Editorial for the special issue - Renewable Energy for Sustainable Development

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The significant role of renewable energy in our quest for a just transition to reach the Sustainable Development Goals is unquestionable (Güney, 2019). In particular, the global challenge of reaching net zero carbon emissions by 2050 will require the most technically feasible, cost-effective, and socially acceptable interventions; with immediate and continual actions from all stakeholders – governments, businesses, investors and citizens – if we are to continue on a sustainable pathway as outlined in a recent report of the International Energy Agency (2021).

However, renewable energy is not synonymous with sustainable energy, and the literature is rampant on unintended consequences—economic, environmental, and social—due to technical and policy interventions (Güney, 2019; Spillias et al., 2020). Thus, finding renewable energy solutions is a complex issue that requires multi-, inter-, and transdisciplinary approaches across many levels of analyses: from individual to community and organisational behaviours; in urban and rural contexts; from local- to macro-economies; and the global society as a whole.

This Special Issue explores these different levels of analyses, as well as the methods to investigate the inherent complexities of potential renewable energy interventions as part of the energy transition. And especially, how the levels of analyses can be integrated meaningfully, with the aim to inform more efficient decision and policy making.

One complexity with utilising more renewable energy resources, is the economic implications of such a transition. To this end, the paper of Pérez-Franco et al. sheds some light on the causality of energy consumption, of different sources, and economic growth at a national level. Using statistical analyses of historic data, they show that, for the case of Spain, which has invested considerably in the wind and solar thermal industries, a positive impact on the economy has been realised. The research demonstrates that a long-term view is necessary for policy making, and that the opportunities of an energy transition can lead to real economic growth.

A long-term view requires plans at a national level, and the paper of Kim et al. introduces a renewable energy plan for South Korea. While high-level plans for energy transitions are important from a policy perspective, the paper investigates the public perception on enabling the plan. Specifically, the willingness of households to pay a premium on electricity charges, which, in this case, amounts to over 50% of residential electricity costs. They conclude that, indeed, the public, in general, is willing to carry some of the financial burden to move forward with the transition to renewable energy, which is crucial to ensure of the sustainability of the transition.

Policy for an energy transition also needs to consider the role of other sectors, to facilitate the transition. The paper of van der Merwe and Brent investigates the potential of utilising

existing mining sites in the Northern Cape Province of South Africa to generate electricity with conventional, utility-scale solar photovoltaic plants. Through a simulation and spatial analysis, they demonstrate that the majority of licensed mining sites can generation between 10 MWh and 10 GWh per day, and combined can exceed the annual electricity demand of the country. Importantly, this can be achieved using existing infrastructure without new green field developments. From a policy perspective, this represents a clear opportunity to enhance the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), which the national government established, in a (potentially) sustainable manner.

The paper of Duvenhage et al., on the other hand, highlights the importance of understanding resource management more holistically. They focus on the concentrating solar power (CSP) technology, which is more water intensive than utility-scale solar photovoltaic plants, in the same region of South Africa. With developed spatiotemporal CSP performance models they analysed the water consumptive patterns and the impact of variable resource availability on CSP plant operations. The paper suggests policy guidelines to ensure the sustainable roll-out of a CSP fleet from a water resource management perspective and informs decision-making, in the private sector, in terms of suitable locations for CSP implementations.

With respect to utilising water resources, the sustainability of hydropower has been questioned. The paper of Li et al. then evaluates the environmental impact of a specific hydropower station in China, based on the standardised life cycle assessment approach. They conclude that, although there are environmental burdens associated with hydropower, it is still cleaner compared to the alternative thermal options for the region. Nevertheless, they do emphasise the need to support necessary innovation, with respect to structural designs, improved construction materials, and the extension of farmland lifting technology.

The sustainability of an energy transition requires sub-regional considerations of available resources. The paper of Marseglia et al. investigates the potential of using local biomass resources, as alternative syngas fuels, to operate a combined cycle plant to produce power and steam for local industrial use, with a specific case study outside New Delhi. The operational modelling demonstrates clear performance efficiency gains and associated economic benefits for the private sector, as well as carbon emission benefits for the megacity region, with switching to the alternative, biomass-based fuels.

At a different level of analysis, namely that of households, the sustainability of using (traditional) biomass, specifically for cooking and heating, has received much attention from an indoor air pollution perspective. The paper of Zhang et al. investigates the sustainability of induction cooking stoves, coupled with solar home systems, in terms of costs and health benefits in lower-middle-income countries in Southeast Asia. Using the metrics of Disability-Adjusted Life Years and the value of a statistical life year, and considering six different countries, they show that the health benefits far surpass the costs associated with rolling out the technology solutions; again, highlighting the importance of a cross-sector perspective when considering energy transitions.

The local uptake of new technology solutions, however, always remains a challenge without the effective engagement of the relevant stakeholders. The paper of Fouché and Brent emphasises the importance of an appropriate participatory planning approach for local

energy sustainability. They demonstrate the outcomes of using such an approach, based on an in-depth case study at a town level, to facilitate conversations and build consensus for a community vision – to explore, design and act for sustainability – as part of energy transitions. The voice of the people, in turn, is crucial to feed back into regional and national policy making pertaining to energy transitions.

The overall theme of the Special Issue is that of holistic, systemic analysis, and how systems thinking at different levels is necessary to inform our collective understanding of how a just transition may be achieved, and, in particular, the role of renewable energy in sustainable development.

References

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