome evaluation strategies. Summative research should be the final stage in the process of continual feedback, identifying opportunities for improvement and failings (Balch and Sutton, 1997)</p>
Sustaining trust and credibility	<p>A key component for the establishment of effective risk communication</p> <p>If expert trust is high, the public are more willing to defer to experts' policy analyses and recommendations</p> <p>Effective risk communication relies upon the provision of accurate information as well as the characteristics of communicators, their relationships with the audience and their socially defined roles (Eiser <i>et al.</i>, 2009)</p> <p>Trust can be eroded by divergence in risk perception; disagreement and poor co-ordination between expert groups; ineffective public involvement; and poor information distribution</p>	<p>Trust can be built through demonstrations of technical competence, the reduction of uncertainty and responsiveness to audience concerns</p> <p>Trust as a concept is composed of perceptions of competence, an absence of bias and a commitment to due process, as well as ideas of objectivity, fairness and information accuracy (Peters <i>et al.</i>, 1997). A commitment to these features will help to ensure that trust can be sustained between authorities/communicators and the target audience</p> <p>Commitment to openness, while partnering with organisations and groups that are trusted by the target audience, can also help to sustain trust</p>

4 Relay Risk: Exploring Householder and Stakeholder Perspectives of Effective Risk Communication through a Case Study of Domestic Wastewater Treatment Systems

4.1 Introduction

To investigate the issues surrounding the perception and communication of risk, and to explore what is required to communicate risk effectively, a case study of DWWTSs in Ireland is used. Providing a brief background to the study, the following section details Ireland's DWWTS profile, the related implications for health and environmental risk and Ireland's response to managing these risks. It then provides a summary outline of the project outcomes.

In Ireland, some 30% of the population use an individual DWWTS, accounting for an estimated 46 million gallons of wastewater discharged to systems each day. In rural areas, this number rises to over three-quarters of households who use a DWWTS (Scott, 2005; Central Statistics Office, 2012). When installed and managed correctly, these systems protect human health and water quality and minimise the contamination of soils and waters; however, poorly maintained DWWTS can pollute groundwater, surface water and local drinking water supplies (Dubber and Gill, 2014). Indeed, Ireland reports one of the highest crude incidence rates of verotoxigenic *Escherichia coli*² (VTEC) infection in the European Union (EU), with infections more common in rural parts of the country (HPSC, 2013). Waterborne transmission related to contact with untreated or poorly treated water from private water sources is identified as being a dominant factor in the transmission of VTEC in Ireland (O'Sullivan *et al.*, 2008; Garvey *et al.*, 2010; HPSC, 2013). Private well-owners who use individual DWWTSs are particularly at risk of infection. Approximately 30% of private wells in Ireland are contaminated by *E. coli* (EPA, 2010); in 2015, the EPA revealed that just over half of households with private

wells failed an inspection of their DWWTS (EPA, 2015). In addition, Naughton and Hynds (2013) reported that unregulated ground water users (i.e. private wells) exhibited the lowest levels of awareness of the potential threats to their water supply as a result of poorly performing DWWTS.

Although DWWTSs are not considered to pose a significant national risk (EPA, 2015), the risk of pollution from a poorly maintained DWWTS has been identified as a challenge to Ireland meeting its obligations under the EU Water Framework Directive (WFD; Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000) and other water directives (Department of the Environment, Heritage and Local Government, 2012; EPA; 2013). Moreover, in 2012, the European Court of Justice ruled against Ireland for failing to implement and comply with Articles 4 and 8 of the Waste Framework Directive. In response, the Irish government introduced the Water Services (Amendment) Act 2012 to provide for the introduction of a risk-based approach towards the registration and inspection of DWWTSs. Arising from this legislation, DWWTS owners have an explicit duty of care to ensure the safe operation of their system and to carry out annual "self-inspections". In 2013, the National Inspection Plan for DWWTSs was launched in accordance with the provisions of the Water Services (Amendment) Act 2012. This Plan involves an inspection regime targeting DWWTSs in high-risk areas. Between 1 July 2013 and 30 June 2014, a total of 987 inspections were carried out (EPA, 2015), with the following results:

- Nearly half (476) of systems failed on inspection, with failure to de-sludge the main contributing reason for system failure, followed by operation and maintenance issues.
- Most systems (79%) that were installed prior to 1965 (> 50 years old) failed on inspection.
- For newer systems (installed post-2000), operation and maintenance issues were the primary reasons for failure.

² Verotoxigenic *Escherichia coli* (VTEC) is a particular form of *E. coli* which can cause severe diarrhoea and abdominal cramps. It occurs most commonly in young children and older members of the population. Extreme cases can result in lifelong kidney problems, which can prove fatal.

- Just over half (52%) of sites with private wells failed on inspection; this means that these householders form a particularly at-risk group, especially if located in high-risk areas (EPA, 2015).

Although no formal co-ordinated communication strategy was developed at a national level, each local authority in Ireland was charged with responsibility for implementing engagement activities. Consequently, different levels of engagement were employed by each of the 31 local authorities (EPA, 2015). For example, whereas Cavan County Council employed a whole range of engagement methods,³ other local authorities such as Wicklow reported less activity, relying on leaflet distribution, information on the local authority website and emails/letters to registered owners (EPA, 2015).

Despite progress in policy that addresses the risks associated with poorly functioning DWWTSs, there are gaps pertaining to the level of understanding among householders regarding the severity of the risks and to the maintenance requirements of their systems (Naughton and Hynds, 2013). Existing research shows that the social challenges and barriers to ensuring DWWTS maintenance include:

- gaps in householder knowledge concerning the function of their DWWTS, the standard that should be adhered to (Dennison, 2013), related maintenance requirements (Butler and Payne, 1995; Nunn and Ross, 2006; Alexander *et al.*, 2008; Naughton and Hynds, 2013) and the potential health and environmental risk implications (Arnold and Gallasch, 2001; Campbell and Foy, 2008);
- gaps in the awareness of householder responsibility for ensuring system maintenance (Alexander *et al.*, 2008; Naughton and Hynds, 2013);
- householder concerns relating to the financial cost of managing their DWWTS (Butler and Payne, 1995; Alexander *et al.*, 2008, 2010; Naughton and Hynds, 2013), and concern only when there was an obvious breakdown in the system (Butler and Payne, 1995; Alexander *et al.*, 2008).

³ These included articles in newspapers/other publications; newspaper adverts; radio interviews; stakeholder meetings; school visits; leaflet distribution; social media; local authority websites; emails/letters to registered owners; information packs; pre-inspection visits; and examples of best practice.

There are often discrepancies between what householders perceive as working DWWTSs and the extent to which their system is functioning appropriately (Alexander *et al.*, 2010). In addition, compliance with DWWTS regulation is often related to the fear of detection, rather than to a commitment to risk management for health and environmental motivations (Dennison, 2013). A limited understanding exists of how householders respond to engagement and communication efforts, and the barriers that may exist to more successful communication strategies regarding environmental risks (Dennison, 2013). Results from the "Relay Risk" case study contribute to an understanding of how Irish householders perceive the risks associated with DWWTS maintenance. In response to these social barriers, recommendations have been made on the need for the development and implementation of targeted education and awareness programmes (Arnold and Gallasch, 2001; Campbell and Foy, 2008; Alexander *et al.*, 2008; Naughton and Hynds, 2013; Dennison, 2013). However, there is a limited understanding of how householders respond to engagement efforts, of their communication needs and preferences and of the barriers that may undermine the potential of risk communication strategies.

4.2 Methods

This study used qualitative research methods (semi-structured interviews and focus groups) to explore householder perceptions of, including motivations and barriers to, DWWTS maintenance and awareness, and, from a stakeholder perspective, the features required for effective risk communication. Qualitative research methods allow for a more in-depth understanding of a study topic (Bryman, 2001), making them suitable for conducting exploratory social science research. However, there is little evidence, nationally or internationally, of the use of qualitative research methods as a research tool in exploring public perceptions of wastewater issues. The topical and contested nature of the study topic called for qualitative methods that were sufficiently sensitive to capture the beliefs and perceptions of householders towards the issue. Indeed, providing an opportunity for dialogue and conversation is important when seeking to understand how individuals form and attribute meaning and understanding to environmental risk (Baxter and Eyles, 1999). Consequently, the core method components of this study involved:

- focus groups and semi-structured interviews with owners of DWWTSs (householder cohort);
- semi-structured telephone interviews with representative officials and lobby groups, practitioners, and risk communication, assessment and management experts. For the purpose of clarity, this group will be categorised collectively as “stakeholders” throughout the remainder of this section (stakeholder cohort).

Research ethical approval was granted by the University College Dublin Human Research Ethics Committee (HS-15-04-ONeill).

4.2.1 *Householder cohort*

A random sampling technique using the GeoDirectory (a database of Irish addresses) generated fewer householder participants than expected for Focus Group 1. On review of the effectiveness of this recruitment technique, convenience sampling was employed for the remaining data collection sessions in an effort to increase the potential for a higher response rate. Information material was administered to key contacts within community groups, who were willing to circulate study information to the wider public. A detailed information letter was developed and disseminated. Four focus groups were conducted in late 2014 and early 2015, in three regions in Ireland that were high risk in terms of vulnerability to water contamination and that had a high rate of DWWTS usage: one group in a north-west region ($n = 4$ participants); one group in a Midland region ($n = 8$); and two groups in eastern regions of Ireland ($n = 4$, and $n = 10$, respectively). Two face-to-face interviews were also conducted. In one instance, a planned focus group yielded only one participant (Midlands region) and was, therefore, conducted and analysed as a semi-structured interview, whereas a second interview was conducted with a householder from the east of Ireland, who was identified as having an active interest in the topic of DWWTSs.

4.2.2 *Stakeholder cohort*

For stakeholders, a list of representative officials and lobby groups, practitioners involved in DWWTS-related issues, practitioners and experts involved in knowledge transfer and risk communication, and practitioners and research scientists involved in risk assessment and risk

management was drawn up for the purpose of telephone interviews. Identified individuals were contacted and invited to participate in the study. A total of $N = 16$ stakeholders participated. These included: representative officials and lobby groups ($n = 6$); practitioners involved in maintenance and inspection ($n = 3$); knowledge transfer and risk communication experts ($n = 3$); and risk-assessment and risk-management representatives ($n = 4$).

4.3 Results

Qualitative data were analysed using a well-established process called thematic analysis. Carried out in line with the procedure presented by Attride-Stirling (2001), this involved the inductive and deductive development of basic codes summarising the data and the development of organising themes and global themes, reflecting analytical interpretations of the text.

From the analysis of the data generated by the householder cohort, 4 global themes derived from 14 organising themes were generated. From stakeholders, 4 global themes and 15 organising themes were derived from data analysis. Table 4.1 presents an overview of themes that were common to both cohorts. The prominence of each theme is also presented: this is assessed by comparing the number of passages (i.e. the number of times the theme was mentioned in the data source) and the number of data sources in which the theme was mentioned. The number of data sources mentioning the theme is the more conservative estimate of a theme's prominence.

Other themes identified (although not necessarily common to both groups) included, for householders, *Trust and Response* – which identified the features required for, first, trust in regulators and communicators, and second, a favourable response to regulation and communication – and, for stakeholders, *Engagement and Enforcement*; *Misperceptions*, *Reaction and Uncertainty* – explaining their experiences of encounters with householders, the registration process and National Inspection Plan. Tables 4.2–4.4 elaborate the global and organising themes generated by data analysis. Table 4.5 presents stakeholder responses to the question of what is required to communicate effectively. In line with the techniques recommended by Anderson (2010), illustrative text directly from the data is used to illustrate and support each theme.

Table 4.1. Common themes and their prominence for householder and stakeholder cohorts

Global themes	Organising themes	Householders ^a	Stakeholders ^b
Barriers and beliefs relating to DWWTS awareness and action	Intangible risk perception (“out of sight, out of mind”)	3 (13)	4 (11)
	Information and knowledge gaps	6 (31)	4 (16)
	Financial cost/perceived and real cost	4 (9)	3 (9)
Drivers of DWWTS awareness and action	Visual and olfactory evidence	6 (49)	5 (12)
	Registration and risk of inspection	4 (23)	4 (6)
	Proximity/experience, risk reduction and control	3 (14)	5 (5)
Communicating risk effectively	Communication of risk implications	5 (34)	NI
	Empowerment	5 (39)	NI
	Truth and evidence	5 (27)	9 (18)
	Supportive message	6 (28)	NI
	Clarifying the purpose	NI	4 (8)
	Evidenced-based and best-practice led	NI	4 (7)
	Community engagement	NI	11 (24)
	Know your audience	NI	3 (9)
Partner with credible sources	Partner with credible sources	NI	6 (13)
	Work with the media	NI	5 (15)

^aNumber of data sources (n = 6) (no of passages).

^bNumber of data sources (n = 16) (no of passages).

NI, not identified.

Table 4.2. Householder and stakeholder responses to what motivates and prevents householders being alerted to and carrying out action on their DWWTS

Organising themes	Supporting statement
The registration process and inspection regime were identified by both cohorts as alerting householders to their DWWTS. A prominent viewpoint associated the risk of inspection with a negative outcome, such as a monetary fine for householders	“... if you think about [the inspections], you'd say, I better go and look at it and make sure it is working. Then you realise, if it wasn't working, I'd know about it.” (Householder)
Reliance on visual and olfactory evidence: referred to in both cohorts, householders were alerted to (and acted on) their DWWTS in response to a noticeable environmental cue (such as a foul smell, clogging and backing-up or ponding). Conversely, the absence of cues is taken as an indicator, by householders, of a satisfactorily functioning system	“... it's usually because [a householder's] toilet won't flush... or there is excess ponding in the garden. The environmental part of it [DWWTS maintenance] is so far down the list. It's more to do with smells ... its practical reasons. Things that interfere and they're things that are disturbing their way of life.” (Stakeholder)
Proximity, risk reduction and control: householders in one focus group elaborated how DWWTS maintenance was a necessity as a result of living in a high-risk area. For others, including a number of stakeholders, awareness of the potential environmental risks is augmented by proximity to a water channel, experience of environmental regulation and water monitoring and experience of an existing water-related health risk	“If there was an awful lot of rain, you could nearly time it; [DWWTS] will start acting. If you've got heavy rain and you've got someone coming in a few days' time... [nods of agreement from other householders] ... a little bit like <i>Meet the Fockers</i> [US comedy film].” (Householder)
Perceived financial cost: although the financial cost of DWWTS maintenance was cited as a barrier across all data sources, it was not as prominent as the weight attributed to knowledge and information gaps. Different cost estimates were cited for de-sludging and other maintenance works – perhaps reflecting a fear of the potential scale of maintenance works required and a limited understanding of the real costs involved	“At the end of all this, it comes down to cost. They think it's going to cost a leg and an arm or they'll get into bigger costs ... they think 'well that's the first step, you get it registered and then there's an inspection fee and then I might have to dig the whole thing up'. So they shy away because of the perceived costs and the regulation.” (Stakeholder)
Information and knowledge gaps: the greatest weight was attributed to information and knowledge gaps, as a barrier, in both cohorts. A point reiterated by stakeholders was that there was a notable absence of evidence in the data to reflect householder awareness of the more technical details of how their system works and its maintenance requirements.	“no set of instructions are given to people, once the septic tank goes in ... to what should and what shouldn't happen.” (Householder)
Intangible risk perception: identified in both cohorts, intangible risk perception explains the physical (and psychological) separation of householders from their DWWTS, which limits the level of exposure householders have to their system	“... it's difficult to have a sense of the dangers ... when you don't see it every day, it really only registers on your radar when there is a problem.” (Householder)

Table 4.3. Communicating risk – the self-reported communication needs and preferences of householders

Organising themes	Supporting statement
<p>Empowerment: householders across all data sources identified the need for instructions, criteria, checklists and wider information on how to maintain their DWWTS. However, only two householders explicitly referred to engaging directly with existing information sources on DWWTS maintenance</p>	<p>“... send a document out to every householder who owns a septic tank ... here's what your responsibilities are, here's what you're supposed to do, here's what you should know about to maintain it, here's how to know if it's not properly maintained and here's how to do it and here's the likely cost. There are means of putting out independent advice.” (Householder.)</p>
<p>Truth and evidence: explains the reported need for objective information from an independent and authoritative source. Householders expressed the opinion that credibility would be enhanced if risk messages provided accurate, clear information in a candid manner. They acknowledged the necessity for risk communicators to be transparent and open in terms of the objective of regulation</p>	<p>“A scientific, neutral, independent assessment of what I need to do, what I shouldn't do. Give me the science ...” (Householder)</p>
<p>A supportive message: positively oriented and encouraging communication and engagement was favoured. Householders reported that any engagement strategy should be conducted in a positive light, using clear, scientific, yet non-technical, information in a manner that seeks to emphasise the positive actions that households could make to protect their families from environmental harm</p>	<p>“you can't go instilling fear in people either, it just won't work that way ... there are so many things going on in the last while in this country ... try to encourage people, its need to be framed in an encouraging way, a positive rather than negative.” (Householder)</p>
<p>Communication of implications: communication and information that discussed, first, the personal and family implications, followed by the community implications, arising from poorly maintained DWWTSs were preferred. The majority of householders considered the issue to be much more important when expressed as a public health risk than when considered as an environmental, economic or legal/ethical issue</p>	<p>“We need a focus that people's septic tank can have an impact on water quality in your family and the whole community ... and it's in your health interest to save yourself trouble down the road.” (Householder)</p>

Table 4.4. The attributes of trust – householder responses to the National Inspection Plan, regulatory bodies and communicators

Organising themes	Supporting statement
<p>Responsibility and fairness: regulatory authorities were regarded as attempting to implement enforcement proceedings on “ordinary households” while paying insufficient attention to the “big guys” (Householder). This presumed targeting was seen as unfair; responsibility and liability for poorly functioning or dysfunctional DWWTSs were attributed by householders to those charged with responsibility for planning and DWWTS design and installation. Concerns regarding fairness, responsibility and accountability reflect householders' beliefs that the new inspection regime was less to do with protecting groundwater, the local environment and public health and more to do with revenue generation through the DWWTS registration charge</p>	<p>“When I got planning there a few years ago, I was just told put in an ordinary septic tank. And if someone is coming out to inspect my septic tank, right ... and basically fine me? Even though it was the council, that told me and that signed off on the tank ... that's not really fair on me.” (Householder)</p>
<p>Engagement and concern: the general consensus was that the implementation of enforcement should first be preceded and accompanied by engagement with owners of DWWTSs. Conversely, the perceived absence of engagement and concern – as indicated, for example, by reference to the introduction of household water charges in Ireland – negatively influenced how regulation is perceived. Engagement should reflect a concern towards householders' opinions and viewpoints</p>	<p>“they're [member of community group] there to listen” (Householder), “ask[ing] the public for support, trying to get things done ... for the people”, and “not trying to play people, as if they are stupid.” (Householder)</p>
<p>Competence and credibility: perceptions of competence and credibility influence how householders perceive institutions, regulatory authorities and communicators, and the levels of trust they are willing to invest. These perceptions were associated with the availability and transfer of knowledge and expertise, transparency, and whether or not an alternative agenda was presumed. Criticisms were directed at the lack of visibility of inspections. However, the EPA was described as being a credible source of information, with reference made to its available technical expertise and its authoritative standpoint</p>	<p>“I want to see the head of the EPA on. I don't want to hear the Minister for the Environment because he's a politician. But the guy who's 30, the clever people, and I know there are clever people in the EPA who'd love to be switched on to solve these problems and let loose. But they also have to ask the public for that support and they don't.” (Householder)</p>
<p>Agenda and interests: a critique of the presumed agenda and regulatory and communication objectives and interests underpinned how householders responded to regulation, and how their views towards regulation and risk communication were formed. Favourable comments were made about examples in which transparency was demonstrated and independence and objectivity presumed. Unfavourable perceptions were attributed to instances in which there was a presumed vested interest, or where regulation and communication was believed to be underscored by political motivations</p>	<p>“... trust in the Irish media has become minimal since the water charges fiasco. Most people see it, the media is a way of the government pushing their agenda ... there is independent media but the majority of the media is contributed by government.” (Householder)</p>

Table 4.5. Stakeholder responses to communicating risk effectively

Global theme	Supporting statement
<p>Community engagement: identified as a necessary feature in generating public support and bringing about compliance with regulatory goals. Engagement could be ongoing (ensuring that a baseline of knowledge is maintained across communities). Points of crisis at which the level of risk is heightened can present an opportunity to proactively communicate the need for risk management</p>	<p>“In the case of health and safety on farms, it’s a good idea to get a message out there at weekends ... to have people listening, the weekend that people are busy, we know there are going to be more accidents... We want to get that consciousness up in someone’s mind ...” (Stakeholder)</p>
<p>Engagement that is evidence-based and best-practice led: refers to the benefit of using research to understand the audience and manage audience response and expectations, hence ensuring that the design and implementation of campaign initiatives are supported and guided by evidence and best-practice guidelines</p>	<p>“... conduct focus groups, bench marking research to find out where people’s attitudes are at ... regularly conduct those same exercises again to see if there is any shift in attitudes ... Everything that we do is data-led, research-led and psychology-led ... research and being able to counter every possible argument out here with facts is absolutely critical...” (Stakeholder)</p>
<p>Know the audience: identified as necessary in developing targeted messages to know and understand the audience in terms of who is affected by the risk, how they are affected and how they respond to risk, and their communication needs and preferences</p>	<p>“It is important by targeting audiences and if you have a particular target audience in mind, then you need to get through to them through the most effective means ... through the platforms that they use and learn the most from. There is no point in using social media if the audience aren’t going to be using it ...” (Stakeholder)</p>
<p>Partnering with credible sources: identified as an effective means of community engagement, while enabling trust and credibility between communicators and householders, and allowing communicators to benefit from the experiences of “people that are working on the ground” (Stakeholder)</p>	<p>“you can have organisations that aren’t necessarily going out with communication themselves, but are the organisations that would be there to provide the voice of authority ... or scientific reason ... don’t underestimate the impact of collaboration with different stakeholders” (Stakeholder)</p>
<p>Work with the media: varying perspectives were presented in relation to the role of the media in communicating risk, with concerns expressed over the accuracy of media reporting. General agreement was expressed, however, by stakeholders on the important part the media plays in communicating risk messages, therefore rendering it necessary to work with and manage media relations</p>	<p>“The media is critical, unless you have the media on your side – I think you’re not going to win the argument. It is absolutely vital to identify a couple of ambassadors who really are very keen on the issue and almost take it up as a cause and run it as a cause on their own.” (Stakeholder)</p>
<p>Ensure truth, honesty and openness in communication strategies: described as being crucial to communicating risk and underpinned and supported by community engagement, working with the media and partnering with credible sources</p>	<p>“... building trust in peace time ... that’s a vital activity for an organisation to undertake, that you are not just trying to build trust in the aftermath of a crisis but you’re actually being transparent in peace time.” (Stakeholder)</p>

Trust perceptions played a crucial part in influencing householder responses towards their communication preferences, how they viewed the National Inspection Plan and their perceptions of regulatory bodies and communicators (Table 4.4). Stakeholders’ views of the implementation of the inspection scheme were influenced by how they perceived the fairness of enforcement and how they experienced the reaction of householders to the need for registration, the announcement of the inspection regime and its resulting implementation. Favourable perceptions towards enforcement were underpinned by an opinion that the level of inspections allocated under the National Inspection Plan were in line with available resources, and for those in representative and lobby positions, positive views of the level of inspection were influenced by householders’ reactions to what was perceived as the low number of inspections

being conducted (i.e. circa 0.2% of all septic tanks annually). Simultaneously, however, among the same group of stakeholders, mixed perceptions towards the regime related to what was reported as a failure to engage sufficiently with communities prior to enforcement or to inform them of the details of the inspection plan, and also inadequate attention paid to the management of householders’ subsequent expectations.

4.4 Discussion

Chapter 2 of this report detailed a number of theoretical models for understanding risk perception; results from the case study show that the perception of householders does not necessarily fit one model or approach, but rather, explanatory capacity is derived from a number of theoretical frameworks.

4.4.1 Understanding householder risk perceptions

Results from the householder cohort suggest that the capacity to recognise the risks associated with poorly functioning DWWTSs is reduced by knowledge and information gaps; beliefs (often inaccurate) about what constitutes a properly functioning DWWTS; a problem-oriented approach aimed at removing an inconvenience; and a reliance on environmental cues (e.g. ponding, odour, system backing up) to suggest a problem with their DWWTS. Barriers such as the perceived and real financial costs of DWWTS maintenance and upgrade function only to further limit the potential for risk acknowledgement and reduce the capacity to carry out risk-management practices. These barriers and beliefs mirror findings elsewhere on perceptions and behaviour related to DWWTS risk management (Butler and Payne, 1995; Alexander *et al.*, 2008, 2010; Naughton and Hynds, 2013).

Participants from both cohorts were keen to attribute gaps in knowledge and awareness of DWWTS-related risks and DWWTS maintenance requirements as reasons for failing to maintain one's DWWTS. Although local authorities around the country had put in place information provision and engagement activities, the experiences and perspectives of most householders suggest a lack of engagement with aspects of information provision under the National Inspection Plan. Lack of engagement with information may be due to, *inter alia*, issues of distrust between householders and communicators and negative perceptions concerning the objectives of the National Inspection Plan. In addition, individuals are more likely to engage with (disseminated) information that fits with their particular belief and value system (Kollmuss and Agyeman, 2002). Willingness to engage with disseminated awareness-raising information material may be reduced if there is a low perception of risk or if risk management is of low priority. However, without appropriate information and knowledge, householders lack the critical awareness required for recognising, acknowledging and managing risk.

Acknowledging that a reliance on sensory mechanisms to suggest an environmental problem can result in a tendency to ignore threats and dangers that cannot be seen, smelled or touched (Kollmuss and Agyeman, 2002; Vugt *et al.*, 2014). The very nature of DWWTSs – their typically close location to the owner's house, the propensity for vegetation and overgrowth to limit physical access, and the fact that the bulk of the system

is underground – can reduce the level of visual (and perhaps physical) exposure that householders have to their DWWTS, and, thus, their perception of the risk and their fostering of risk-management behaviour. With an emphasis on the tangible signs of malfunctioning, in the absence of a direct sensory relationship, the risk is unacknowledged. An absence of information and knowledge, particularly as regards the personal health implications associated with a malfunctioning DWWTS, may limit householders' cognitive exposure to the potential risks. Indeed, in the absence of information, the level of emotional investment and involvement that an individual attributes to the likelihood of a cause or event is lowered, thus reducing their propensity for concern and their perceived susceptibility of a risk event occurring (Kollmuss and Agyeman, 2002). In addition, risks that are voluntarily controlled are considered less dangerous, and are, therefore, often averted (Covello and Sandman, 2001). Householders' risk perceptions towards their DWWTS may therefore be explained by their perceived control over risk-management behaviour (e.g. householders can choose to de-sludge their DWWTS), and their perception of the likelihood that a malfunctioning DWWTS will create negative health implications for them personally. Perceived risk severity is also an important variable in explaining and predicting risk behaviour (Table 2.1). Without any understanding of risk severity and susceptibility, along with an absence of appropriate knowledge, the likelihood of risk-mitigation behaviour is reduced. Given that risk perception and behaviour is influenced by the perceived severity of a threat (Aakko, 2004), we hypothesise that a limited awareness of the environmental and health risks associated with poorly performing DWWTSs and a reduced approximation of the risk may limit how the risk is perceived and may reduce the likelihood of risk-mitigation behaviours.

4.4.2 The importance of public trust

The centrality of trust to householder responses supports the contention that trust is one of the most crucial features in anticipating responses to hazards and related risk communication (Kasperson *et al.*, 1992; Eiser *et al.*, 2009). If public trust is high, the public are more willing to rely on expert judgement (Slovic, 2000; Covello and Sandman, 2001), and, therefore, maintaining trust is crucial to facilitating the transfer of risk information and the acknowledgement of risk messages.

In this case study, trust was attributed by householders to bodies and groups that exhibited transparency and impartiality, and a non-profit-driven agenda or an agenda dependent on ensuring good environmental/water quality status, with distrust being widely attributed to government and sections of the mainstream media. Overall, the features identified from the literature as determining public trust in this study (Table 3.1) mirror those identified in the literature as influencing trust levels (see Frewer *et al.*, 1996; Peters *et al.*, 1997). Consistent with results observed by Vugt *et al.* (1996), the perceived role of knowledge transfer also contributed favourably to how competent, credible and trusted public bodies are perceived to be – resulting in favourable perceptions being generally attributed to academics and scientists, including agencies such as the EPA. Features that were identified by stakeholders as being important included the need to communicate uncertainty, partnering with credible and authoritative sources, engaging locally and showing visibility.

Understanding these features can help regulators and communicators to identify and form partnerships with information and engagement sources, particularly at a local level, that are likely to be viewed as credible by householders. However, the process of building trust can be challenged by a number of factors (Table 3.1), and existing public distrust can cause a lower acceptance of the validity of risk communication (Peters *et al.*, 1997; Renn, 2006). Householders expressed concern over what they felt was a lack of engagement and consultation relating to the National Inspection Plan and other areas of regulation. In particular, reference to the establishment of water charges in Ireland was made by all data sources – with widespread concern influenced by perceptions of the agenda and interests of Irish Water (the new national water utility established by the Irish government to provide municipal water services and empowered to charge householders for their water use). The prevalence of this emphasis during focus groups reflects the potential for topics on water quality in general to be hijacked by debate and to erode levels of public trust in general.

Overall, rather than attempting to build trust during a point of crisis or at the point of enforcement, results suggest that it may be advisable to ensure that public trust has been gained prior to the implementation of enforcement measures. The concept of “building trust in peace time” – putting in place the necessary features required for positive trust relations beyond and external to the

implementation of regulation and enforcement – has been previously advanced in other policy documents and guidelines (European Food Safety Authority, 2012). Consequently, this can help to ensure that the regulator is viewed positively and is trusted and referred to by the public on matters of risk judgement. Maintaining public trust enables a more suitable environment for the implementation of regulation, and a greater likelihood of compliance with legislation.

4.4.3 *The potential of enforcement to achieve attitudinal and behavioural change*

In addition, enforcement measures are usually more effective when implemented alongside education and information provision (Phillips *et al.*, 2011). In the “Relay Risk” study, concern was expressed within both cohorts that the inspection regime was initiated without a similar level of focus being applied to educational and engagement initiatives. These concerns may help explain information gaps among householders, as well as the confusion and uncertainties reported by stakeholders as existing among householders, in response to the inspection regime. However, for a minority, enforcement was viewed as necessary to curb poor maintenance and to ensure standardisation of DWWTSs nationwide; a widely held view of householders was that the registration requirement and inspection process were a means of generating revenue for the government (a perception echoed by stakeholders who represented the interests of particular stakeholder groups and who had direct experience with householders of DWWTS-related issues). As such, these perceptions towards the National Inspection Plan may have hardened some householders’ attitudes towards inspections, impaired efforts to encourage risk-management behaviour and eroded public trust as the credibility of and confidence in the National Inspection Plan were called into focus.

The level of uncertainty concerning the inspection scheme and the low visibility of inspections were seen by some household participants as either an indication of a low value placed on this issue or a reflection of a regulatory failure by government, and led some to suggest that the approach comprised an intentional regulatory failure for reasons of political expedience, which was, however, sufficient to satisfy European requirements and to avoid fines from the European Commission. This has implications for how householders’ perceive the risk of being inspected, their corresponding motivations for

acting on DWWTSs, and, moreover, their perceptions of regulatory authorities and communicators – in terms of trust, perceived competence and credibility. The national inspection regime currently employs a risk-based approach to target inspections of DWWTSs in high-risk areas. As a result, a large number of DWWTSs in certain lower risk geographical areas will not be inspected. Among householders, it appears that in the initial stages of the National Inspection Plan, greater concern was attributed to the risk of having one's DWWTS inspected than to the health and environmental implications of a malfunctioning system. Both cohorts commented on the high level of worry and concern when the inspection scheme was announced and a sense of relief on hearing of the low rate of inspection and the concentration of inspections in regions more vulnerable to the risk of water contamination from malfunctioning DWWTSs. Interestingly, these reports may fit with the risk perception model (Chapter 2), which explains how risks that are involuntarily imposed, unfamiliar or under the control of others are considered greater risks, and how risk perception also has an affective component. Although the risk of enforcement may be sufficient in alerting householders to their DWWTSs and motivating action on DWWTS maintenance, given the nature and focus of the inspection regime, this potential is reduced when the risk of inspection is perceived as low. In the absence of appropriate engagement, the risk-based approach may have negative implications for how regulation and the regulator/communicator are perceived, especially for those living in low-risk areas. A perceived lack of evidence of enforcement is likely to reduce the potential for the risk of inspection to alert householders to the need to maintain their DWWTS. In order to realise the potential of enforcement to bring about attitudinal and behavioural change, the authors would argue that effective implementation of a risk-based approach to DWWTS management requires high visibility both locally and nationally. Intentional engagement with the media and frequent scheduled communication through local and national media provides a means of ensuring good visibility in the public sphere (see Table 3.1).

Finally, stakeholders recalled householders with malfunctioning DWWTSs requesting an inspection so as to ensure eligibility for grant support and criticising the creation of such perverse incentives. This point highlights the need for regulators to consider the scope of the grant scheme and the extent to which it complements other aspects and objectives of the National Inspection Plan.

4.4.4 The role of targeted messages

Chapter 3 of this synthesis report detailed how, in order to achieve effective risk communication, it is necessary, in part, to understand the target audience and to frame targeted messages accordingly. The theoretical literature on risk communication (Chapter 2) suggests that risks with the potential to harm individuals personally or to produce identifiable victims are considered more dangerous than abstract risks or risks that produce statistical victims. Therefore, a risk to human health is likely to be perceived as more direct and more immediate than an environmentally framed risk (Covello and Sandman, 2001). Furthermore, environmental behaviours are more likely to be undertaken when they are in line with personal priorities (e.g. personal health and family health) (Kollmuss and Agyeman, 2002). Whereas Naughton and Hynds (2013) reported that the framing of messages around the topic of household water supply would help to improve public engagement, results from the "Relay Risk" study highlight the importance attributed to human health, as opposed to water quality, in engaging and motivating householders. Householders identified the need for positively framed messages that frequently communicate the personal implications, are scientific-based and impartial, draw on a local context and encompass an inclusive, balanced reach. Considering the intangible nature of DWWTSs and related risks, it would seem beneficial for message approaches also to include the use of visual techniques for risk perception to tap into society's sensory reliance (Vugt *et al.*, 2014). Table 4.6 presents a sample of key messages developed by the authors for use in communication campaigns, accompanied by the underlying principles drawn upon to support each message.

4.4.5 Broad recommendations for engagement on domestic wastewater treatment systems

Individual capacity for DWWTS maintenance can be enhanced by enabling awareness and providing information on self-inspection and maintenance of a household's DWWTS (Naughton and Hynds, 2013; Dubber and Gill, 2014). This needs to be conducted in a way that adequately informs risk perception towards more appropriate risk-management behaviour and demonstrates the efficacy of implementing risk-management practices to the target audience (Naughton and Hynds, 2013; Dubber and Gill, 2014). However, information provision alone will not necessarily result in a desirable change (Kollmuss and Agyeman, 2002),

Table 4.6. Recommended key messages to help change risk perception and their underlying principles

Recommended key message	Underlying principles
Regular maintenance of your septic tank system helps protect you and your family's health	A positively framed message, it communicates the personal and family health implications and what householders can do to reduce the risk. Uses everyday language to refer to DWWTs but seeks to expand understanding by reference to a septic tank "system"
More and more people are now maintaining their septic tank system – by also doing so, you too can help protect drinking water in your community	Aims to target descriptive norms, that is, what society regards as normal behaviour, and moral norms – what we feel we ought to do. Another example of a positively framed message
Everyone has a part to play in protecting drinking water sources. Do your bit by regularly maintaining your septic tank system	This message associates DWWTs with a sense of collective responsibility, targeting moral norms. The association is also made between DWWTs maintenance and drinking water quality

and effective risk communication must go beyond the simple provision of information to involve dialogue and the building of trust (Aakko, 2004).

A key objective of the "Relay Risk" study has been to identify the core features required for an effective communication and engagement strategy for the implementation of risk-based environmental regulation. Results point to the need for a comprehensive engagement strategy. Driven by these results, Table 4.7 presents an overview of the aims and objectives of such a strategy and the guiding principles that could be employed to underpin more specific engagement

activities. In addition, regular monitoring and review will help to ensure that campaign objectives are being reached. In addition, the case study results clearly highlight the need for an approach that integrates DWWTs management across the public regulatory system, by incorporating the planning system (i.e. planning guidelines around the design and installation of DWWTs) and the public health system (i.e. that treats the health outcomes of poorly maintained DWWTs), to ensure that the right approach is being taken in terms of overall risk management.

Table 4.7. Aims, objectives and guiding principles for an effective engagement strategy

Aim	Objective	Guiding principles
Inform risk perception	To establish an attitudinal shift towards risk awareness through risk acknowledgement and risk acceptance, and to reduce a reliance on environmental cues to suggest a malfunctioning DWWTs	<p>Draw on an understanding of the target audience and use visual mechanisms, targeted messages and information to inform risk perception. Refer to the literature in Chapter 2 on the different variables that shape how a risk is perceived</p> <p>Provide and include information comprising details on how DWWTs work, their maintenance requirements, as well as information on how to properly detect signs of malfunctioning, and recommended steps towards risk-management behaviours</p> <p>Communicate and engage at the local and national levels, across media spectrums, over a sustained period of time, and collaborate with mechanisms that involve trusted, credible communicators</p> <p>Communication should be positively framed, yet should emphasise the personal and family health implications of DWWTs-related risks</p>
Build regulatory and best-practice compliance	To encourage the adoption of risk-management behaviours in line with regulatory requirements, regardless of the risk of enforcement	<p>Ensure that the National Inspection Plan is highly visible within the public sphere (by reporting regularly on co-ordinated activities, actions and the progress of enforcement measures)</p> <p>Communicate and target the variables that inform and predict risk-management behaviour (i.e. risk perception, including perceived severity of the risk, and confidence in carrying out risk-detection and risk-management behaviours; see Chapter 2) and combine measures previously outlined for informing risk perception</p> <p>Ensure consistency of information on the financial costs of DWWTs risk management</p>
Enable public trust	To create a favourable environment for risk communication and compliance, while facilitating public support towards other areas of regulation	<p>Be aware of the features that combine to influence public trust levels (Chapter 3 and results in Chapter 4): these include perceptions of competence and credibility, an absence of bias, fairness, openness and transparency, information objectivity and impartiality, and engagement and exhibited concern</p> <p>Engage and work collaboratively with trusted bodies and organisations when aiming to inform risk perception and build regulatory support and compliance</p>

5 Conclusion: Lessons for Risk Communication

This synthesis report has summarised the project “Relay Risk; Examining the Communications of Environmental Risk through a Case Study of Domestic Wastewater Treatment Systems in the Republic of Ireland”. The project set out to identify how to effectively communicate risk-based environmental regulation by:

- carrying out a review of the literature to identify the theoretical framework explaining risk perception and risk communication (Chapter 2);
- reviewing national and international case studies on risk management and communication to identify features of good practice (Chapter 3);
- taking the case study of DWWTSs in Ireland to explore, using qualitative research, the risk perceptions of householders (Chapter 4);
- conducting semi-structured interviews with stakeholders from a range of areas to identify what is required to effectively communicate risk (in relation to DWWTS maintenance and risk management in general) (Chapter 4).

Overall, conclusions from case study results (Chapter 4) are in line with the literature presented in Chapters 2 and 3. The literature on risk perception and behaviour and environmental behavioural change (Chapter 2) helps to explain how householders respond to DWWTSs as an area of risk and to their related risk management. The features required to achieve effective risk communication (Table 3.1) mirror householder perceptions about trust and their communication preferences as well as stakeholder views on the need for public engagement, greater understanding of the “audience” and the need to partner with credible organisations to communicate better, in parallel with greater engagement with the media, while also sustaining public trust.

In terms of the policy implications, there is increasing acknowledgement that effective policy implementation should have adequate public participation at its core (Collins and Ison, 2009; Newig and Kootz, 2014), and, certainly, public participation and engagement is central to effective risk communication (Covello, 2003). In accordance with the provisions of the Water Services (Amendment) Act 2012, the National Inspection Plan

involves a two-strand approach to education and enforcement through a risk-based inspection regime. Within the first year of the plan (i.e. 2014), nearly all of the planned number of inspections had been conducted. Although these inspections reflected favourably on Ireland’s efforts to bring about good standards in water quality, results from the “Relay Risk” study suggest that gaps exist in householders’ capacity (in perception and knowledge) to comply with regulation and good environmental practice, and more comprehensive and co-ordinated engagement is required with householders on DWWTS risk management. Mirroring recommendations also put forward by Naughton and Hynds (2013), results from the “Relay Risk” study emphasise the need for policymakers to assess the capacity of householders to comply with regulation and to put effort into understanding public risk perception. Indeed, both studies highlight the significance of understanding public risk perception for the effective communication of environmental risk regulation, and a key learning for policy from “Relay Risk” is the necessity of public engagement not only to enable the transfer of education and information and the facilitation of two-way dialogue, but also to help foster positive trust relations while bridging the divergence in risk perception between regulators and the public.

Material reviewed in Chapters 2 and 3 of this report provides a useful framework in which to position and contextualise case study results, and provides learning for communicators on the essential requirements for carrying out risk communication. However, the topic of DWWTSs highlights, in particular, the challenge for risk communications when engaging with the public on a potential hazard which is essentially hidden and intangible for the risk manager (i.e. the householder). The authors suggest that the DWWTS case study shows that, in the first instance, an initial objective of risk communication should be to enable and build a critical capacity of risk awareness, evolving, in the case of DWWTS, for example, from a problem-oriented approach to carrying out behaviour, to a behavioural approach based on risk mitigation and risk management. Although there is a growing body of literature on risk perception (for different hazards) and how to

communicate risk effectively, a challenge for regulators going forward is to ensure that sufficient scientific evidence exists on which to base communication efforts while ensuring information accuracy. Indeed, a gap currently exists in the scientific literature showing the direct pathway of contamination between malfunctioning DWWTSs and negative human health outcomes. In the absence of this scientific certainty, greater effort will be required to manage public expectations concerning information and engagement. In some respects, this is an important area where, perhaps, more focus is required within the risk communication literature.

Overall, results from the case study contribute to a baseline understanding of householder perceptions and build on existing work carried out by Naughton and Hynds (2013). The results generated by this project have been applied to the development of a set of guidelines (presented separately) on how to effectively communicate risk. The authors envisage that, although they draw on the example of DWWTS risk perception and risk management, these guidelines will be transferable to other areas of risk-based regulation, particularly policy contexts that require public involvement in achieving regulatory objectives.

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Abbreviations

DWWTS	Domestic wastewater treatment system
EPA	Environmental Protection Agency
EU	European Union
VTEC	Verotoxigenic <i>Escherichia coli</i>
WFD	Water Framework Directive

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL

Tá an Gníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaoil a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaoil a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: Déanaimid córais éifeachtacha rialaithe agus comhlionta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcleoíonn leis na córais sin.

Eolas: Soláthraimid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírthe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.

Tacaíocht: Bimid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaoil atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaoil inbhuanaithe.

Ár bhFreagrachtaí

Ceadúnú

Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaoil:

- saoráidí dramhaíola (*m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola*);
- gníomhaíochtaí tionsclaíocha ar scála mór (*m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta*);
- an diantalmhaíocht (*m.sh. muca, éanlaith*);
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe (*OGM*);
- foinsí radaíochta ianúcháin (*m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha*);
- áiseanna móra stórála peitрил;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdarás áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhírú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídionn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaoil.

Bainistíocht Uisce

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uisce idirchríosacha agus cósta na hÉireann, agus screamhuisceí; leibhéal uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaoil

- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil (*m.sh. tuairisciú tréimhsiúil ar staid Chomhshaoil na hÉireann agus Tuarascálacha ar Tháscairí*).

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn

- Fardail agus réamh-mheastacháin na hÉireann maidir le gás ceaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil

- Taighde comhshaoil a chistiú chun brúnna a shainaithe, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta

- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaoil in Éirinn (*m.sh. mórfheananna forbartha*).

Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéal radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas

- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaoil ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaoil (*m.sh. Timpeall an Tí, léarscáileanna radóin*).
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhail ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta

- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:

- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- An Oifig um Cosaint Raideolaíoch
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair inní agus le comhairle a chur ar an mBord.

Authors: Eoin O'Neill, Catherine Devitt, Richard Waldron and Craig Bullock, University College Dublin

The report examines the elements required for the preparation, implementation, and monitoring of an engagement strategy aimed at communicating risk-based environmental regulation of domestic wastewater treatment systems to owners of such systems. The report is aimed at regulators, national and local authorities, and policy makers, particularly those involved in environmental risk communication, management and assessment.

Identifying Pressures

There are approximately 500,000 septic tanks in operation in Ireland. Septic tanks not operated and maintained adequately can pose economic, environmental and social risks. The fundamental objective of this project was to explore and identify how to effectively communicate environmental risk, by focusing on the case study of domestic wastewater treatment systems (DWWTS) in the Republic of Ireland. Risk communication aims to address the divergence in how risk is perceived between expert and lay positions, and when carried out effectively, it empowers individuals to recognise and manage risk. By identifying what influences householder behaviour regarding their DWWTS, it is possible to formulate a communication approach that aims to improve compliance with environmental regulation, thus protecting human health and the environment.

Informing Policy

Results show that the capacity for householders to, first, recognise and be alerted to the risks of a poorly operating DWWTS, and second, to manage these risks, is undermined and limited by a range of factors, which include inter alia : householder beliefs as to what constitutes a functioning DWWTS, and their approach to maintenance (i.e. problem-oriented aimed at removing an inconvenience); and a reliance on sensory perception to detect a problem (i.e. a reliance on environmental cues such as ponding, and odour, to suggest a malfunctioning system);

When implementing risk-based environmental policy, the findings suggest that the provision of sufficient and targeted information could facilitate an attitudinal shift towards risk awareness and understanding and risk management across the stakeholder groups. For it to be effective, risk communication requires policy makers to build regulatory and best-practice compliance by encouraging the adoption of risk-management behaviour, while simultaneously increasing public trust towards the objectives of environmental policy.

Developing Solutions

The findings from this research suggest that understanding the public's perception of risk is central to the successful implementation of risk-based environmental regulation. One output is a set of guidelines on how to effectively communicate risk that relates to DWWTS. The guidelines are transferable to other areas of risk-based regulation, to facilitate effective communication of risk-based environmental regulation in Ireland, particularly in policy contexts that require public involvement to achieve regulatory objectives.

