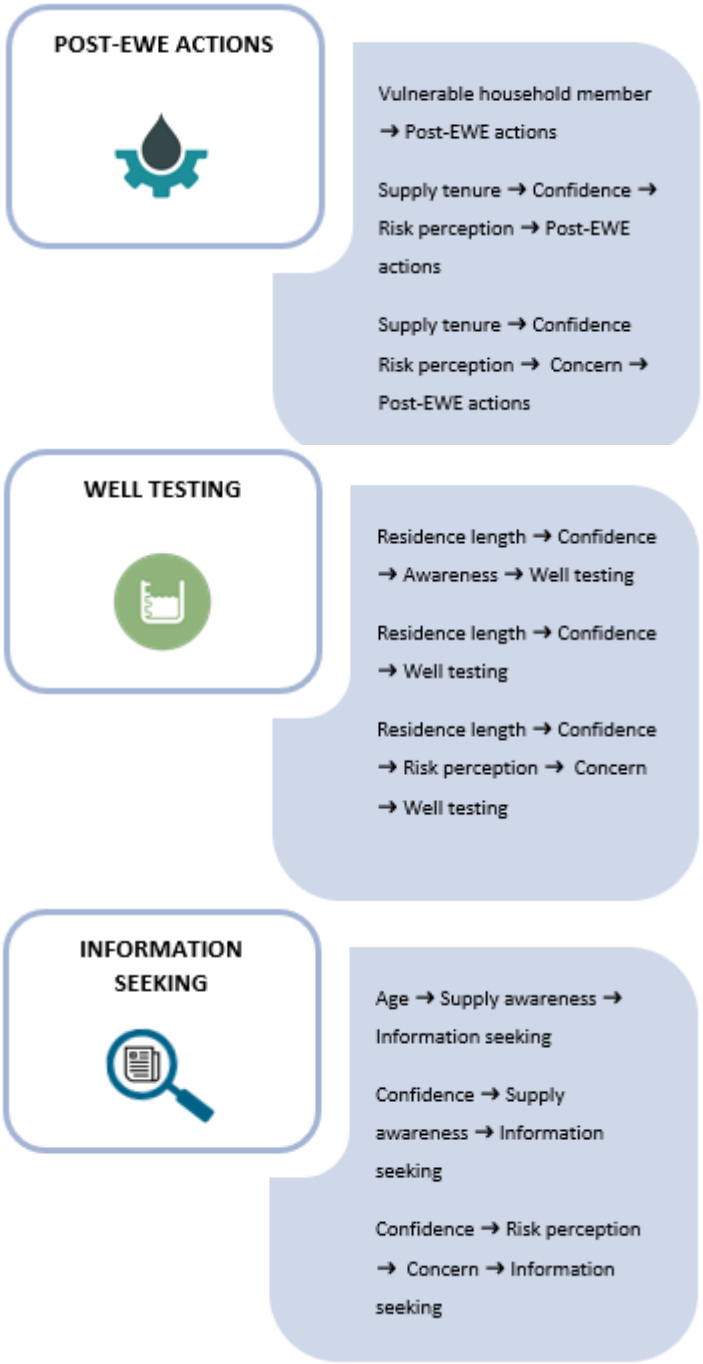
## Best Water-Related Presentation at Environ 2022
## Winner: Simon Mooney, Technological University Dublin

# Pathways to private well management: A structural equation modelling approach

Drinking water contamination disproportionately impacts rural communities due to ageing populations, geographic isolation and susceptibility to extreme weather events (EWEs). As rural regions are characterised by high private (unregulated) groundwater reliance and prevalent contaminant sources, routine and event-based private well management is vital to reducing consumption of microbially contaminated water. In the Republic of Ireland (ROI), up to 80% of annual cases of Verotoxigenic E.coli (VTEC) enteritis are associated with private well exposure – with a temporal link identified between increased EWE occurrence and acute gastrointestinal infection (AGI) outbreaks.

Evidence-based risk communication is essential to educating Irish well owners and promoting appropriate supply management behaviours. Existing research globally suggests that communicative interventions involving community and educational organisations correspond with higher rates of private well maintenance. To date, however, pathways and relationships between behavioural predictors remain unknown while latent constructs such as risk perception, climate change concern and perceived self-efficacy have yet to be sufficiently explored. In response, a national behavioural survey of 560 Irish private well owners was conducted. The survey utilised a novel scoring protocol to measures respondents' supply awareness and perception of risk posed by EWEs towards private groundwater quality. Respondents were additionally questioned about their recent EWE experience and household occurrence of gastrointestinal illness.

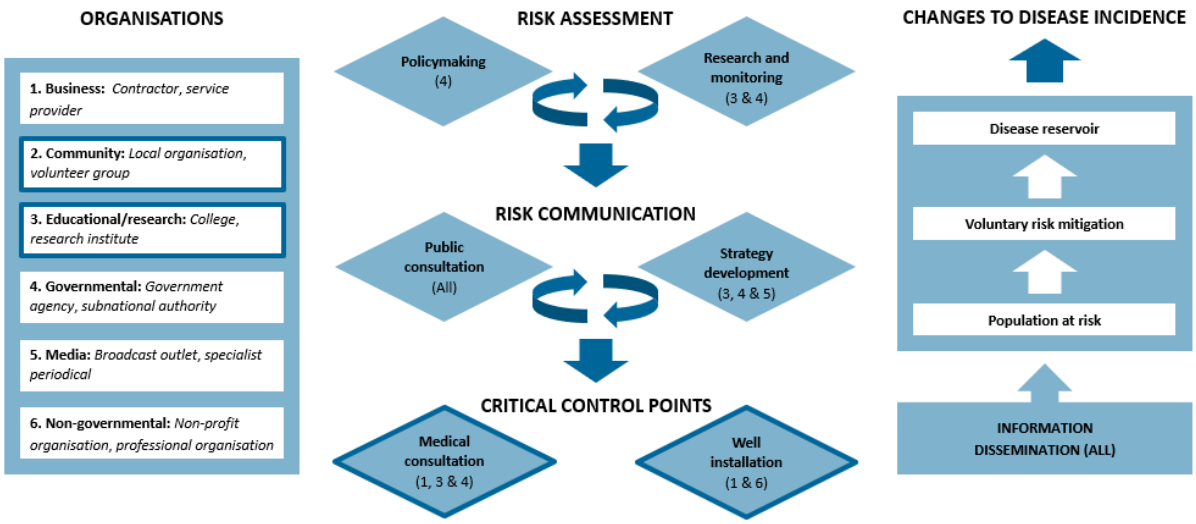
Subsequent to closure of the survey and data importation for analysis, structural equation modelling was employed to identify predictors and underlying relationships determining adoption of three (key) binary outcomes: information seeking, post-EWE actions and supply testing. Pathway analysis (a multivariate statistical analysis technique) was used to analyse structural relationships between socio-demographic, cognitive and experiential variables.




Upon development of optimal models from the data, perceived self-efficacy and climate change concern emerged as significant direct and/or indirect influences on all three behaviour types. Perceived self-efficacy had an inverse influence on EWE risk perception in all three models but positively influenced supply awareness (where present). Presence of a vulnerable (infant and/or elderly) householder was notably found to negatively influence adoption of post-EWE actions ($\beta = -0.131$, $p = 0.016$).

Residential, health and age-related factors constituted key demographic variables influencing supply management and were strongly mediated by cognitive variables.

Accordingly, medical consultations and preliminary well installation phases may represent significant control points for future interventions. Exploration of such activities, in line with tailored public engagement, may inform future interventions seeking to minimise exposure to contaminated rural drinking water in the face of frequent EWEs.




**Potential risk management framework incorporating preferred information sources and intervention control points (both highlighted).**

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