

Justice, innovation and emerging technologies: marine energy, green hydrogen and Orkney energy futures

Background

The Orkney Islands is an archipelago off the north coast of Scotland, world-known for ongoing research and innovation in the renewable energy arena. It is often self-called a testing ground, or "living lab" for the pilot demonstration of new technologies, and known by many as the "Energy Islands" (Watts, 2018). It is also one of the regions in the UK with the highest levels of fuel poverty and sits on the most northerly point of the UK national grid – at the periphery of existing, centralised supply chains and connections.

Marine renewables and hydrogen are two emerging, innovative technologies, which will play different roles in the energy transition. Both technologies are being tested by the European Marine Energy Centre (EMEC), an "innovation catalyst" operating as an R&D and Demonstration centre in Orkney.

Given these technologies' emerging nature, there is opportunity, and risk, associated with how they will be developed and deployed. In addition, these processes will determine wider dynamics of our socio-energy future, in a time when energy system transformation is at the top of agendas, and the "just transition" has gained relevance worldwide.

In this context, our absolute interdependence with energy infrastructures creates, through our response to climate change, an opportunity to radically transform our socio-energy system to improve social and ecological justice overall.

This research will therefore aim to explore and to contribute to our understanding of this conceptually, methodologically and empirically, in Orkney, and in relation to these emerging technologies as they undergo processes of innovation.

Conceptual objective

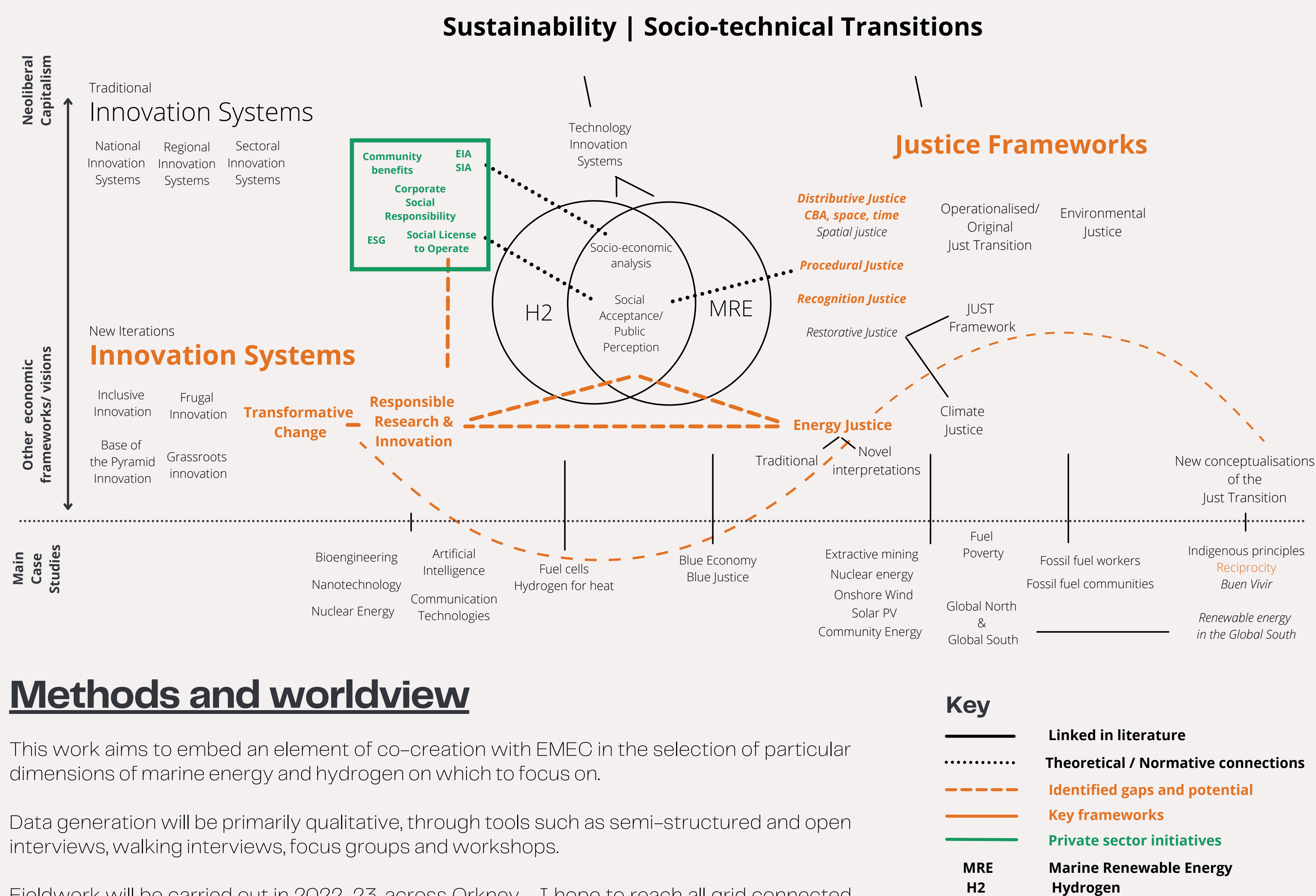
Governments have taken steps towards recognising some of the justice dimensions embedded within the energy sector – and Scotland is a leading example of this (Scottish Government, 2021). Nonetheless, current iterations of the just transition are reactive to what seems a pre-determined, techno-focused energy transition path, driven primarily by technical and economic considerations. Moreover, they are inherently focused on specific policy objectives such as affordable energy or employment (both of which are essential outcomes) versus taking a more holistic approach to the many dimensions of justice. There remains an opportunity, and a need, for a change in paradigm.

Working with theories of (energy) justice (e.g. Jenkins et al, 2014) and novel approaches to innovation (e.g. Schot and Steinmueller, 2018), this research will scrutinise energy technology development and deployment, in the context of the energy transition.

By finding synergies between ethical theories of innovation which are inherently future-focused, with well-developed theories of justice in the energy sphere, this research aims to develop a robust conceptual framework for a future-facing, proactive, just energy transition.

Can we build justice into energy technologies and infrastructures?

Literature map & analysis



Methods and worldview

This work aims to embed an element of co-creation with EMEC in the selection of particular dimensions of marine energy and hydrogen on which to focus on.

Data generation will be primarily qualitative, through tools such as semi-structured and open interviews, walking interviews, focus groups and workshops.

Fieldwork will be carried out in 2022–23, across Orkney – I hope to reach all grid connected islands and if possible, off grid islands too; as well as via virtual means across multi-scalar institutional and industry dimensions.

I hope to engage with a wide range of industry participants – from technology developers, engineers, regulators, policymakers and community members. **If this interests you, please get in touch!**

This research is being undertaken from a critical realist standpoint, and is imbued with ethnographic perspectives on situated knowledge (Haraway, 1988) and the embedded, relational nature of the researcher infrastructures (e.g. Watts, 2018; Star, 1999).



Mooring in tidal flow at EMEC Fall of Warness tidal test site (Copyright Colin Keldie)



EMEC Billia Croo wave test site visit, Credit: EMEC

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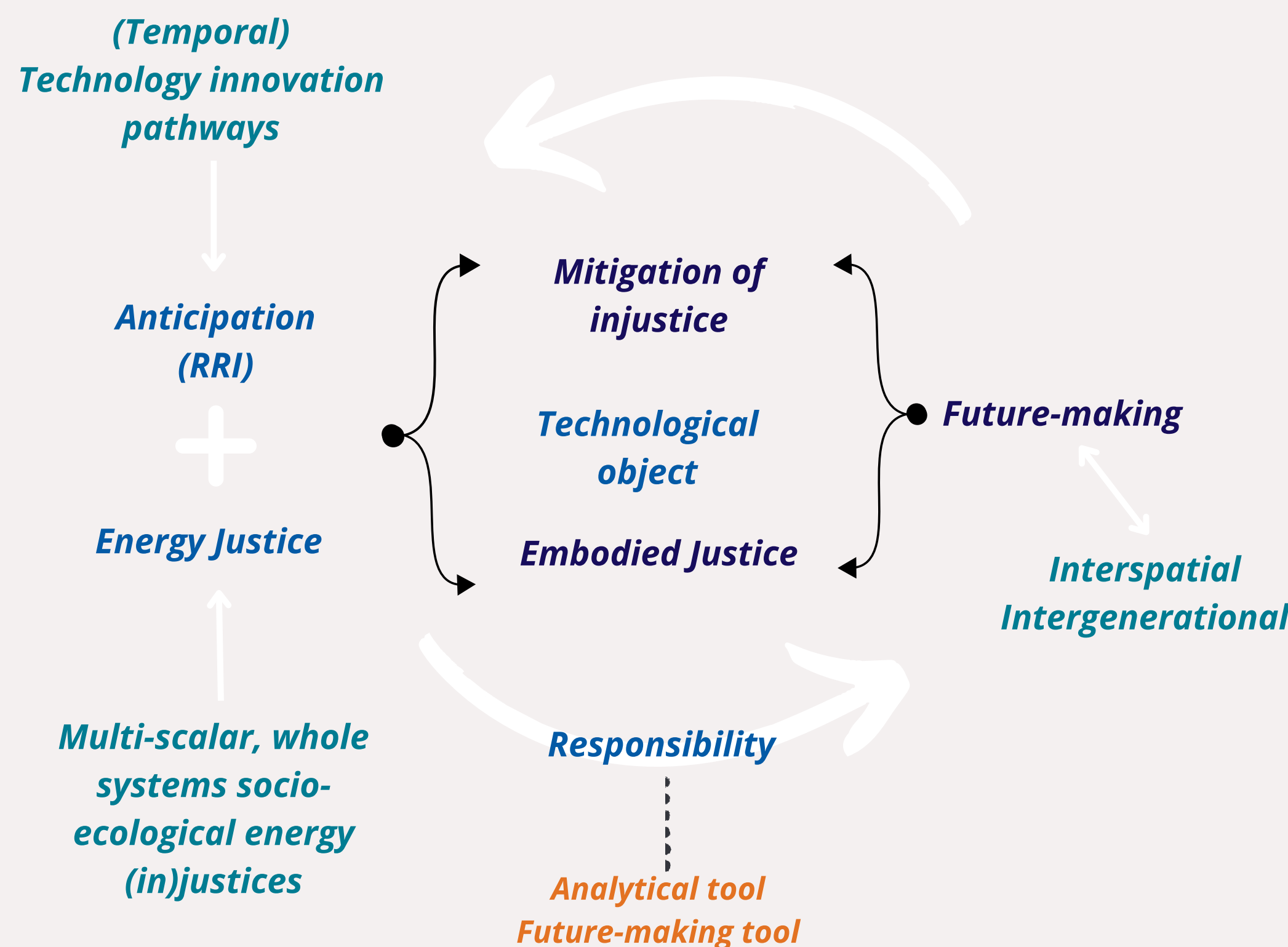
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Empirical objective & relevance

These technologies' infrastructures are embedded in the Orkney landscape, and embody certain values. Due to their emerging nature, there is a lack of research on their justice dimensions, in contrast to the plethora of government commitments world-wide to their deployment.

This research will address this gap by interacting with these technologies from a justice perspective, in the context of "justice"-loaded global commitments to energy transitions. It will do so in an environment where these technologies have been 'mainstream' for years, given the Orkney Islands' innovation track record. EMEC specifically, has tested 35 marine energy devices since 2003, and has led and engaged with a multiplicity of hydrogen projects, across the hydrogen value chain, since 2016 (www.emec.org).

Globally, ecological and social injustices perdure through time. Technological innovation impacts are multi-scalar over time and space; as are the (in)justices the generate and respond to.

Ocean renewables and hydrogen being trialed and tested in Orkney will have **local justice dimensions**, alongside **national and global scale impacts**. The responsibility for this transversality must be acknowledged, and to the extent that is possible, studied, enhanced or mitigated accordingly.

What is ocean energy and green hydrogen's role in Orkney's just energy future?

Do these technologies have potential to mitigate historical climate injustices?

Do they create new risks of injustice and disempowerment?

There is a pressing need to test and demonstrate technologies through a whole-systems lens, that accounts for their lifecycle and supply chain dimensions alongside a genuine prioritisation of their relevance beyond techno-economic assessments to incorporate understandings of justice. **Why?**

If justice is balance, or equilibrium, then there is vast empirical evidence demonstrating current socio-ecological imbalance, system breakdown. **I suggest that by embedding justice and mitigating injustice upon designing, developing and even selecting what future energy technologies are prioritised, 'locked-in' and locked out, we can create a more resilient, sustainable and just socio-energy system overall.**

Are current cost-benefit calculations an appropriate measure of the systemic value of renewable energy technologies?

Is their potential for 'just' futures a missing variable?

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