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Mapping the perceived potential of energy harvesters to increase the resilience of European water and energy infrastructure

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Energy harvesters (EH) are devices designed to capture and convert mechanical energy from ambient sources, which can be converted into electrical energy employing piezoelectric materials. Energy harvesters can capture and convert energy from vortex-induced vibrations in water flows such as water piping, open channels, and natural streams. Harvested energy can be used or stored to power small electronic components such as wireless sensors. These renewable and environmentally friendly energy sources present a tremendous opportunity for clean, reliable off-grid energy production. In the EU-funded project H-HOPE (<https://h-hope.eu/>), energy harvesters are being designed and deployed for various environments to improve and enhance water and energy resilience. In Reykjavik, Iceland, EH can be implemented in geothermal pipes, providing energy for a sensor network in volcanically active areas where traditional powered sources may be unavailable. In Izmir, Turkey, EH can be implemented in the water supply systems, offering reliable electricity for monitoring drinking water quality. In Padova, Italy, EH can be installed in sewage systems, providing electricity for continuous water quality monitoring. In natural streams like fjords (West Fjords, Iceland) and lagoons (Venice, Italy), EH might be upscaled to power remote communities. However, the perceived potential for EH by local energy stakeholders is unknown. To address this, we conducted semi-structured interviews and expert surveys with relevant stakeholder groups to assess the perceived opportunities and challenges of implementing EH in the mentioned case studies. Preliminary results are visualized in causal diagrams, identifying positive and negative feedback loops of stakeholder perceptions. This analysis identifies both enablers and barriers to EH implementation. These findings will be used to develop a strategy for energy and water service providers to enhance the resilience of existing water and energy infrastructure across Europe and assess the potential uptake and validation of such technology by stakeholders.