



# Understanding the relationship between water scarcity and land use in private water supply catchments – a review

Josie Geris<sup>1</sup>, Eva Loerke<sup>1</sup>, Diana Valero<sup>2</sup>, Keith Marshall<sup>2</sup>, Jean-Christophe Comte<sup>1</sup>, Mike Rivington<sup>2</sup>, and Mark Wilkinson<sup>2</sup>

<sup>1</sup>University of Aberdeen, St. Machar Drive, Aberdeen AB24 3UU

<sup>2</sup>James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH

## Aim and scope

This project aimed to compile an evidence base and offer recommendations informing policy and practice regarding how land use changes may impact the amount of water available to private water supplies (PWS). The focus was on the impacts to water availability from emerging land use trends of tree planting (afforestation and agroforestry) and wind farm development in Scotland.

The project objectives were:

1. To collect and review scientific evidence on the effects of tree planting and wind farm development and management on water availability.
2. To carry out an international review of private water supply policy and practice in relation to these land use change effects.
3. To consult with stakeholders to identify and co-create recommendations for private water supply protection, policy and implementation solutions in relation to the land use changes that might operate at different scales.

## Background

Scotland's net zero path involves developing wind farms and tree planting, addressing key renewable energy and carbon storage goals. Afforestation and agroforestry (planting trees on farms) also contribute to biodiversity and other ecosystem services, such as natural flood management. However, there are concerns that these land use changes may impact water availability for private water supplies. Here, water availability specifically relates to water quantity not quality.

Private water supplies serve about 3% of Scotland's population and are crucial for rural communities and businesses, which already face vulnerability owing to droughts. In this broader context, concerns about private water supplies related to tree planting and wind farm development are complex. In addition to uncertainties about the effects on private water supply water availability, there is limited knowledge of land use impacts on private water supplies directly. Challenges are also related to the regulation and resilience of private water supplies, land use change risk assessments, lack of integrated land use planning, and engagement with private water supply users.

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**To access the outputs for this project, please visit:** [crew.ac.uk/publications/water-scarcity-land-use-pws](http://crew.ac.uk/publications/water-scarcity-land-use-pws)

## Key findings

Based on a review of the available scientific evidence and a review of international private water supply policies and practices considering private water supply in relation to tree planting and wind farm development, and stakeholder engagement, the study found that:

1. Both tree planting and wind farm development can decrease water availability in private water supply catchments. However, the extent of and whether there is any impact on private water supplies at all also depends on private water supply water demand and local circumstances and infrastructure.
2. Tree planting effects on water availability vary widely based on a complex set of inter-related factors, such as timing, spatial orientation, extent of planting, tree species, and landscape characteristics, including previous land use. Agroforestry effects are generally smaller than for afforestation, but they are more sensitive to specific planting details.
3. Wind farm effects also depend on landscape factors and specific characteristics like type, number, and density of turbines, with limited research available for Scottish landscapes.
4. Key international policies to mitigate land use and management effects include impact assessments, forestry standards, and buffer zones, but post-approval documentation is often inaccessible, leading to potential biases of our review to mitigation plans only.
5. There is a critical need internationally for up-to-date, integrated information on private water supply types and locations, catchment conditions, and land use impacts to support decision-making, along with effective consultation and mediation with private water supply users during land use change planning.
6. International scientific literature and policy and practice documents primarily focus on water quality rather than quantity, with limited information on wind farms and better-documented impacts of tree planting through EU-funded projects.
7. Stakeholders called for improved policies and legislation regarding private water supply owners' rights and responsibilities and highlighted the need for coherent cross-sectoral policy alignment and improved practices for considering private water supply in land use developments.

## Recommendations

The key findings emphasize the need for better data, data availability, integrated policies, and stakeholder engagement to prevent negative impacts on private water supply amidst changing land use change trends. Key recommendations, outlined in full in the main report, include:

1. Careful consideration of local assessment and management strategies for tree planting and wind farm development, both in the short- and longer-term;
2. Addressing the lack of integrated land use planning and management that accounts for private water supply;
3. Addressing knowledge gaps (around both water scarcity, and policy and practice – see full report);
4. A shared repository of data and information to address the above points and to help create shared understanding of the potential impacts of land use changes on private water supplies, and;
5. A continued process of stakeholder involvement and knowledge sharing including good practice examples and guidance, and regulatory oversight, and public awareness raising around private water supply management and land use change.