Water insecurities in unexpected places: experiences of Private Water Supply (PWS) users in rural Scotland

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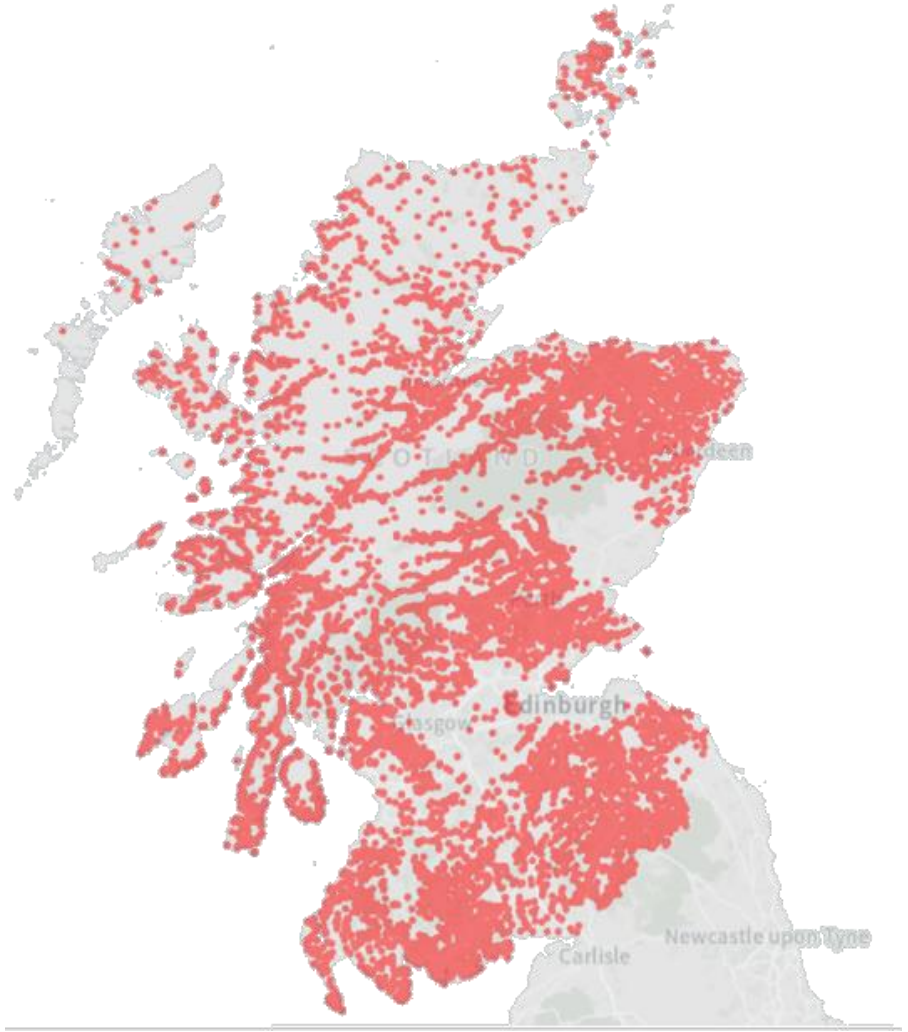
Private Water Supplies (PWS) and water security in Scotland

PWS are self-managed sources (e.g. springs, boreholes, lochs) and treatment systems managed by owners or users, not public or private utilities

- Sources may serve single dwellings or communities, mainly in rural areas
- There are 22k PWS in Scotland serving 3.3% of the population (~182k people)
- 4k are **Regulated** PWS serving: >50 people; commercial/ public activities (inc. privately rented accommodation); or >10m^3 water/day
- There are 18k+ **Unregulated** domestic PWS

  (Citizens' Advice Scotland, DWQR, 2021)

Location of known Private Water Supplies



Source: Drinking Quality Water Regulator, 2022

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Water insecurity challenges for PWS

- **Quantity**: Water scarcity affects PWS in dry periods (Holdsworth 2019; Rivington et al 2020)
- **Quality**: Poor for some PWS (CAS 2020, DWQR 2022)
- **Reliability**: Unprepared for climate change impacts (Valero et al 2022, Scottish Government 2022)
- **Affordability**: Upgrading to more reliable supplies can be costly, and connecting to mains supply is not always possible (Scottish Water; CAS 2020; Teedon et al 2020)

Framing: Scotland as an "unexpected place" for water insecurity e.g. low awareness of household water vulnerability (Valero et al, under review)

- How vulnerable are PWS users to water insecurity?
- PWS users (particularly unregulated supplies) are an "unheard" group
- **Relevant for ongoing policy development!**

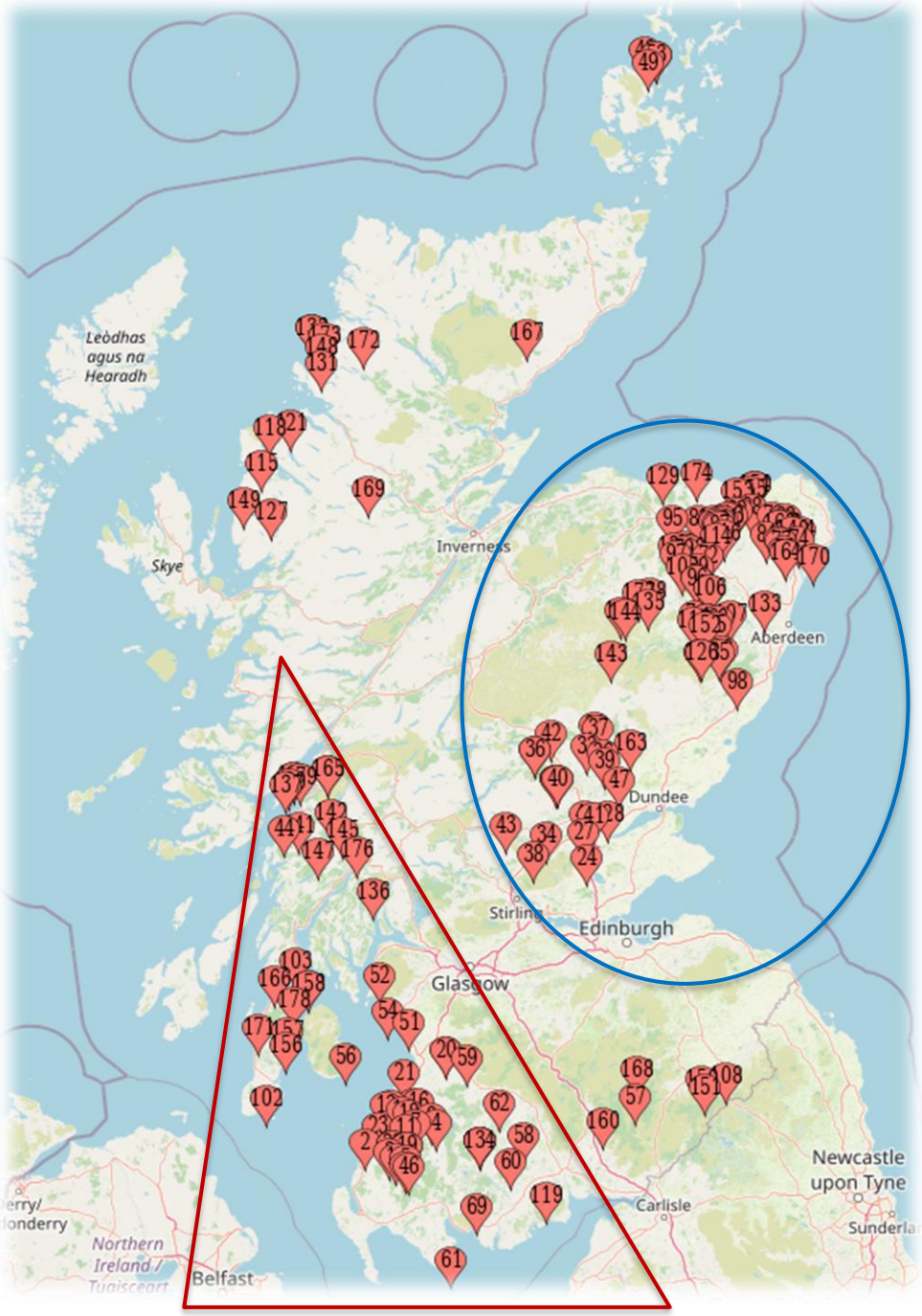
Online survey with PWS users

Aim: to explore the perceptions of risks for PWS water quantity and quality for households with PWS and identify a range of interviewees for the next stage of the research.

- Online questionnaire building on insights from reports (e.g. DWQR, CAS) and related research (e.g. Mooney et al 2022, Malecki et al 2017). Topics included:
  - Household characteristics;
  - PWS infrastructure;
  - Impacts experienced and responses;
  - Perceptions of risks;
  - Regulatory and technical support
- Recruitment via social media, with some users contacted via Local Authority email lists

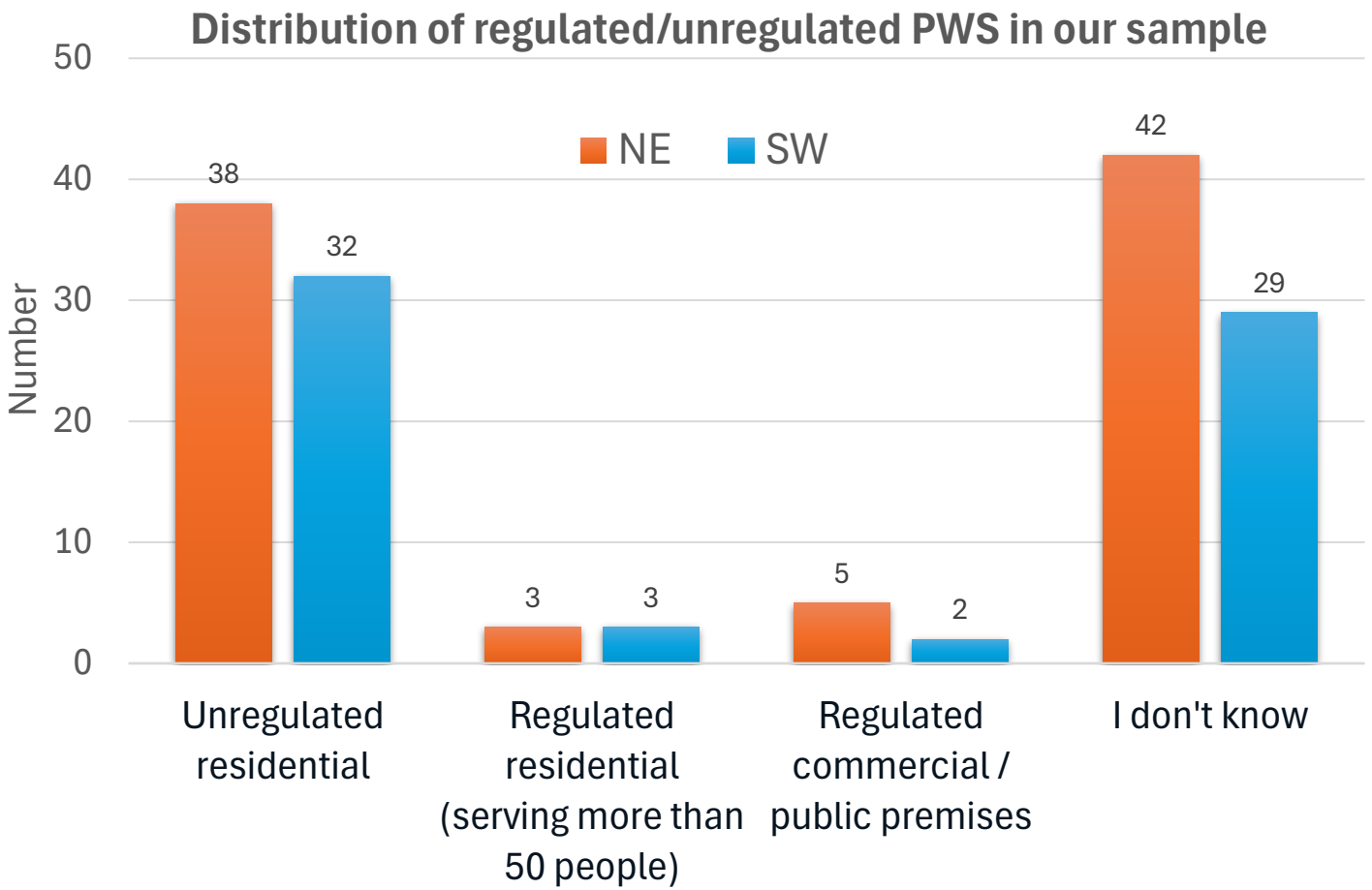
Exploratory results: vulnerability to water quality and quantity issues via relationships between:

- Northeast and Southwest Scotland (contrasting climate and land use; both with high numbers of PWS)
- Which factors influence vulnerability, and perceived current and future risks or concerns



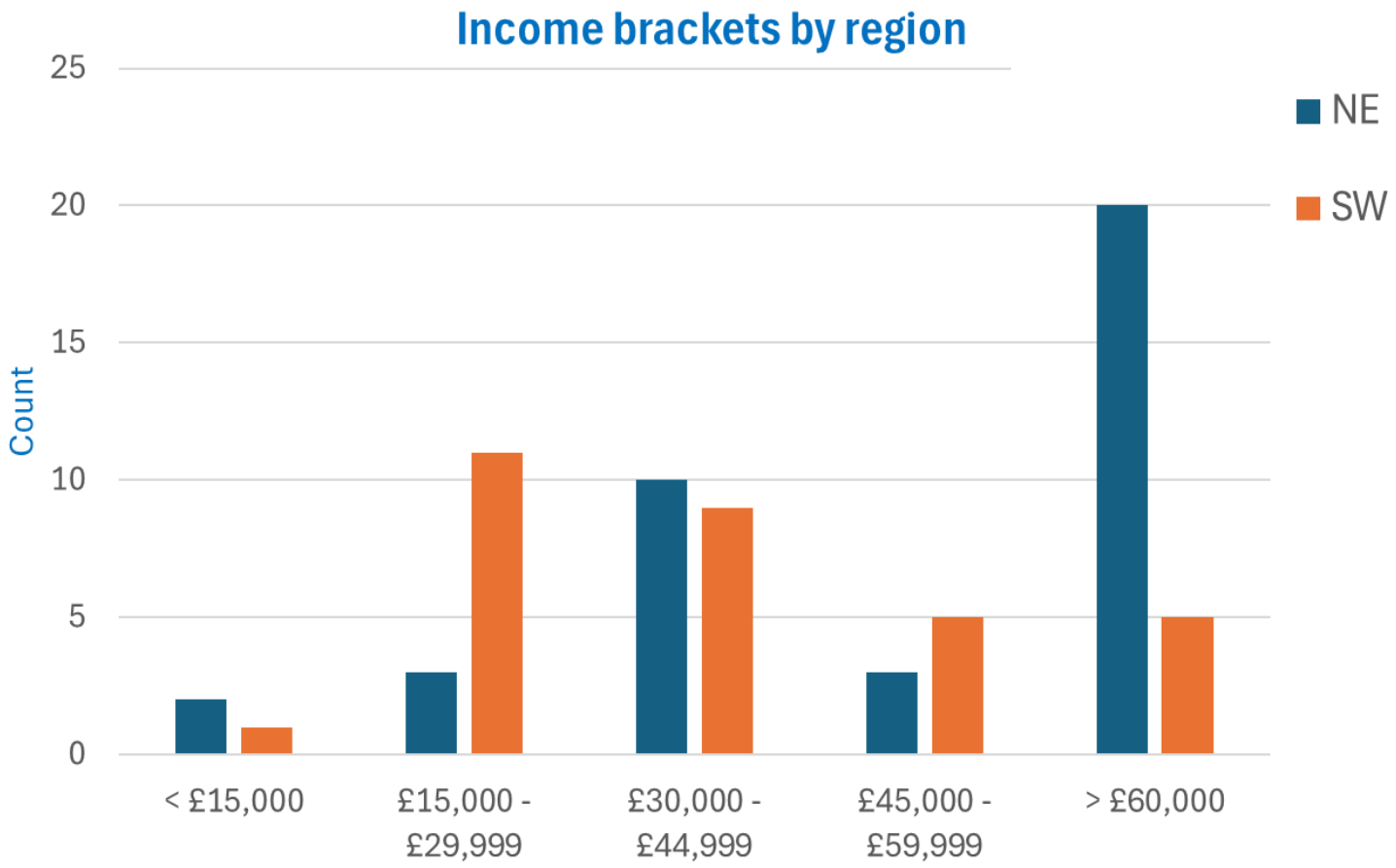
185 responses (Dec '23 – May '24)

- 88 NE
- 66 SW
- 31 elsewhere
- 91% of our *respondents were on unregulated* supplies (compared to 83% nationally)



Our sample of PWS users in Scotland

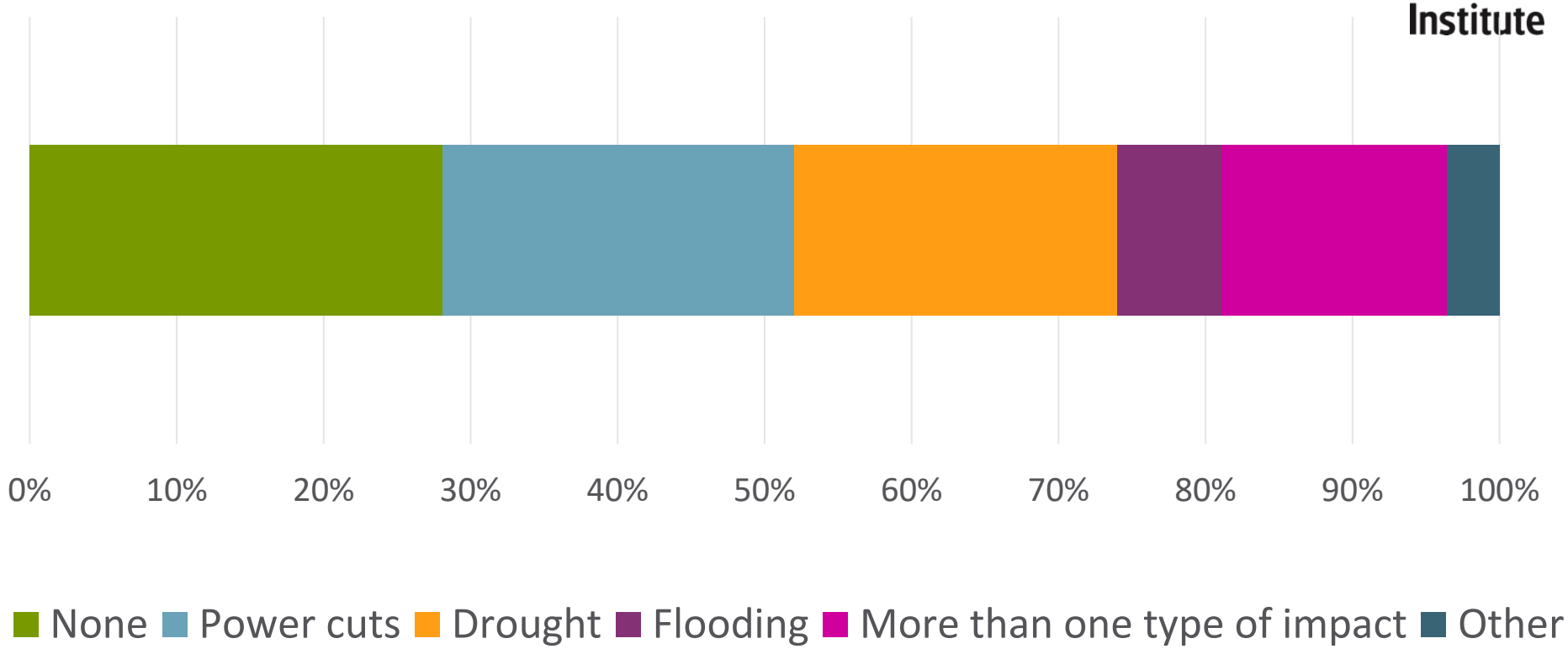
- **Age:** ~50% between 50-64, > 25% 65+, only 3% 18-29
- **Education:** primarily university
- **Income and deprivation:** 15% live in lower 2 Scottish Index of Multiple Deprivation (SIMD) quintiles
- **Tenure:** ~80% owner occupiers, 12% tenants/lodgers, and only ~1.5% landlords
- **Vulnerable people:** 20 responses indicated households with e.g. chronically ill, pregnant, unemployed



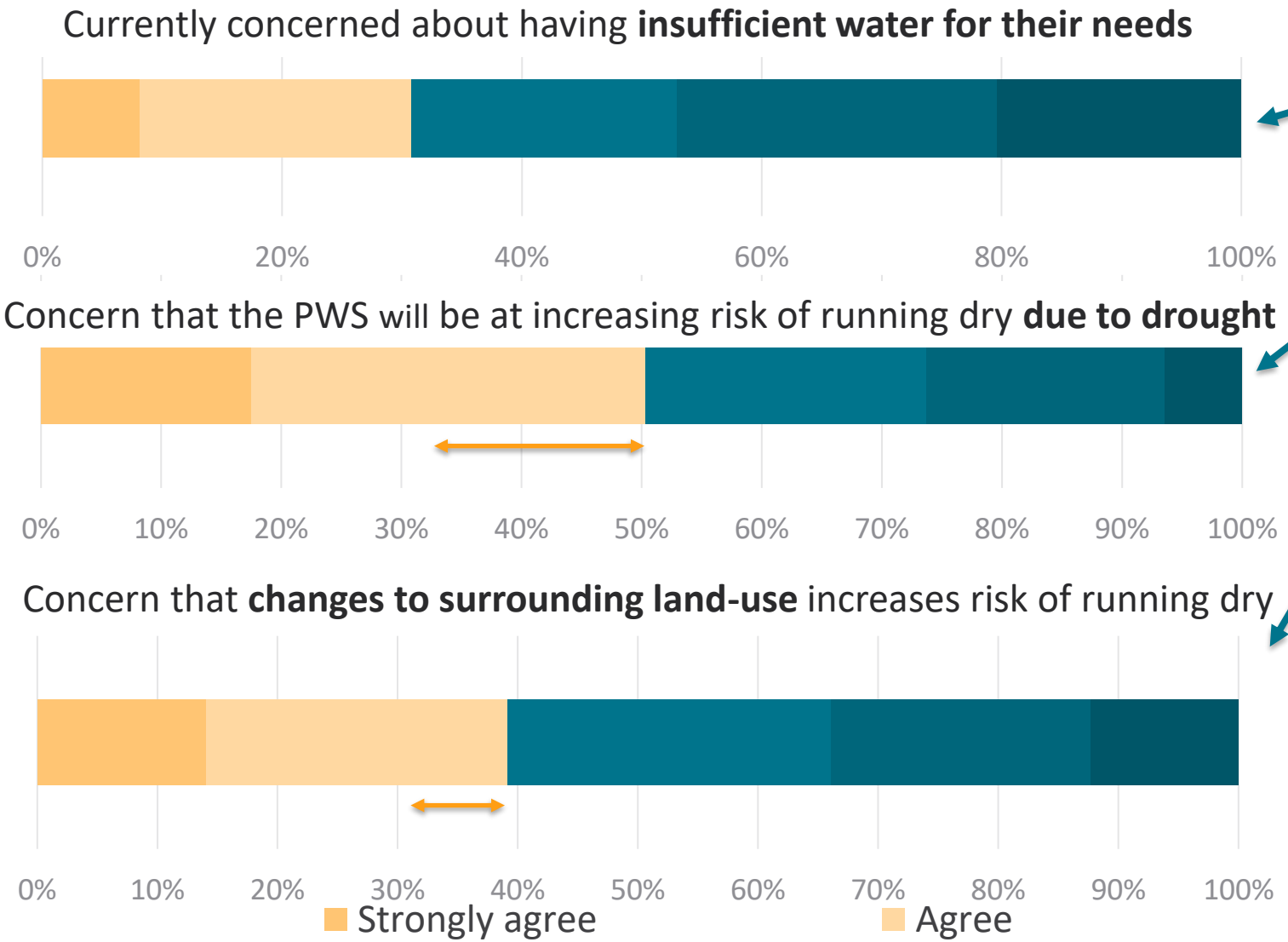
Types of impacts on water supply

Have any of these types of event ever impacted your PWS?

- 68 experienced supply issues due to power-cuts
- 43 from drought
- 14 from flooding
- *55 reported none of these, and **several had experienced more than one type of issue**.*



Concerns over sufficient water



31% of respondents are concerned about insufficient water for their needs at present.

50% expressed concern about increased future risk of running dry due to drought.

Almost 40% are concerned that changes to surrounding land use will increase the risk of the PWS running dry.

- Those that had insufficient water for their needs >2 times were mainly using surface or shallow sources e.g. springs (13), wells (5) or rivers (4).

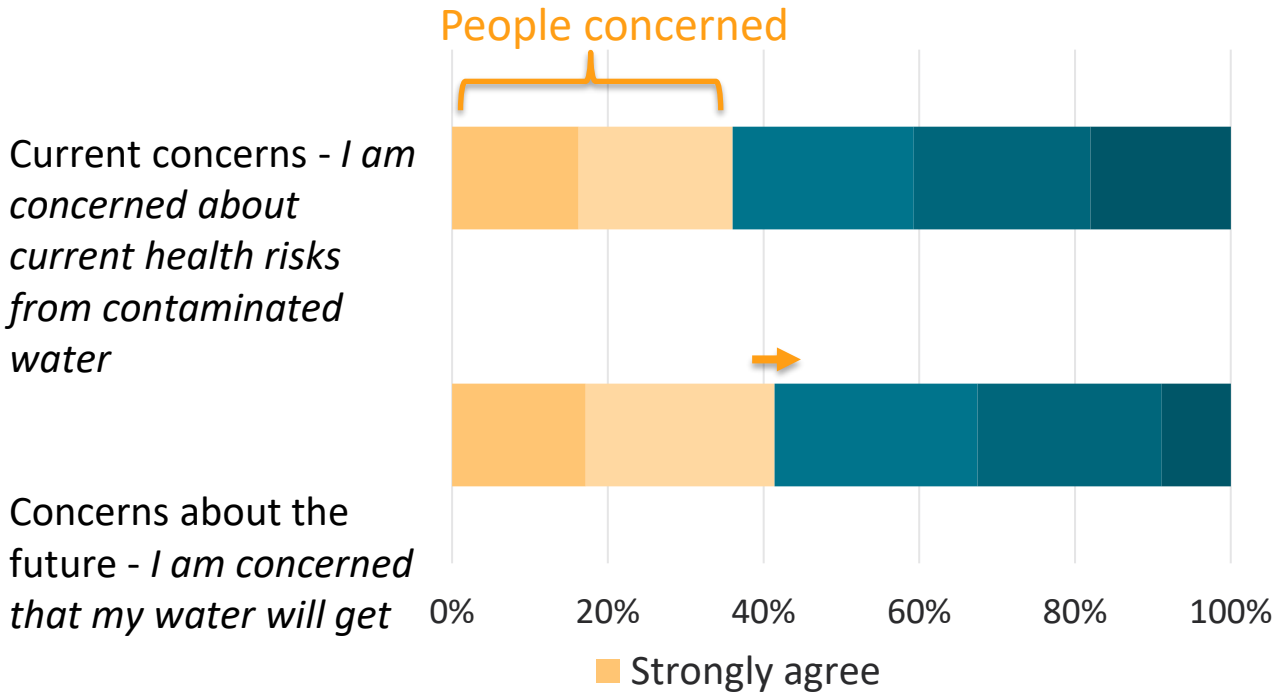
Examples of responses to lack of water

- “Take water from burn in buckets to house”
- “We have an extra supply from rain-water”
- “Local neighbour arranged with council for drinking water”
- “Collect water from other properties in containers for drinking and cooking”
- “Have to fill a tank up for in-laws' property to use”
- “Complain to landlords. Plead for support from landlords. Query about water supply deeds and rights”
- “Stop flushing pee except once a day”

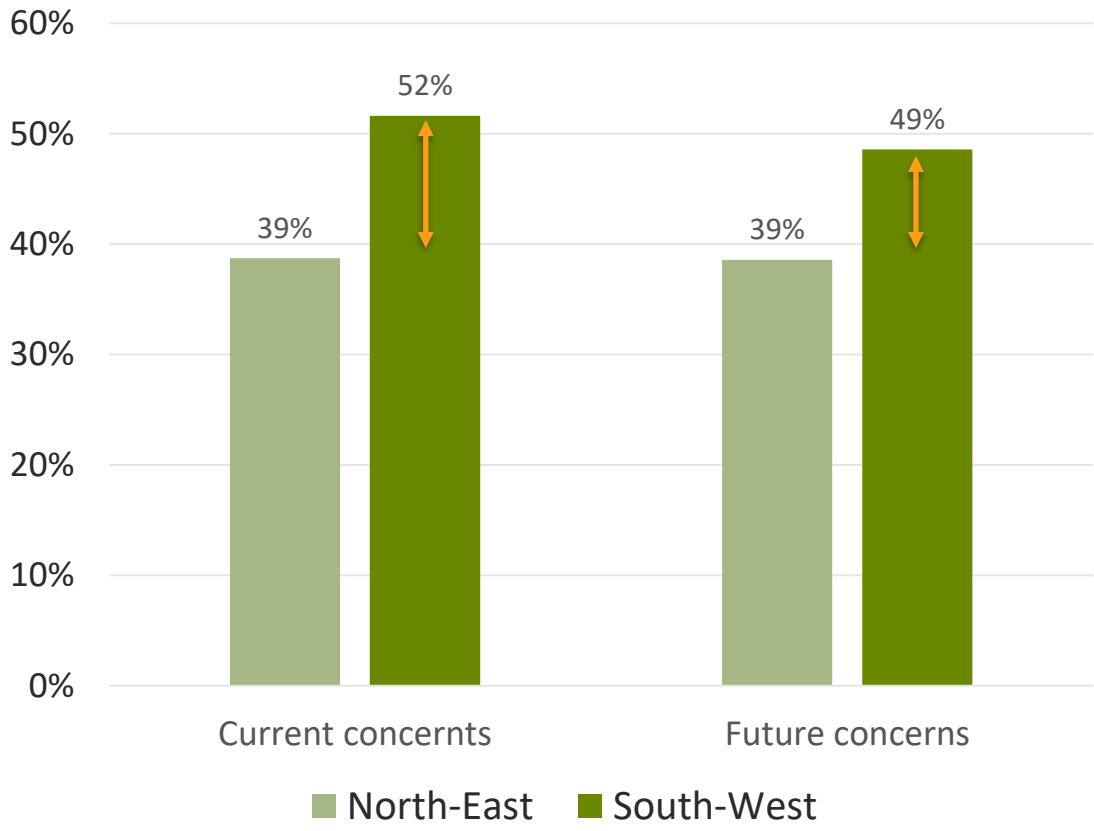
- **Short-term adaptation vs long term resilience**
- **Behavioural responses & social capital**

Concerns over water quality

1. Almost 2/3 of PWS users are not concerned about current water quality issues. The proportion of people concerned increases slightly when considering future water quality.

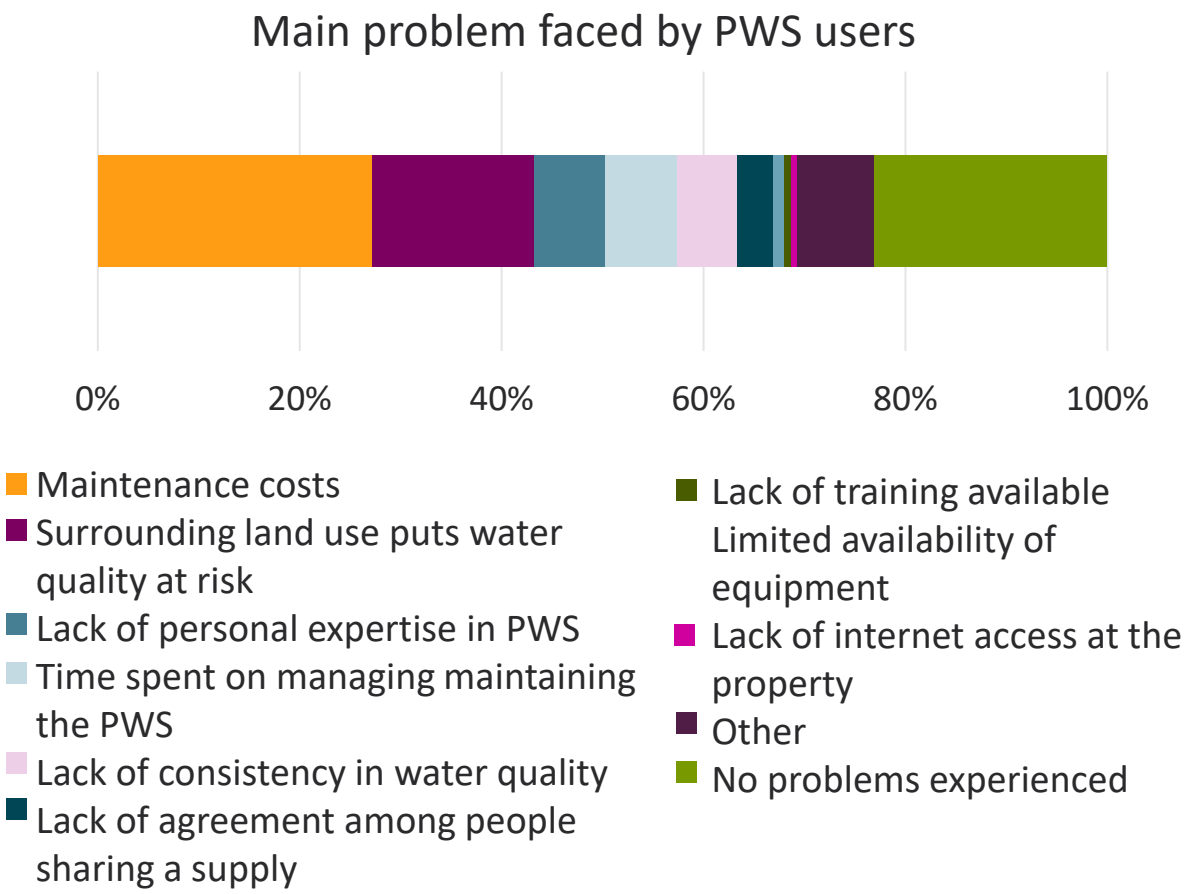


2. Concerns about water quality (both current and future) are more common among PWS users in the South-West of Scotland.



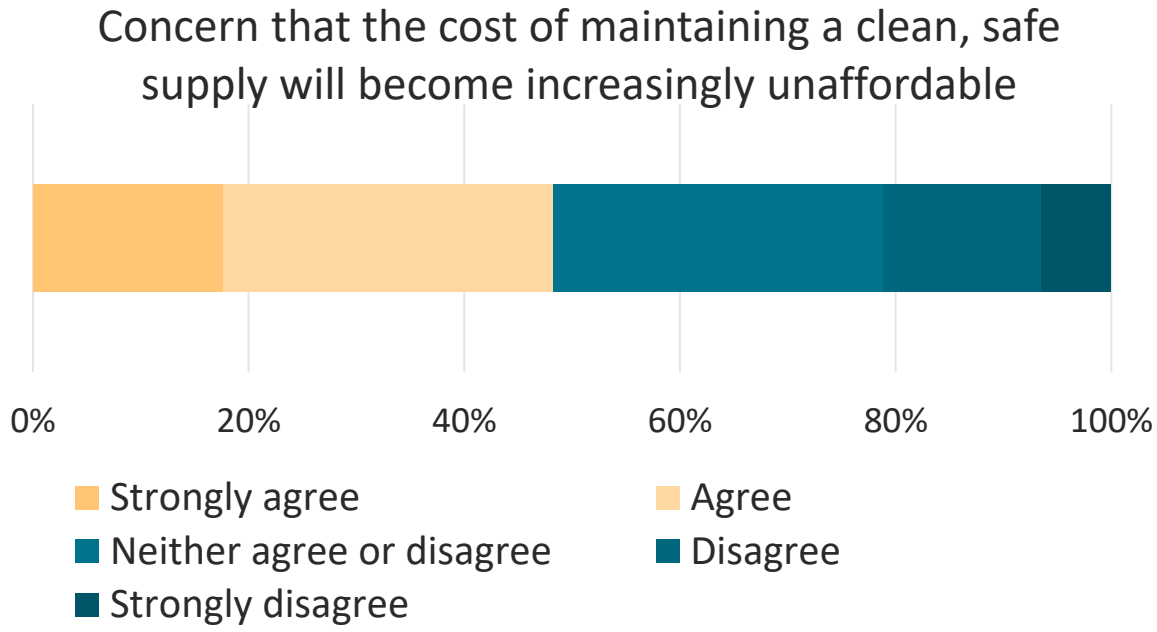
Affordability concerns

Currently: 27% of respondents identify **maintenance costs** as the main problem faced.



Future: Of the future concerns we asked about, the issue concerning the most people (48%) was **increasingly unaffordable** costs of maintaining a clean, safe supply.

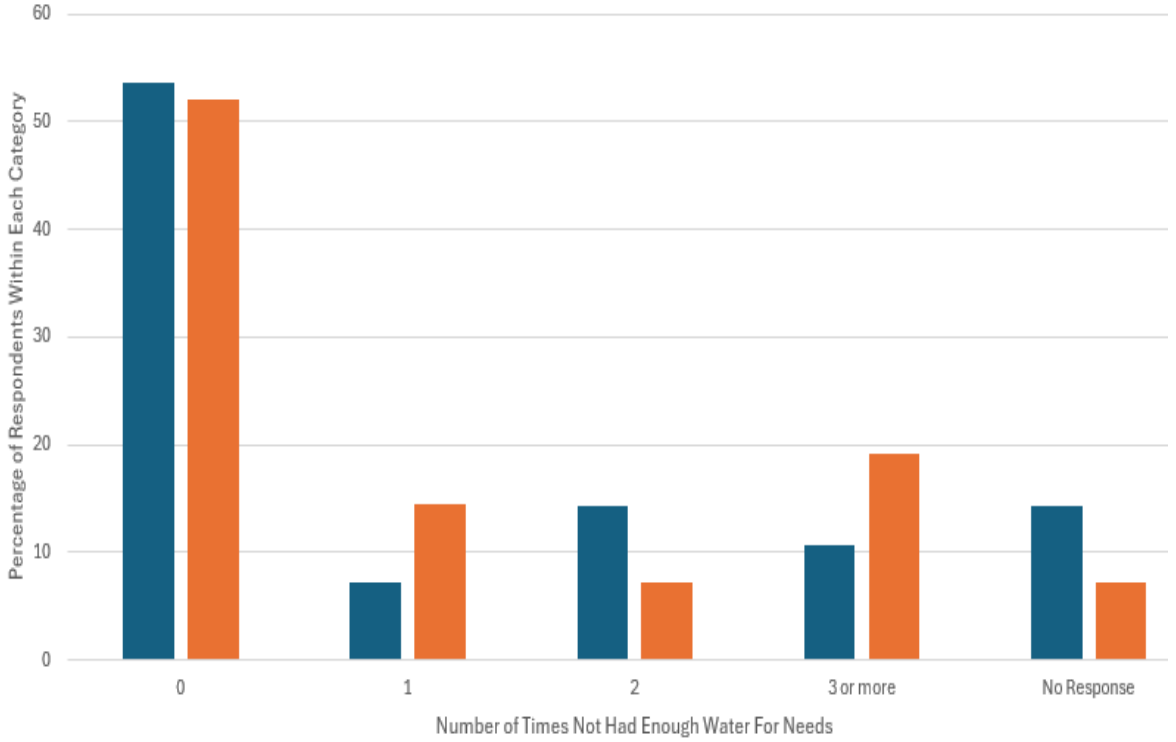
This is similar for both the SW and NE and is not particularly linked to household profile



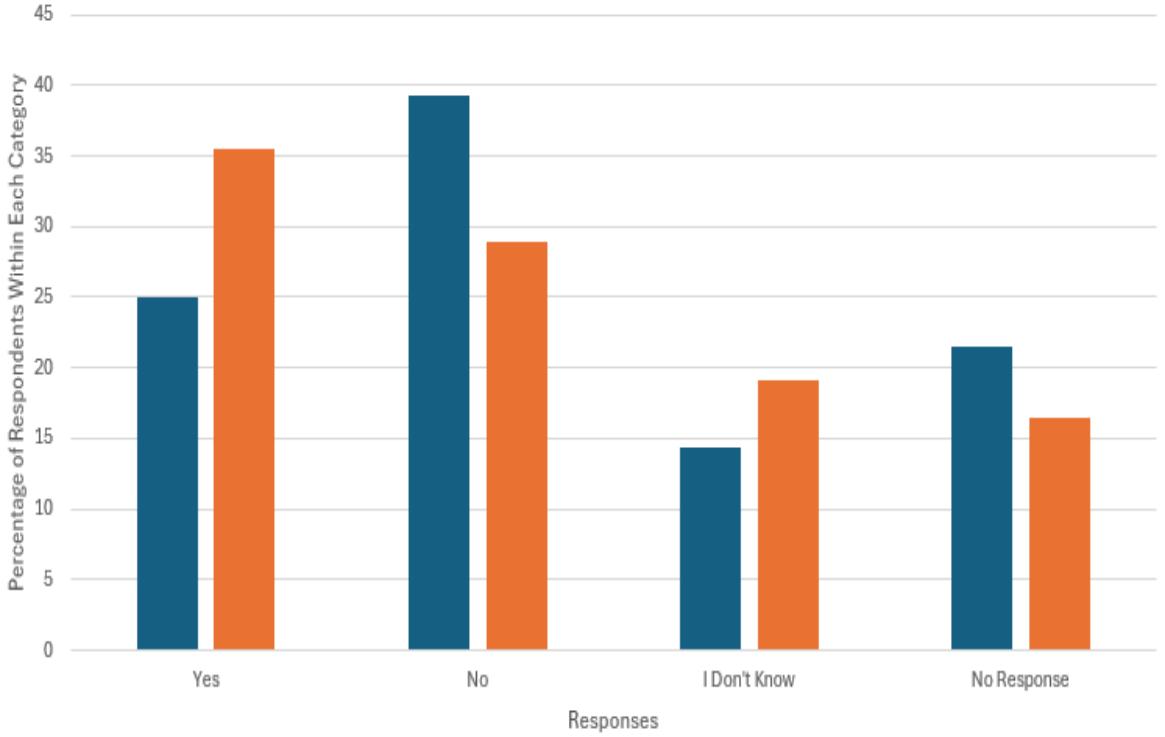
Do the most vulnerable people face more or different risks?

SIMD (Scottish Index of Multiple Deprivation) risks differ around water quality, not water quantity

How many times have you **not had enough water** for your needs?



Has your drinking water supply failed a **water quality** test?



SIMD Categories 1 & 2 (most deprived)

SIMD Categories 3,4 & 5

Conclusions (to date) and next steps

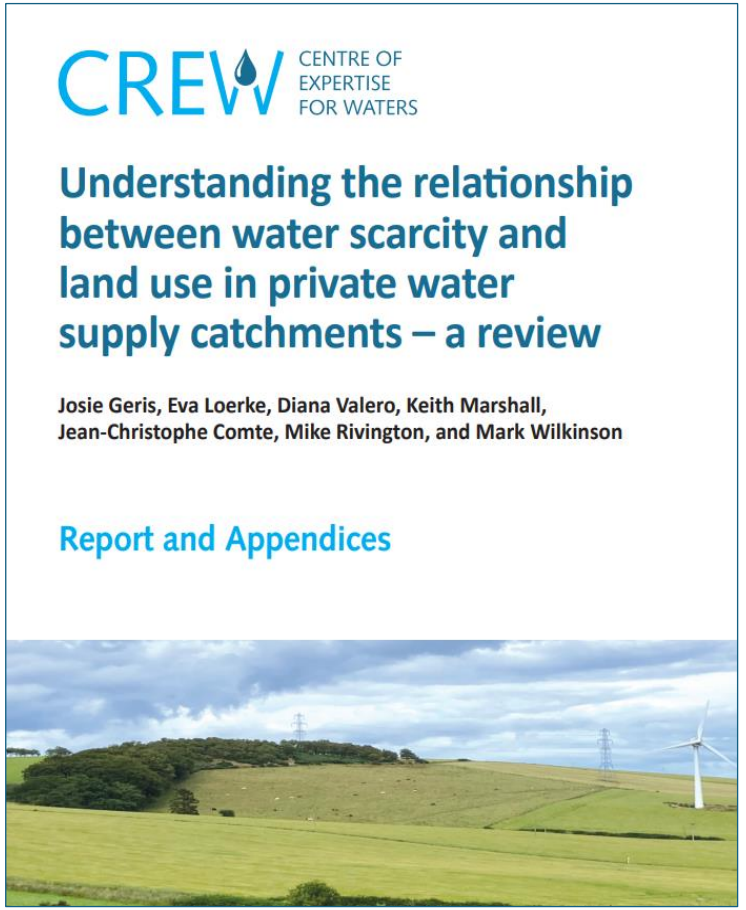
- Perceptions of risk differ between NE Scotland (water quantity) and the SW (water quality) with supplies in the NE often being shallow groundwater, and the southwest being surface water sources (springs, streams or lochs).
- This has implications for how people might perceive their ability to adapt, something to be explored further in the interviews.
    - People in the NE may be able to afford to dig deeper boreholes to avoid water shortages or contamination whereas options for adaptation in the SW may be fewer, either due to geological (lack of groundwater) or financial reasons if their source is at risk.
- This has implications for aligning policy and regulations with the support needs of people and communities in different places, and different strategies to aid with adaptation and mitigate PWS vulnerability.

Links to adaptation and related policy

- How might people adapt to the risks they perceive?
  - Our team is currently exploring this with **in-depth interviews** (20+) in NE and SW Scotland. Preliminary results summer 2025.
- How testing and monitoring can be supported?
  - To be explored in **participatory workshops** with PWS users and stakeholders in September 2025.
- This research has implications for aligning policy and regulations with the support needs of people and communities in different places, different strategies to aid with adaptation, and to mitigate PWS vulnerability.

Our active research on water (in)security in Scotland:

- Water insecurity in unexpected places
- Narratives of water security and water scarcity
- Experiences of risk and vulnerability of water insecurity in PWS households
- Impacts of land use changes in water security for PWS
- Water security and the impact of climate chaos driven emergencies
- Social innovation around water security and provision of water supply in decentralised supplies



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