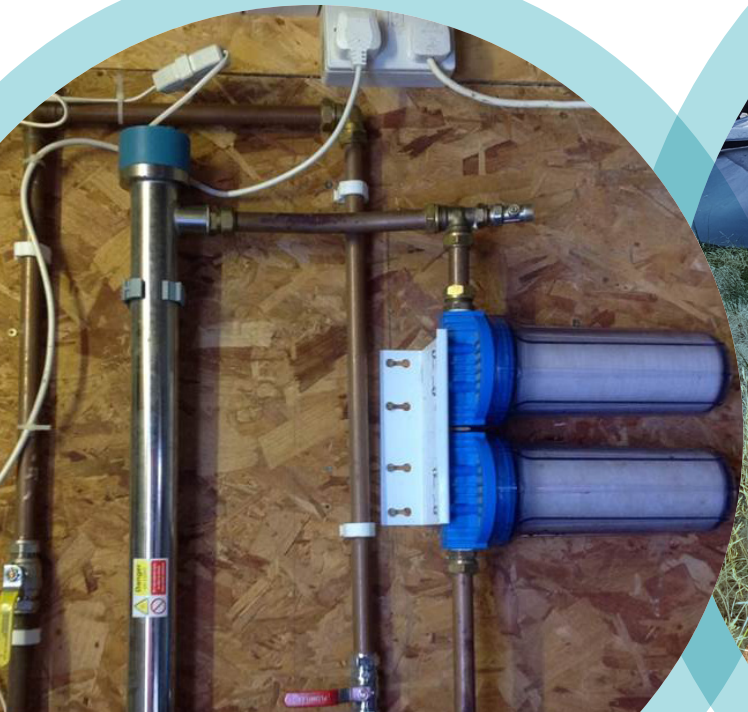
crew

Scotland's centre of expertise for waters

Engaging communities around Private Water Supplies



Published by CREW – Scotland's Centre of Expertise for Waters. CREW connects research and policy, delivering objective and robust research and expert opinion to support the development and implementation of water policy in Scotland. CREW is a partnership between the James Hutton Institute and all Scottish Higher Education Institutes supported by MASTS. The Centre is funded by the Scottish Government.

This document was produced by:
Paul Teedon, Margaret Currie, Karin Helwig and Rachel Creaney

Please reference this report as follows:
Teedon, P., Currie, M., Helwig, K., and Creaney, R. (2017) Engaging communities around private water supplies. CRW2014_12. Available online at crew.ac.uk/publications

Dissemination status: Unrestricted

Acknowledgements

The research team would like to thank each of the pilot communities for their contributions to the research and particularly to the community researchers: Davie Newton; Tricia Lawson, Alexis Fleming, Mahri Ivey, Hannah Walker, Cath Curd, Sandy Snell and Imogen Furlong.

We would also like to express our thanks to CREW and members of the SRC Steering Group for their ongoing support.

Research Summary

Research questions

1. What are the attitudes to private water supplies and their management in the case study communities?
2. What are the main concerns users' have with their private water supplies?
3. How can we engage with people around private water supplies?
4. How can that engagement be improved?

Key Findings

- Communities value their access to private water supplies. Many community members (residents, stakeholders and businesses) are engaged with issues associated with private supplies; both in terms of its quality and its reliability.
- Communities have detailed awareness of the problems associated with effective supply through private water supplies but knowledge varies about infrastructure (location); appropriate maintenance; testing regimes; managerial responsibility; health risks and associated support services. There was a desire for improvements to this knowledge.
- Improvement, repair or investment costs are seen by many as a major barrier to change because they have the (perceived) potential to be limitless. There are particular economic cost challenges faced by a number of businesses.
- Engagement – through baseline work – can provide the basis and capacity for greater levels of private water supply related activity.
- Possible improvements can be made to management structures, maintenance regimes, technological applications, and pipe and tank infrastructures. Many of these would promote enhanced equitability, resilience, access to water, and a reduction of health risks.
- Communities often require locally-specific solutions. As such, any engagement around private water supplies should be on the basis of an assessment of the community's current understanding, perceptions and attitudes towards pertinent supply issues. Where action or change is identified in this assessment as a need, this should be based on an examination of the community's readiness for change.
- There are considerable opportunities for solutions to be 'co-produced' by agencies and communities.
- Effective engagement with these communities can reveal the detail associated with their attitudes and perceptions; effective engagement is essential for any proposed community-based change. A lack of sensitivity in engagement may lead to a community not willing to engage.

Background

Drinking water quality in Scotland has improved significantly since the formation of Scottish Water in 2002, and they are committed to achieving zero failures. However, there are issues in some areas with private water supplies (PWS), which are the responsibility of their owners and users. In 2013, there were 20,193 private supplies registered in Scotland. These drinking water sources may not provide resilience in dry periods, their quality can be highly variable posing potential health risks (DWQR, 2016) but anecdotal evidence suggests they are highly valued. This project aimed to work with four rural communities to explore issues and attitudes around PWS.

Research Undertaken

Research was conducted with four rural communities in Scotland to explore communities' attitudes, acceptance and issues with regards to private water supplies.

The aims and objectives of this research were:

- to engage rural communities about private water supplies issues
- to understand, whether there is a lack of engagement around private supplies and if so, why
- to increase understanding about what encourages communities to engage around the topic
- to explore ways with the communities that change could be instigated.

Community researchers (local residents from the case study areas) were employed to work in the study's communities and assist with, and inform, the research.. They conducted interviews with local stakeholders to identify the key issues associated with private water supplies in their area. A community engagement exercise followed, where a baseline of private water supplies characteristics in the area was developed and concerns around the private supplies were heard in more detail. The fourth stage of the research comprised a second engagement exercise; in three communities this involved information sharing with key agencies. In the fourth community, local children (and subsequently their parents) were engaged via a school lesson and subsequent discussion with parents. Finally, an information day was held to share experiences across the communities.

Recommendations

A range of recommendations are provided. A summary of the strategic recommendations is:

1. Engagement:

- Development of a private water supply -specific engagement strategy, drawing together the needs of all relevant stakeholders and communities through a process of co-production
- Locally-specific responses, respecting local attitudes to water quality and local priorities, and where appropriate, direct engagement exploring health risks
- Communication of positive as well as negative messages, e.g. resolution of issues
- Further work on the needs and concerns of commercial interests around private water supply use

2. Resilience:

- Further research into the resilience of communities that rely on private water supplies, particularly with regard to the issues of technical and socio-economic infrastructure, economy (e.g. business risks) and the environment (e.g. reliability of supplies in light of changes in population (including tourism) and water availability

3. Information:

- An 'Information Hub' as a credible and authoritative information source for all who may live, use or rely on a private water supply to cover all (reasonable) aspects is given consideration as a priority. This might include information on the following: rights and responsibilities of (land) owners and tenants to maintain and ensure private water supply provision; where further advice is available to each of these stakeholders; liabilities; indicators of quality; health issues; regulatory testing; technical advice on filtration systems and other infrastructural aspects and any financial support available.

4. Support:

- There is a case to be made for looking broadly at the forms of support public agencies might offer to private water supply users and owners in a wide range of areas. In some contexts this would go beyond the provision of 'information' but might include direct initiatives for technical innovation; new forms of grant schemes or other appropriate models of financial support; accredited training provision for installers and maintenance technicians; and improved advocacy services.

Contents

1.0 Introduction

This project aimed to work with four rural communities to explore engagement around private water supplies (PWS). Approximately 3.4% of the Scottish population uses around 20,000 PWS, predominantly in rural areas (DWQR, 2016). These drinking water sources may not provide resilience in dry periods. In addition, the quality of PWS is highly variable (DWQR, 2016), posing associated health risks. Failures are often due to poor or unmaintained treatment systems and sources with variable quality (especially during wet weather events).

To be able to improve PWS, it is necessary to understand how to engage with rural communities around the issue, and this project sought to consider this. The Scottish Government is working towards improving the quality of these supplies and this project is an integral part of that work.

1.1 Project Aims

The aims and objectives of this research were to:

(i) engage communities about PWS issues and to identify improvements in engagement practises specifically relating to private water supply challenges;

(ii) understand the perceived lack of engagement around private water supplies;

(iii) increase understanding about what encourages rural communities to engage around private supplies;

(iv) explore ways with the communities that change could be instigated.

1.2 Context

As this report is aimed at informing agencies involved in the provision and monitoring of water supplies on how to engage with rural communities around PWS, we provide a brief consideration here of some of the PWS aspects and present the significance of the community-engagement approach in the following section [2].

"A private water supply [PWS] may be defined as any water supply that is not provided by a statutory water undertaker and where the responsibility for its maintenance and repair lies with the owner or person who uses it. A PWS can serve a single household and provide less than one cubic metre of water per day or it can serve many properties or commercial or industrial premises and provide 1000 m^3/d or more. The water source could be a borehole, well, spring, lake, stream or river" [1].

There has been wide discussion (e.g. Richardson et al., 2009) about poor drinking water in developing countries but less so in developed countries. Approximately 3.4% of Scotland's population, around 183,000 people, rely on PWS for their drinking water (DWQR, 2016 p.4). In Scotland, two types of PWS are distinguished by legislation [2], whereby Type A refers to supplies that serve 50+ individuals, provide more than 10 cubic metres of water per day or provide water for commercial or public activities and any other supplies are classed as Type B. Over 88% of PWS are Type B supplies (DWQR, 2016 p.4).

Type A supplies are tested by local authority Environmental Health departments on an annual basis, whilst Type B supplies are not subject to regulatory monitoring. If Type B owners or users request that the local authority test their supply, the authority must do so, but normally a charge is levied. If a Type A supply fails a regulatory test, the local authority normally issues a 'boil notice', which remains in place until the supply has been retested and found safe.

One intake structure may feed multiple properties. If one of these is a public or commercial building, the entire supply is classified as Type A by the Regulator; however, testing is carried out at the point of delivery (i.e. the tap) in the public or commercial property.

2.0 Methods

The strategy developed for effective engagement within (and beyond) the project sought to build local capacity to facilitate the various stages of the project but also to leave capacity in place to enable, where there was a (local) desire, further work on PWS or related initiatives.

2.1 Selected pilot communities

Four pilot communities were identified; and the project team engaged with each throughout the year (November 2015 - November 2016). The communities' selection, by the project's Steering Group, was undertaken to ensure consistency with the other projects in the Sustainable Rural Communities (SRC) work stream (see www.crew.ac.uk), drawing upon strategic information and an existing evidence base of issues. Communities represented a variety of demographic, environmental and economic rural contexts, but all shared the common feature of having a high proportion of residential properties on PWS. Communities and their participants were assured of anonymity in line with good ethical practice; communities are not identified in this report.

2.2 Community researchers

The project employed 'community researchers': local residents from the case study areas who were employed to help carry out research on the project. The main benefit of using community researchers is their ability to utilise information as 'insiders' within their communities that traditional researchers cannot access as 'outsiders' (Devotta et al., 2016), they can also ensure enhanced rigour, data quantity and quality (Teedon et al., 2015). Utilising local community members allows the project to benefit from local knowledge such as highlighting the cultural norms and rules which are relevant to the communities / issues under study (Mistry et al., 2015, Teedon et al., 2015).
Their use can enhance trust between the researchers and the community under study as there is a continuing locally-based presence within the community (Teedon et al., 2015). This presence can also increase awareness and acceptance of the project by the community, including those who have not been keen to participate in previous studies.

Research teams need to be careful to ensure good relationships are maintained between core-team researchers and the community researchers (Teedon et al., 2015), helping to maintain retention. There are other ethical issues that need to be addressed to avoid the exploitation of community trust and to ensure community researchers are respectful of community privacy and confidentiality. Appropriate training and support need to be available (Mistry et al., 2015 p.33).

Community researchers were seen as a key mechanism to engage effectively with the selected communities to meet the project's brief of understanding how engaged the selected communities were around PWS and to identify ways to improve current engagement practices.

1 Scottish Executive's Technical Manual for Private Water Supplies (2006) [p1-5]

2 The Private Water Supplies (Scotland) Regulations 2006

2.2.1 Recruitment of community researchers

The project aimed to recruit two community researchers in each of the four areas. The core research team spent time contacting key local stakeholders in each community (for example contacts in community councils and local groups). These individuals were asked to suggest appropriate places to advertise the community researcher posts. These included local newspapers, round robins on local community email lists and posters put up in local shops, post offices, and village halls. Posts were advertised in line with normal (Glasgow Caledonian University) human resources policies. Employment contracts, for all community researchers, were held with the University, to ensure common arrangements across the project. Candidates were asked to demonstrate both local residency and knowledge of the area; eight community researchers were successfully recruited.

2.2.2 Training of community researchers

A training day was arranged in a rural location most equidistant to the communities. All community researchers attended along with the core research team and representation from DWQR (providing technical expertise). Training and guidance was given on a range of skills and project requirements, including ethical issues; health and safety; interviewing techniques and data capture. As part of the session community researchers, with their pre-existing knowledge of the area, were invited to help define the precise geographical area for the study, to ensure that locally-accepted area and community definitions were built into the study from the outset. It also enabled the pairings of community researchers to develop professional arrangements for their work in the respective areas.

2.3 Identification of local stakeholders

Community researchers were asked to develop a 'stakeholder map' and define, with guidance and input from the core research team, 5-6 stakeholders in each area to be interviewed. These individuals were identified as knowledgeable about the broad and specific issues around PWS and could provide perspectives on this to inform the development of a locality baseline. This in turn provided the basis for locality-specific engagement activity.

Stakeholders varied between areas but included those with Environmental Health responsibilities within local authorities, community councillors, representatives of local business owners, those on shared PWS systems, landlords, tenants, estate managers, crofters and a variety of tradespeople including plumbers.

2.4 Literature review

A literature review was conducted to identify 'high level' themes for investigation within the interviews and inform the development of a Topic Guide for the stakeholder interviews.

2.5 Interviews with stakeholders

Interviews of local stakeholders were undertaken by the community researchers to set a preliminary baseline of the key issues associated with PWS. Topics for exploration were determined by the literature review as well as the project brief and examined in line with particular stakeholder's responsibilities and related concerns. The broad themes examined were:

- Water quality
- Technical aspects
- Management, ownership, upkeep and testing requirements
- Community make-up and changes
- PWS costs

2.6 PWS baseline and community profile development

Investigation of the topics by interview helped to develop a baseline for more detailed examination with community members.

In addition to conducting interviews, community researchers kept notes of relevant thoughts, discussions and conversations they had with each other or with members of the community to aid the development of the evidence base. The field notes, emails and contributions at various events were used as primary data in the project.

2.7 Open workshop with community residents – verification exercise

A central element of the work was the direct engagement with members of the public [3] in the case-study communities. Using a variety of activities, community members were asked to identify their awareness of PWS in the area (for example by mapping them); exploring their notions of 'water quality' and identifying any concerns they had about water quality or other aspects of supply in the locality. The framework for these considerations was informed by the results emerging in the baseline studies. The workshops in each of the four communities attracted good numbers of people (with over 20 at every one). Each event lasted between 1.5 and 2 hours.

2.8 Information day to address issues arising

The response to the 'verification events' was unpredictable at the project outset, as it was intended to be receptive to the needs' of the communities. As we report in Section 3, three of the four communities were in need of greater levels of information in a variety of problem areas. In one area, however, further engagement with the community was necessary rather than an Information Day and the community researchers suggested doing a lesson with the local school children about water availability; which they then explained to their parents at the end of the day. This allowed further engagement with researchers and the community as to their opinions about PWS in the area and received a positive response.

2.9 Experience sharing

The final element of community engagement was a sharing event for community researchers, core research team and members of the project Steering Group. This had several aims:

For community researchers to:

- Share experiences directly as community researchers
- Offer their own observations on the learning from the project with respect to PWS issues and involvement in the project as 'community researchers'
- Offer indications on community-engagement research 'good practice'
- Identify issues they aimed to develop as a result of community capacity built through this form of 'action research'

For Steering Group members to:

- Hear directly from community researchers about PWS-

[3] We did not seek to recruit only residents on private water supplies though in reality most individuals who attended the verification workshops (and some stakeholders) were reliant on these for domestic water use.

engagement locality-specific issues
- Introduce themselves and provide initial feedback to community researchers
- Establish lasting contacts in the communities that could form the basis of future engagement

3.0 Engagement Findings

Community-specific baselines for each of the four communities are reported in the Community Profiles (published as a separate report).

3.1 Water Quality

3.1.1 Introduction

The first theme explored with the communities was 'water quality': what communities understood to define 'good quality' water; their perception of the quality of their water, and what might threaten good quality. Associated topics, such as connections between water quality and health, including notions of risk and concerns, were also discussed.

3.1.2 Definitions and perceptions of quality

Water quality was very important. It had sometimes influenced people's choice of where to live, and could be an emotive issue. There were often optimistic responses to PWS 'problems' with the opinion frequently expressed that if you live in these areas (reported positively by those raising the issue) you accept these as part of the way of (rural) life: the 'compromise' residents made.

'Quality' was primarily defined in terms of taste and clarity. However, PWS water was also described as 'unadulterated'; 'pure' and 'straight off the hill', indicating an appreciation of naturalness. The majority had a (very) high regard for the quality of their water, though this was not clearly defined and varied by community. Being safe (to drink) was considered as one aspect of quality.

Acidity of water and manganese levels were mentioned by some. Acidity was perceived to cause damage to pipes and tanks; 'green hair', and blue staining of sanitary ware and also raised concerns about non-specified health impacts. There was less evidence of understanding the link between manganese and quality; concerns were primarily linked to the inconvenience or costs due to failed regulatory tests rather than to any adverse effects.

Universally, participants reported the taste of their water positively, frequently contrasting it with that of mains water with specific mention of the absence of the taste of chlorine. When asked what they meant by 'untainted' or 'unpolluted' a number indicated that this meant having no chlorine or other added chemicals. A common view was that PWS water was of a superior quality to mains water and was contrasted positively with 'city' water. It was expressed that water should be 'tasteless'.

It was felt water should be 'clear'. Quality in this respect was described as less consistent and attention was drawn to strong variability: water reportedly varied from 'crystal clear' to 'brown' for some supplies. After heavy rain, water was reported to be strongly coloured, taken by some as an indication of poor quality. Interestingly, whilst there appeared to be an understanding that brown water may be less safe to drink, there was also a positive appreciation of this colouring, as it signified a connection with the land.

Unlike the community responses, local authority officers defined quality almost exclusively in terms of safety, with particular emphasis on microbiological elements. Community members also acknowledged that local authority communications, including 'official leaflets' and the information about the Scottish Government's grant provision, had raised awareness of safety and microbiological contaminants in particular. These different interpretations of quality go some way to explain why in one case-study area, water was rated very highly by PWS users, but was described as 'terrible' by local authority personnel.

3.1.3 Water quality and health: safety, risk and concern

Levels of concern about health risks and impact varied. Within the workshops, it was rare for community members to raise specific health concerns with respect to the quality of their PWS, though it was expressed as a concern by a number of interviewees and in one area there were reports of minor or major incidences of poor health. Allusions were made to a 'stomach upset' and 'tummy bugs' suffered by visitors being blamed on the water whilst one stakeholder raised bacterial contamination as 'the biggest issue'. The notion that local people were immune to various health effects was commonly held; with some residents indicating that they 'did not allow' visitors to drink local water and provided bottled water instead. Sometimes health concerns were raised obliquely; for example one person drew attention to the fact that after heavy rainfall they would only drink boiled water as they took a darker peaty colour to indicate an increased health risk.

With regards to risk, there was some concern with the way health risks were calculated. One view was that there was an acceptable level of risk associated with use and consumption of their [better quality] water. It was found that an indication of bacterial contamination in regulatory test results did not always translate into a perceived health risk: for example, there was not really a sense of risk until there was an incidence of illness.

Apart from health risks, business risks were mentioned. The imposition of boil notices and regulatory tests being carried out whilst (paying) visitors were in residence were perceived to have a negative impact on business. Some businesses had concerns over liability. Having a PWS in itself, and the taste and clarity of the water, however, was thought to attract business / visitors.

3.1.4 Reliability

Community members often equated quality with reliability of supply (i.e. quantity) as their overriding concern. Respondents remarked that when they had water, it was good, but due to frequent blockages, it was not always available.
There were two distinct scenarios in which water availability was compromised: most commonly as the result of intake tubes blocked by debris, which occurred after heavy rainfall but also as resources were depleted during dry weather. In all areas, participants could recount instances where prolonged periods of dry weather caused supplies to dry up.

Additionally, water infrastructure issues such as leaks were reported to affect availability.

3.1.5 Threats to quality

Apart from adverse weather, the most immediate perceived threats to quality were associated with forestry operations and other land-based activities: felling and planting operations, pesticide spraying, and livestock practices. A number of respondents mentioned experiences of frogs and vermin in tanks, although in some cases improvements had since been made. Whilst workshop participants seemed to have an understanding of several aspects of good practice in catchment management, they

4 Italicised comments are direct quotations from (anonymised) individuals attending public events

did not always have direct control over these.

Interestingly, imposed solutions – such as the provision of a chlorinated supply – were also mentioned as a threat to quality.

3.1.6 Water quality summary

When asked their perceptions of quality, community residents drew on a range of terminology often to convey their expectations of purity. There was a firm belief expressed universally that the water in their respective areas was seen to be of (exceptional) high quality – in some cases articulated as a selling point of the community. Where there was a concern this was usually seen as something they took in their stride and for most was a minor inconvenience seen to be easily dealt with through a variety of mitigation strategies. Many indicated that substantive issues were often outside of their direct control – notably issues associated with catchment management.

3.2 Technical aspects and responsibilities

3.2.1 Introduction

PWS feature distinct components, for example upstream catchment, intake structure, tanks, pipework and in-house treatment. The distinction between these components was particularly relevant when considering to what extent improvements could be made or instigated by PWS users. Control of the various components did not always reside with the PWS user; where it did not, this limited the user's options for improving quality. This applied in particular to catchment management interventions and sometimes hindered improving water quality. Other barriers such as financial constraints also limited improvements. This section explores these issues.

3.2.2 PWS technical considerations and house tenure

There were a range of issues raised relating to property ownership and responsibility, with confusion, not least for new home owners, who had not previously encountered or lived in properties with PWS. As part of the initial verification workshop activity, we invited participants to map their own PWS. It was found that whilst a number of participants had very detailed knowledge of their supplies, others expressed uncertainty around location of sources and infrastructure. This was particularly the case for newer residents and those who relied on others to provide or maintain the supply. Some expressed real concern that this local-infrastructure knowledge was being lost as properties changed hands or long term residents left. This was seen to make maintenance increasingly difficult and to increase community vulnerability. Similarly it was noted that landlords did not always know who was using the water resources on their land, thus adding to this complexity.

The responsibility for a PWS was seen as a central issue by many across the case-study areas; one stakeholder stated that when a PWS 'dries up' it is the responsibility of the user to find another source.

3.2.3 PWS systems

Several types of water sources and treatment installations are being used. Water was drawn most frequently from surface waters (mostly streams, but also a shallow pond and spring supplies), as well as one shallow groundwater system and a small number of boreholes. The most common treatment appeared to be a two-stage particle filter plus UV filtration, but other systems were also mentioned (including a chlorinator). Some residents had no treatment other than a very coarse screen at the intake to keep debris out of the pipes.

There was no consensus in the case-study areas on the need for water treatment. Some felt that no treatment was required; others reported that prior to treatment water quality had been very poor, whilst some interpreted the need for treatment primarily as necessary to pass the regulatory test or to comply with building standards.

In terms of installation of treatment systems, there was in some areas confusion with respect to the most effective system and in a number of cases a particular desire to have more sophisticated information about appropriate solutions or interventions. Some residents felt their systems were not capable of coping with the highly variable quality of the water source. There were concerns around the longevity of infrastructure. In one particular case, a workshop participant articulated the acidity of their supply meant that pipes and tanks were being corroded, citing that a water tank had lasted two years instead of thirty. It should also be noted that in some of the areas, power supplies are intermittent, thus limiting the choice of suitable systems.

Stakeholders felt that residents were poorly aware of maintenance requirements and did not carry out maintenance until a problem such as illness or a (pipe / system) blockage arose. Others in the community were aware of the need to replace filters, but reported that after very short periods of time (a few days to a few weeks) filters looked black again, which appeared to contribute to a feeling that no more could reasonably be done. When problems arose, residents adopted a variety of 'mitigation' strategies, such as buying bottled water for drinking.

3.2.4 Maintenance arrangements

A diverse array of maintenance practices were in place across the communities. For example:

- Informal arrangements, whereby one or two residents carry out inspections or repairs
- A 'Community Maintenance Company' that could be called upon for repairs (for a charge); employing a person who had previously undertaken the work 'informally'
- Business taking the lead: where a business and one or more residential properties shared a supply, it was often the business who took responsibility for maintenance, although sometimes other properties contributed to costs
- Long-serving plumbers looked after and had good knowledge of local supplies
- Private landowners taking full responsibility for properties on their estate
- Unclear situations: for example in tenanted properties, including in one case where an estate owner had died intestate
- Ad-hoc (particularly when things went wrong).

A number of workshop participants drew attention to the physical nature of the work needed, often undertaken by residents themselves, and an awareness of vulnerabilities ensuing with old age.

There were indications for a desire to understand more fully the best options for establishing better (and formal) arrangements. However, caution is needed with this approach, as others expressed unwillingness to join any community approaches as their experiences indicated that these would be unlikely to work and may lead to conflict.

3.2.5 Appetite for improvement

Several respondents commented on quality improvements that

had already been made, with reference to iron pipework having been replaced; filtration systems put in place; tanks upgraded etc. The availability of the local authority grants was reported as having supported many of these improvements.

Some respondents indicated their intention or desire to make (further) improvements. Three predominant opinions deterred people from to making improvements to PWS:

1. Although water quality is not good enough, nothing more could be done due to a lack of suitable options
2. While the system could be improved, they (or a previous owner) had already used up their grant
3. No improvements were required.

3.2.6 Technical issues - summary

At a practical level, 'technical' issues raised the biggest barriers for PWS users / owners. Infrastructure was often seen to be complex and, for some, largely unknown in as much as they were unaware of the system networks in any detail, often relying on the expertise of others and in many cases of one key individual. Responsibility for maintenance was often seen to be lacking in clarity. There was a lack of certainty on what was the 'best' system in a given context to ensure good water quality. This has potential impacts upon individual and the community's vulnerability. Engagement strategies which develop potential appropriate solutions to these are likely to be well received.

3.3 Management, ownership, upkeep and testing requirements

3.3.1 Introduction

A PWS may draw water from a source owned by a landowner who does not own the properties to which the water is delivered, and the property may be let or be part of a tied tenancy. The supply infrastructure may be owned by one or multiple persons; one of several users (for example a business owner); by multiple users in shared ownership or by the house owner or the land owner. These complexities have had considerable impacts upon associated management and testing issues.

3.3.2 Responsibility - Complexities of landownership, land management, home ownership, tenancies

Arrangements around ownership and responsibility appeared to be both complex and obscure. There was a general feeling in all study areas that more clarity on responsibility for supply management was needed. For example a local tradesman related that a PWS user had called him out for a repair, but referred him to the landlord for payment, which the landlord was reluctant to pay. Landowners expressed concerns about unexpected expenses impacting on sometimes marginal profits whilst residents often reported not wanting to make a fuss.

Many positive experiences of management arrangements were also voiced:

- significant investment in treatment installations serving multiple estate properties
- effective communal management
- ad-hoc group-scheme management systems functioning without conflict
- effective land-management.

Whilst improved catchment management appeared to be favoured over technological interventions alone, residents lacked awareness of what to do if landowners did not adhere to good practice.

Concerns were raised around land-management issues where commercial activity had the potential to impact on the quality of water or the integrity of PWS infrastructure. Some community members identified that because activities like forestry had complex contracting and sub-contracting arrangements for different aspects of the work, it left them confused and frustrated as to whom they should contact if they wanted to make representation or complain.

3.3.3 Management models encountered

Some good practice associated with maintenance arrangements was evidenced (see Section 3.2.4). Ad-hoc arrangements with a volunteer manager on shared supplies appeared more vulnerable. The Irish National Foundation of Group Water Schemes (NFGWS), who contributed to the project Information Days, reported that their associated members implemented good practice in community owned and managed schemes; maximising use of local knowledge with centralised provision of support and advice, job creation, economies of scale for installation and online testing (for example Colilert® system) of some parameters.

NFGWS: rationalisation and community management schemes

The second workshops, largely formulated as Information Days, sought to answer some of the questions the communities had around PWS and, as part of this, the project brought in the Irish National Federation of Group Water Schemes (NFGWS) as experts on technology. The NFGWS supports private and part-privately-owned water schemes to achieve and maintain water quality standards. During the NFGWS contributions it became obvious that technology options and management structures were strongly interlinked. In Scotland, although intake structures and storage tanks are frequently shared, nearly all filtration systems are implemented at household level. By contrast, in Ireland, most of the group schemes, which are managed collectively, treat water before it is distributed to individual properties. When visiting our research areas, NFGWS representatives identified a significant potential to amalgamate treatment installations in the communities; deeming that installation of community-sized filtration systems could not only deliver economies of scale on the treatment itself and allow for larger structures such as sand filters, but also for on-line quality checks such as a Colilert® system, to address the uncertainties over quality in-between regulatory tests. As the group schemes are typically community owned and managed, the reluctance among some to engage with the regulator would not be a barrier. The organisation further provides training for operators, publishes a quarterly newsletter, is involved with initiatives on source protection and water conservation and acts as a representative of group water schemes in partnership structures with local authorities and national government. Moreover, it appeared to form a vital link between communities and governing agencies, in that water quality standards set by the agencies, are achieved for and by the communities themselves, with the necessary support: an example of good practice in co-producing solutions.

3.3.4 Liabilities

As with responsibilities, there appeared to be a great deal of confusion over liabilities. Some businesses had a clear sense of responsibility towards their customers, but were unsure to what extent they would be liable should a customer experience adverse effects. Others appeared to imply - although not with much certainty - that they thought offering visitors the option of bottled water absolved them of responsibility for ill effects due to unsafe tap water. None of those who, often voluntarily, carried out routine management and maintenance tasks mentioned to what extent they felt responsible, or would assume to be liable, for water quality related health effects.

3.3.5 Testing

3.3.5.1 Aims and outcomes

There was considerable confusion amongst community members about the testing regime. This appeared to be rooted in misunderstandings of what the water testing requirements seek to achieve. The view often expressed was that testing should guarantee water quality; yet at the same time it was seen that an annual test could not provide such a guarantee. In the absence of this guarantee, quality was judged largely by taste or by colour. Few residents knew the technical distinctions between 'Type A' and 'Type B' supplies: this is perhaps unsurprising given the technical nature of the definitions. However, there appeared to be no confusion about which supplies were liable for testing on the ground.

Despite many community members expressing satisfaction with local authority advice regarding testing, it was also found that there was, at times, ambivalence towards the local authority or suspicion of their actions or motivations.

3.3.5.2 Relevance to the community

There was a general feeling amongst participants that the annual test did not offer the PWS owner any sense of safety, due to their awareness of the variability of quality. Some felt that the test result reflected the weather conditions at the time more than the adequacy of the installation, and therefore perceived the test as largely irrelevant. Given that a negative result could lead to considerable cost and inconvenience, some residents resented the testing regime. Furthermore, there was evidence that when a regulatory test was announced and weather conditions were poor, some people 'try and put [the testing officer's visit] off' until conditions had improved.

There was evidence that residents prioritise 'passing the test' over ensuring the safety of their supply. 'Fails' had an immediate and significant impact on people's lives and finances. It emerged that some Environmental Health departments have logistical difficulties in getting samples from remote and island communities to the lab in time for analysis, indicated by a note on the test report stating the results are not valid. To be made to act on a 'fail' and pay for retesting on the basis of invalid results contributed to a sense of 'irrelevance' and in some cases anger. Consequently some residents on Type B systems reported to prefer to 'fly under the radar' rather than to seek advice from the local authority on improvements, grants, etc.

3.3.5.3 Effect on business and liability

There was variation in concerns between those who had commercial establishments and domestic PWS users. For businesses, there were concerns over being able to meet the quality standard or pass the test and how to ensure they can guarantee water quality for consumers, notably those running catering establishments. Some of the associated problems were seen to be beyond their control, for example when they suffer power outages that impacted negatively on the effectiveness of UV systems.

Some companies felt that despite having invested significantly, their systems were unable to cope with raw-water quality. This caused concern either because they felt their customers might be at risk or they might fail a test. This could place business owners somewhat outside of the community. Engagement with business owners needs to be sensitive to business needs, but also understand community relations. Whilst local authority staff appeared to minimise inconvenience to business owners, a residual inconvenience and perceived negative impact on, for example, visitor experience remained.

The project's key aim was to engage with local community residents. It is apparent that businesses in a range of areas related to PWS have different and additional concerns to those of residents which may need further exploration.

3.3.6 Management summary

When engaging with PWS users, it is important to realise they may not have control over the entire, often complex, system, which may limit their options for quality improvement. It is laudable that local authorities already appear to handle landlord-tenant situations sensitively and important that they continue to

do so. The agencies should also consider that when rights and responsibilities are clarified around a range of issues (including testing), cases may emerge where properties do not have the right to a suitable water source. Options for community-based management structures were presented as possible good practice during the second workshops by drawing upon the NFGWS experience. These may represent realistic options for communities, however more investigation of this approach would be needed to explore communities' receptiveness to such an approach.

3.4 Community make-up, changes, resource and input

3.4.1 Community context changes and make-up

The changing composition of these very small communities - in one case being barely over 100 residents - was often the cause of considerable speculation as to the likely impact these changes might have on a range of PWS-specific issues and these may need further investigation.

3.4.1.1 Recent settlers

A difference in attitude to PWS between long-term residents and those who had been living in the area for a shorter time was identified, for example towards the perception or definition of (good) quality. Longer-term residents were thought to be more accepting of existing arrangements and of water quality. Recent migrants however, had considerable concern as to the nature of their responsibilities for maintenance and a lack of knowledge of the existing infrastructure.

3.4.1.2 Temporary demographic impacts associated with tourism

A number of the communities identified a considerable seasonal impact upon their demographic structure made by tourism (day visitors and those who have holiday cottages or second homes). One community drew attention to past experiences of PWS supplies drying up and there was speculation that such population changes may be contributing to this. In addition, some drew attention to the information needs of temporary residents with respect to PWS: often holiday makers were unaware that water was locally sourced as a PWS and less aware of the need for water conservation.

We offer caution on these findings, because we feel they would need separate research to fully explore them, as at public events it was not possible to draw out such issues in detail.

3.4.2 Vulnerability and resilience

Residents were aware of the vulnerability of their own communities resulting from PWS use. This was something of a conflict with other findings from the research, notably those which articulated a belief in the high quality of the water itself. Vulnerability concerns were expressed as the unreliability of some technical solutions; the recognition that maintenance or repair within the whole community was often reliant upon one individual; the need for physical labour in the context of an ageing population; and the lack of supply reliability in the summer months. Such individual or combined situations were seen to have potential impacts upon the future of the communities and particularly their economic viability.

3.4.3 Commercial activity

All the communities included the operation of commercial activities to a greater or lesser extent, which had varying degrees of reliance on PWS. Whilst there is no agreed definition of 'high quality', for some industries, such as the drinks industry, a notion of this is central to the business operation.

3.4.4 Community make-up - summary

There is a sense within the communities under study that the locally-specific changes they are experiencing have the potential to impact upon their vulnerability with respect to PWS. Engagement with separate (sub) groups of the community may have value.

3.5 PWS costs

3.5.1 Introduction

There was little evidence that private water was perceived to be 'free'; costs were a major concern amongst community members. Many drew attention to the considerable costs associated with infrastructure installation and maintenance, but also the work and cost of retesting following a failed regulatory test. The unpredictability of these costs caused considerable anxiety for some individuals. Some raised questions about whether alternative supplies were more cost efficient, for example boreholes – but many noted this could be a high-risk solution in which one could never be certain if the water supply would be reliable and wholesome until after it had been sunk (at potentially great cost). This also ties in with a worry about the indeterminate nature of costs associated with PWS.

One stakeholder expressed the view that there should be a 'compulsory payment' taken to ensure the supply and quality of water on PWS (possibly administered through local authorities). A view was expressed by some that rural areas are at a (financial) disadvantage: 'the more remote you are the more you are penalised'. By extension, one insisted on turning the cost argument 'on its head' arguing that PWS does not cost the Scottish Government anything.

3.5.2 Grant scheme

A one-off grant of up to £800 per property for PWS improvements was introduced by the government at the time the new regulations came into force. Whilst there had been some use of (and gratitude for) this grant scheme, some residents saw the amount as inadequate for the level of potential costs of (major) works, and further noted that no financial support was available for ongoing maintenance. There appeared to be confusion over whether grants could be used for catchment-management measures, for example fencing and who would be responsible for its maintenance. Residents were not always aware that grants could be combined to fund shared facilities. Similarly, in the case of tenanted properties, it was not always clear whether the landlord or the tenant could apply.

As a decade has passed since the introduction of the grants, many properties have already made use of this. If further works are required, and indeed if the property has since changed hands, no further funding is available. Extending grant schemes was identified as a useful incentive for further investment.

3.5.3 Costs - summary

There was no substantive evidence that participants saw water from PWS sources as free. There were however considerable concerns with respect to costs being unpredictable leading to potentially 'catastrophic' costs. The large variability of cost makes any general assessment liable to being misleading. Consequently when engaging with communities, it should be recognised that required treatment installations can be costly and beyond the means of the PWS user even with the availability of a grant, that grant options may not exist for all PWS users, and that the affordability of maintenance costs can be an issue.

4.0 Engagement Conclusions

There is considerable evidence from each of the communities that many community members are engaged with issues associated with PWS use and management. This is not however, synonymous with them having a full understanding of its context or how to ensure its effective stewardship.

There was often a mismatch in what stakeholders indicated were community beliefs or perceptions and what was articulated at the public events. For example there were expressions offered that community members had no real concerns about PWS issues – that these were seldom discussed or that the community had greater concerns than those relating to PWS. The evidence from the workshops indicates that, if this has been the case in the past, it might have been because there were no forums for discussion or the expression of concerns. It is worthy of note that the project saw large turnouts for the initial 'verification' workshops, that participants were keen to engage and make their views heard, and that discussion at the workshops was vigorous, often continuing after the event had been formally brought to a close.

To be able to engage effectively with communities, it is important to understand what communities' attitudes and perceptions are about PWS. The project uncovered a variety of possible improvements to management structures, maintenance regimes, technological applications, and pipe and tank infrastructures, many of which would promote enhanced equitability, resilience, access to water, and a reduction of health risks and associated vulnerabilities. Specifically, it is worthy of note that:

1. The quality of water from PWS is generally perceived highly and is strongly valued; specifically with regards to both its perceived naturalness and immunity (by local community) to risk, and lack of chemicals. This should be seen as a positive context upon which agencies might build, with engagement discussions on the variable water quality community members' experience.

2. Technical issues created the greatest problems for PWS users and owners; infrastructure and the system network are complex; responsibilities of ownership and rights are unclear; uncertainty exists as to the best type of system. This may affect a community's ability to be resilient. Attempts to engage communities around these issues and potential solutions are likely to be well received.

3. Due to differences in ownership and responsibilities it is important for agencies to realise that it may be difficult for individual PWS users to make drastic changes to improve their water quality. Local authorities appear to handle landlord-tenant situations sensitively, and this should be continued. Other agencies should also be aware of existing sensitivities around this situation and recognise that a feeling of disempowerment in this regard (i.e. not feeling able to change their situation) may discourage individuals and communities from engaging.

4. Nuanced differences within local communities may mean increased or decreased vulnerability in relation to PWS (for example increased demand from tourism, agriculture etc.) Engagement around these issues and sub-groups may have value, but would need to be dealt with in a sensitive manner in any future work.

5. No evidence was found to suggest that PWS users viewed their water as free. There was however considerable apprehension relating to unpredictability of PWS costs.

These findings are important in an engagement context because a lack of sensitivity to any of these could lead to a community not willing to engage. Also, these issues should not be thought of as discrete; they are complex and inter-linked. The clear indication emerging is that distinctive and locally-sensitive engagement is needed to address these issues directly and that this needs to be both ongoing and transparent. This nuance is seen as important as communities are at different stages of readiness to adopt new (management) mechanisms for example. As a result, any strategic response from agencies working with the community would need to build this variation into their approach to ensure success.

4.1 How to engage?

In this project, community researchers were an effective engagement tool. They were both an important resource and were crucial to the effective operation of the work. As a consequence they also represent increased community-based capacity for further work or interventions around PWS in the given localities providing and gaining valuable knowledge around associated issues. Specifically, they contributed knowledge of individuals and social structures within the communities, as well as local geographical and environmental knowledge which helped us to understand both the water catchment and the drinking-water infrastructure; they built excellent relationships with research participants; identified relevant stakeholders to interview; and ensured high levels of attendance at public events.

If agencies wish to engage with communities directly, given the requirement for locally-specific solutions, initial engagement should be on the basis of an assessment of the community's current understanding, perceptions and attitudes towards pertinent PWS issues. Where action or change is identified in this assessment as a need, this should be based on an examination of the community's readiness or some examination of its capacity for any associated (direct) involvement.

An important aim of engagement strategies is for communities to be empowered: PWS owners and users can only take direct action on those elements over which they have control. As uncovered by the research, some PWS users are unable to address issues with substantial elements of their supply, such as catchment management, which may result in poor intake water quality; increased cost of treatment (for example frequent replacement of filters); cost of re-testing in case of failed regulatory tests; and, more importantly, increased health risks. All these factors are disempowering for individuals and communities, resulting in a feeling that positive changes to PWS are outwith their control; as a consequence, much of the potential for good management and stewardship has remained latent.

The research highlighted that there are considerable opportunities for solutions to be 'co-produced' by agencies and communities. By this we mean agencies and communities working together at all stages to produce consented change on both sides. It is suggested that the communities' agenda in relation to PWS varies from area to area as do the locally nuanced solutions. Community representation can play a key role in strategic decision making, and when putting policies in place, by the effective use of existing stewardship mechanisms, and that which might be currently hidden, in communities.

In this project, there were found to be strong indications that commercial operators in rural communities have different (and additional) concerns about PWS over and above those experienced by the residential populations (the subject of this work). Further work on engagement strategies with the commercial sector in rural communities may be beneficial.

5.0 Recommendations

5.1 Strategic recommendations

5.1.1 Engagement

- The development of a PWS-specific engagement strategy, drawing together the needs of all relevant stakeholders and communities through a process of co-production. Whilst this should address strategic concerns of stakeholders, it should also consider how to develop nuanced responses at a local level – for example through the production of locally-specific and agreed community / infrastructural profiles.

- Further work exploring the needs and concerns of a wide range of commercial interests around PWS use to provide a broader picture beyond that of community residents explored in this project.

5.1.2 Resilience

- Further investigation with respect to the 'resilience' of communities that (largely) rely on PWS, particularly with regard to: infrastructure (technical and socio-economic) and environmental issues (notably reliability of supplies, for example at times of considerable temporary population change caused by tourism).

5.1.3 Information

- The development, as a priority, of an 'Information Hub' as a credible and authoritative information source for all who may live, use or rely on PWS to cover all (reasonable) aspects. This might include information on rights and responsibilities of (land) owners and tenants to maintain and ensure PWS provision; where further advice for each of these stakeholders can be found; health issues associated with PWS; the regulatory testing regime; technical advice on filtration systems and other infrastructural aspects; and any financial support available.

5.1.4 Support

- To consider the forms of support public agencies might offer to PWS users and owners in a wide range of areas. In some contexts this would go beyond the provision of information and might include direct initiatives for technical innovation and, similarly, look at new forms of grant schemes or appropriate models of financial or management support.

5.2 Section Specific

5.2.1 On water quality issues

- When engaging with communities, establish local definitions of quality. Communities often have a strong, positive appreciation of their water and take pride in their water quality. Any interventions seeking to address quality issues within a specific locality should establish these views in the early stages. Local formulations of quality should be evaluated accordingly with sensitivity.

- Publication of information on health and associated risks of PWS use by residents and visitors. This information needs to be widely available, in an appropriate format and easily accessible both online and to non-internet users and could be included in the 'Information Hub'.

- Direct engagement strategies with communities to explore issues associated with health risks, for example by the provision of clear 'state-of-the-art' knowledge, information and any associated guidance.

- After public notification of incidences of increased health risk, provision of information that the immediate risk has passed, for example by publishing additional public-information advice.

- Quantity issues feature highly on communities' priorities and there may be considerable appetite for improvement in this area. Measures that have the potential to address both quality and quantity may therefore find support even where quality is not experienced as a pressing issue and are likely to aid relationships.

- Clear guidance on what constitutes good quality water should be set out. This might address colour, micro pollutants and associated health risks / benefits.

5.2.2 On technical issues

- Consultation with appropriate bodies to encourage clear information to be provided in Home Reports (surveys) to indicate where a property is on a PWS and where relevant information on risks, responsibilities, management and maintenance is available. Equivalent information should similarly be made available for other tenures for new residents.

- Identify key principles of responsibilities for maintenance of PWS infrastructure where there are multiple stakeholders, for example where pipework crosses a variety of boundaries and properties.

- Source-to-tap mapping of PWS as a 'community resource' would be of value and should be provided to relevant community organisations.

- Publication of information on water filtration and other technological solutions to enhance or secure high-quality water. The most appropriate formats for this should be explored to determine how best to make this information available but it could be included in the 'Information Hub'.

- Explore options for encouraging good practice amongst installers with specific respect to installation and maintenance of PWS infrastructure, for example through additional training and associated schemes for accreditation.

5.2.3 On management, ownership, upkeep and testing requirements issues

- Explore how PWS users can access improved advocacy services, and how land owners and managers may benefit from clearer guidance on their responsibilities and liabilities with regards to PWS provision and maintenance. Set out established good practice models on management structures drawn from Scotland and elsewhere as appropriate.

- Provide greater clarity to PWS users on rights and responsibilities for meeting the regulatory quality standards, including issues related to catchment management and installation management, for example with respect to land / property owner vis-à-vis tenant owner etc.

- Provide greater clarity to individuals, businesses and organisations on liability issues so that they are aware of their legal position, for example liability, in case of adverse effects, and can take appropriate action, with respect for example to quality improvements and /or liability insurance.

- A community-based information campaign to shift the PWS agenda from the needs and logic of regulatory testing towards the maintenance of high water quality standards and to explain what testing does and does not seek to achieve.

- Draw out more fully the specific needs of commercial and other business-related activities, perhaps for infrastructural support around PWS, and the technical and financial challenges faced by businesses particularly.

- Further investigate the specific needs and concerns for commercial and business activities around meeting regulatory standards for PWS

5.2.4 On community make-up, changes, resource and input issues

- Consider further research on the influence of different community make-up on PWS, to see if community changes are impacting vulnerability or resilience with respect to PWS use and management and associated changing resource-demand issues.

- Consider further research on how future changes in water availability and demand are likely to affect PWS-specific vulnerabilities and resilience in (remote) rural communities

- Investigate potential economic (and consequent) social and other impacts of (expanded) PWS use and development to the rural economy as a result of impact of PWS-issues on commercial organisations specifically.

5.2.5 On PWS costs issues

- Explore options for estimating costs of PWS for community members over a given time period (e.g. one year). If these are not available, further research work should be considered to estimate or quantify this and its variability.

6.0 References

Devotta, K., Woodhall-Melnik, J., Pedersen, C., Wendaferew, A., Dowbor, T. P., Guilcher, S. J. T., Hamilton-Wright, S., Ferentzy, P., Hwang, S. W. & Matheson, F. I. 2016. Enriching qualitative research by engaging peer interviewers: a case study. Qualitative Research, 1-20.

DWQR 2016 Drinking Water Quality In Scotland 2015 Private Water Supplies, Drinking Water Quality Regulator for Scotland, September 2016

Mistry, J., Berardi, A., Bignante, E. & Tschirhart, C. 2015. Between a rock and a hard place: Ethical dilemmas of local community facilitators doing participatory research projects. Geoforum, 61, 27-35.

Richardson, H. Y., Nichols, G., Lane, C., Lake, I. R. & Hunter, P. R. 2009. Microbiological surveillance of private water supplies in England – The impact of environmental and climate factors on water quality. Water Research, 43, 2159-2168.

Teedon, P., Galea, K. S., Maccalman, L., Jones, K., Cocker, J., Cherrie, J. W. & Van Tongeren, M. 2015. Engaging with Community Researchers for Exposure Science: Lessons Learned from a Pesticide Biomonitoring Study. PLoS ONE, 10.

crew

Scotland's centre of expertise for waters

CREW Facilitation Team

James Hutton Institute

Craigiebuckler

Aberdeen AB15 8QH

Scotland UK

Tel: +44 (0)1224 395 395

Email: enquiries@crew.ac.uk

www.crew.ac.uk

The James Hutton Institute

Scottish Government gov.scot

CREW is a Scottish Government funded partnership between the James Hutton Institute and Scottish Universities.