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ENERGY AND BEHAVIOUR: A multi-faceted perspective towards a low carbon future

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1. Introduction

It is widely acknowledged that the path towards a low carbon future includes the decarbonisation of energy supply and the promotion of energy efficiency and behavioural changes, requiring people to change their daily lives, the way they work, move, consume and interact socially [1]. But, although people are central to the energy system, the definition of "energy behaviour" is evolving and depends on who is studying it and how. Much of the current literature associates energy behaviour with individual actions in homes, leaving groups and their dynamics in businesses and industry understudied ADDIN EN.CITE [2, 3]. This work presents a multi-faceted view emanating from the book "Energy and Behaviour - Challenges of a low-carbon future" [4], we co-edited, to shed light on the interface of people and energy, including the main disciplinary and interdisciplinary approaches to this topic, cross-sectoral perspectives, modelling techniques, and new areas where additional evidence is required for interventions and policy-making. In this work, "energy and behaviour" is broadly understood as the role of people (individuals, groups, or society), organisations, and technology in energy use.

2. Methodology

This work first introduces the study of energy and behaviour, showing that there is not a single approach to this topic. Then, it explores different aspects of energy and behaviour research across different energy end-use sectors encompassing households, non-domestic buildings, industry, transport, smart cities and energy communities. Recognising that energy and behaviour research can be quantitative, qualitative, or involve mixed methods, an overview of several quantitative approaches to energy and behaviour, including modelling, is presented. A final reflection is made on the opportunities and challenges to implementing energy and behaviour change in the real-world, including policies and programmes.

3. Findings

Different disciplinary fields address energy behaviour differently, through approaches that are sometimes complementary and competing ADDIN EN.CITE [2, 5]. Economics and psychology share a common focus on individual choices and provide policy prescriptions seeking to influence them [6]. Going beyond the individual perspective of energy behaviours, social sciences such as sociology and anthropology argue that energy is a means to provide useful services that enable normal and socially acceptable activities to be carried out as part of the daily life ADDIN EN.CITE [7, 8]. Hence, energy demand is not a consequence of individual decisions but a reflection of the social organisation in which rules, practices and routines are embedded [9, 10].

Many policy strategies for promoting energy efficiency and reducing energy demand have focused on technology development, regulation, financial incentives and information provision [3], which are strongly influenced by the Physical-Technical-Economic Model (PTEM) framework and an individual perspective. Decades of behavioural change interventions in Europe have not yet succeeded in achieving long-term and significant improvements in energy efficiency and energy demand reduction [11, 12]. Emerging research is disclosing that when behavioural interventions are focused on individual actions, the effects are uncertain and only deliver marginal short-term benefits. When aiming to reduce energy demand and GHG emissions, the most promising actions are those having higher impacts when considering both technical potential (i.e., the amount of reduction) and behavioural plasticity (i.e., capability of delivering effective behaviour change) [3].

4. Conclusions

Relevant conclusions can be drawn on the interaction between energy and behaviours towards a low carbon future, which include but are not limited to:

- The need to move beyond the usual scale of disciplinary problem-solving and redesign the sociotechnical energy system (rather than redesigning individual technologies or expecting to change people's behaviours);
- The importance of interdisciplinary work in real-world practice and in close cooperation between all stakeholders (e.g., researchers, policy makers, industry, businesses, middle actors, interest groups and other organisations);

- The value of modelling tools to gain insights about problems, design methodological approaches to derive effective solutions and assess the upscaling of interventions;
- The opportunity for reengineering regulations and integrating policies while maximising co-benefits to society, leveraging citizen participation and fostering interactivity.

Transitioning to a low-carbon energy system implies profound and large-scale transformations in the sociotechnical energy system and how people fit in and interact with it and each other [6]. Finding alternative paths requires innovative interdisciplinary work, at all scales, bringing together engineering, economics, environmental, social and political sciences [3]. More than a challenge that lies ahead, interdisciplinary work for a more sustainable low-carbon future offers the opportunity to design more participative and effective development strategies on a global scale.

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