



In the North, who is cold and thirsty after a storm? Storm Arwen and the hydrosocial dynamics in Northeast Scotland.

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Climate crisis context

- Compound extreme weather events that pose challenges for water access are becoming usual occurrences.



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The Observer
Flooding

Robin McKie
Science Editor

Sat 6 Jan 2024 17:07 GMT

Warmer winters and more flooding will be the norm in the UK, scientists warn

The country should be building resilience into the infrastructure to counter flooding like that brought by Storm Henk, experts say

UK Projections

In future, most climate projections indicate that winter windstorms will increase slightly in number and intensity over the UK i.e. more winter storms, including disproportionately more severe storms, are projected to cross the UK. However, this has medium confidence because a few climate models indicate differently.

 **Met Office**

Weather: Norway's worst storm in 30 years with 120mph gusts leaves trail of destruction

nature communications



Article


<https://doi.org/10.1038/s41467-023-40102-6>

Future increased risk from extratropical windstorms in northern Europe

Received: 23 August 2022

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 Check for updates

Alexander S. Little¹, Matthew D. K. Priestley¹ & Jennifer L. Catto¹✉

European windstorms cause socioeconomic losses due to wind damage. Projections of future losses from such storms are subject to uncertainties from the frequency and tracks of the storms, their intensities and definitions thereof, and socio-economic scenarios. We use two storm severity indices applied to objectively identified extratropical cyclone footprints from a multi-model ensemble of state-of-the-art climate models under different future socio-economic scenarios. Here we show storm frequency increases across northern and central Europe, where the meteorological storm severity index more than doubles. The population-weighted storm severity index more than triples, due to projected population increases. Adapting to the increasing wind speeds using future damage thresholds, the population weighted storm severity index increases are only partially offset, despite a reduction in the meteorological storm severity through adaptation. Through following lower emissions scenarios, the future increase in risk is reduced, with the population-weighted storm severity index increase more than halved.

Water Security



- *Every person has access to enough safe water, at affordable cost [...] while ensuring that the natural environment is protected and enhanced* (GWP 2000)
- Aligned with the human right to safe drinking water (UN [A/RES/70/169](#)) and the SDG #6.
- The use of the concept varies across regions and spatial scales -> importance of incorporating community context (Gerlak et al 2018)
- Individual experiences tied to social position and mediated through the meanings and values ascribed to water (Wutich et al 2022)



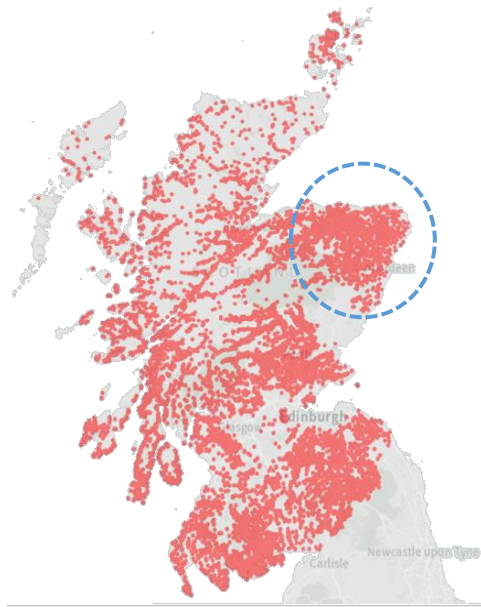
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Water Security in Scotland

- ~97% of the population supplied via piped mains connection delivered by Scottish Water (public utility).
- ~3% (~185,850 people) rely on private water supplies (PWS) sourced by springs, boreholes or surface water (DWQR, 2021).
- Connection to the public supply is not always possible, and when possible, charges can be prohibitive (Scottish Water, nd ; CAS, 2020a).



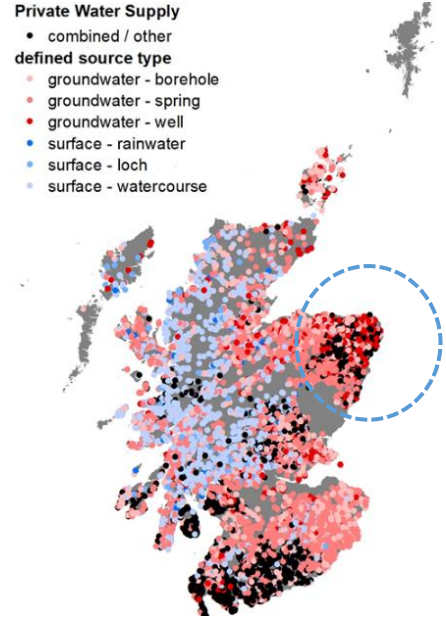
Location of Private Water Supplies



Source: [Drinking Quality Water Regulator, 2022](#)

PWS Source Types

- Private Water Supply**
- combined / other
- defined source type**
- groundwater - borehole
 - groundwater - spring
 - groundwater - well
 - surface - rainwater
 - surface - loch
 - surface - watercourse



Source: [Geris et al., 2024](#)



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Case study:

Impacts of Storm Arwen in North-East Scotland



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Storm Arwen (26-27 November 2021)

Compound event:

- Storm with high windspeeds (109 mph) and unusual wind direction (GDH 2022).
- Heavy snow and sharp drop in temperatures (MetOffice 2021).
- Thousands of fallen trees.
- Interruption of electricity supplies (SSEN recorded 143,749 interruptions).
- Roads blocked. Difficulty to restore connections. Not enough engineers.
- The last connections were restored 10 days after the Storm (GDH 2022).
- ~3000 properties without water for days

Interruption in water supplies



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"...no power to top reservoir as power lines are damaged by a fallen tree [...] Pressure is low in ..." (Scottish Water – response on Facebook to query on 27/11/21)



BBC North East Scot 
@BBCNorthEast

...

Storm Arwen: [@scottish_water](#) says about 1,500 properties are still without a water supply - the main areas include Braemar, Aberchirder, Lumsden, Rhynie, Lumphanan and Torphins [#Aberdeenshire](#) [#StormArwen](#) [@BBCScotlandNews](#)



BBC North East Scot  @BBCNorthEast · 29 Nov 2021

Storm Arwen latest: @ssencommunity says 24,000 customers remain without power, including in many areas of Aberdeenshire and Moray [#StormArwen](#) [@BBCScotlandNews](#)



Methods



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- Digital footprint of the storm to reconstruct what happened
 - Trawling of social media posts in Facebook and Twitter related to access to water during the Storm Arwen and the immediate aftermath.
 - Twitter(*2022): Data systematically retrieved through the academic research developer API and collected using R (~ 60,000 tweets)
 - Facebook (*2022): Manual retrieval of information for research respecting grounds of public and private information and Facebook T&Cs. (+2,000 post & comments)
 1. Identification of accounts for key agencies involved in addressing the situation and local news outlets.
 2. Search within their feeds for posts published during the Storm and the aftermath that are related to the situation of crisis.
 3. Content of public posts copied in a spreadsheet along with metadata (publisher, date and time), number of reactions and comments, and anonymised content of the comments

Methods

- 3 years after:
 - Interviews with people who experienced the cuts and stakeholders
 - Survey to PWS users/owners about perception of risks.

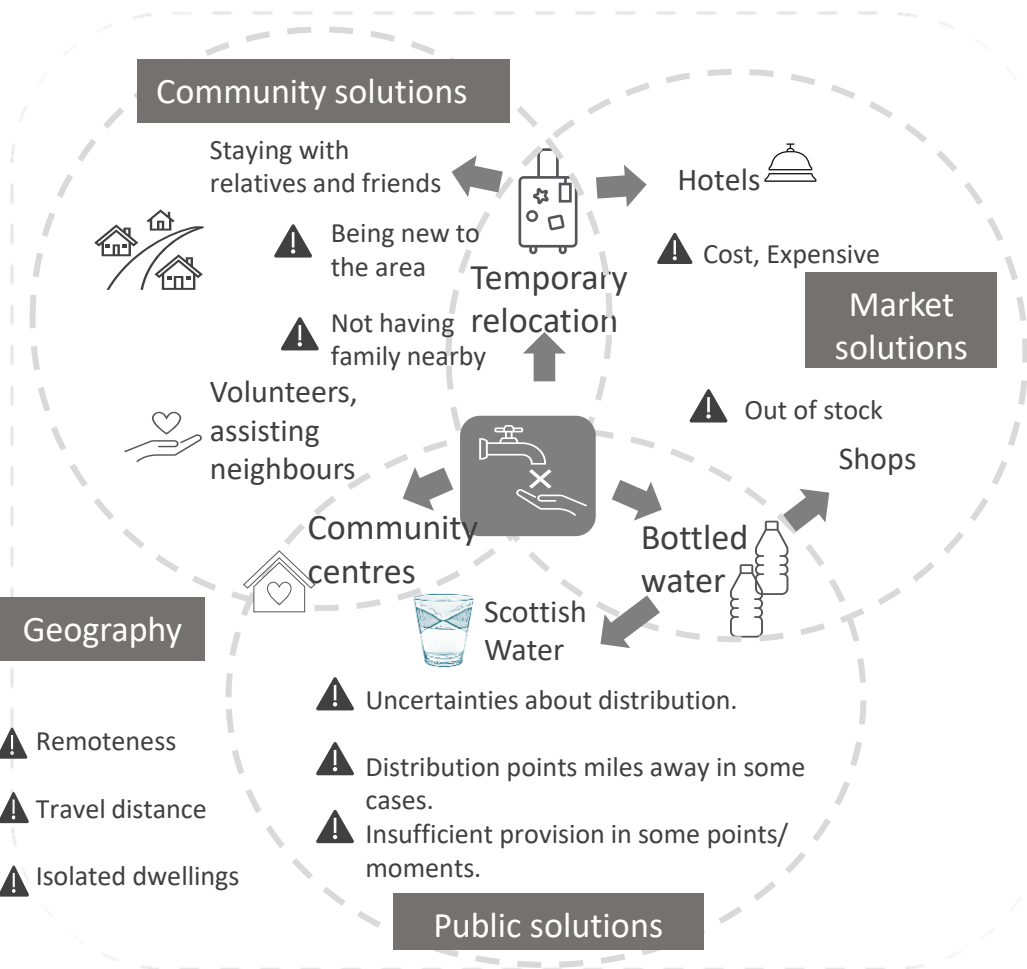


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Findings



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Axis of struggle:

- **Type of dwellings:** remoteness and isolation.
- **Integration in the community:** newcomers, solo-living, immigrants.
- **Disposable money:** poor households.
- **Non-human responsibilities:** farmers, people with pets.
- **Connection to the internet and social media:** people without access to the Internet (via smartphones).
- **Responsibility for the supply:** private water supplies.

Periphery and rural characteristics + socioeconomic vulnerability driving water insecurity during a water access crisis in Scotland



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- Remoteness: road access and distance to community and market
- Management capacity and responsibility for the supplies (connected to mains vs PWS)
- Reliability of other utilities –shortfalls in basic infrastructures
- Community integration and community spirit
- Farming – thirsty animals
- Poor (and financially constraint) households
- Vulnerable health (e.g. people in shielding) and disabilities

Differentiated hydrosocial dynamics across the rural-urban divide that shape the experience of a water access crisis

- Challenges for rural communities not connected to mains
- Critical role of communities
- Was there social learning in storms becoming more frequent that builds up resilience and adaptation? Is there any reconfiguration of social practices? Is getting back-up power generators the only solution?

With thanks to...

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Organisers of the NGM24 and this particular session on Contemporary hydrosocial challenges.

Everybody for listening!

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