



Original research article

Network management and renewable energy development: An analytical framework with empirical illustrations



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ABSTRACT

The promotion of renewable energy is an essential component of energy and climate policies, but it is increasingly recognized that the transition toward an increased use of renewable energy sources constitutes a complex socio-political process. Policy is manifested in multi-actor networks beyond formal hierarchies and must therefore build on a comprehensible empirical understanding of the local collaboration processes that make investments in renewable energy projects possible. The objectives of this article are to: (a) propose an analytical framework within which the local development processes leading to renewable energy investments can be understood, in particular emphasizing the management of the relevant actor networks; and (b) provide empirical illustrations of the framework based on existing research. The article argues that, based on network management theory, some network structures can be expected to be more successful than others in facilitating renewable energy development, and we recognize the ways in which networks and their structure tend to be placed within certain institutional contexts of rules. By consulting selected research on wind power development at the local level we illustrate the added value of the proposed framework, and outline the seeds of a future research agenda.

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1. Introduction

1.1. Background and motivation

An increased use of renewable energy is necessary for a transition towards a sustainable society. For this reason, most developed countries have implemented various types of policy instruments (e.g., feed-in tariffs, quota schemes, etc.) that promote renewable energy development. The social science literature is rich in studies on the aggregate impacts of such policies on capacity developments and technological innovation in the renewable energy sector (e.g., [1–5]). While this research primarily addresses the cost disadvantages of new renewable energy technology and technological lock-in favoring incumbent technologies, previous work has also investigated additional hurdles to renewable energy development, *i.e.*, different legal constraints (e.g., permitting procedures) as well as the importance of stakeholder views and public attitudes in project development (e.g., [6–10]). These hurdles often reflect a concern over the negative environmental effects of, for example,

wind power as well as a stronger pressure to involve key stakeholders in the relevant decision-making processes (e.g., [11,12]).

Most developed countries are characterized by the dispersal of power, not merely upwards and downwards from the national level, but also outwards to quasi-state and non-state actors (cf. [13–16]). Policy is not only associated with administrative hierarchy, it is also formulated and implemented within multi-actor networks beyond formal hierarchies. These networks may involve project developers, contractors, public authorities, researchers, non-governmental organizations etc., and in the case of specific renewable energy projects, many of the relevant interactions take place at the local level. Even though the national government may be active in these networks, policy cannot generally be understood as the product of a single level of governance. On a more normative note, some scholars emphasize that multi-level networks may even be necessary to address complex social challenges in the energy and environment field (e.g., [17]).

Well-designed policies in this field should build on a comprehensive empirical understanding of the prerequisites for renewable energy development as well as the processes leading up to the necessary investments. These processes will be influenced by national policy schemes and goals, but the investments take place in specific local settings, and are therefore also affected by local coordination processes within decentralized actor networks. In fact, the

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joint presence of national goals and support schemes and local co-ordination processes has sometimes led to a growing disconnect between different levels of governance in renewable energy policy (e.g., [18]), in turn motivating the use of a multi-level perspective in the study of energy sector transformation.

The above suggests that in order to understand – and in turn influence – the processes leading to increased renewable energy development—or the lack thereof—we must study the interactions taking place between various actors at different levels of government and highlight the strategies that can be used to facilitate these interactions. In this article we develop an analytical framework for studying actor networks surrounding renewable energy projects at the local level, how the relevant network processes will be affected by institutional conditions, as well as how the networks can be managed over time.

1.2. Objectives and approach

The objectives of this paper are to: (a) propose an analytical framework within which the development processes leading to renewable energy investments can be understood, with a focus on the management of local actor networks; and (b) provide empirical illustrations of this framework based on existing research on renewable energy development. In the latter part, *development* is defined as the process of planning and installing renewable energy projects (e.g., wind mills) at specific geographic locations. The proposed analytical framework could also be used to analyze actor networks and institutional preconditions in other contexts, e.g., important processes taking place in technological development and innovation systems. Still, our focus is primarily on developed countries, which are typically characterized by relatively stable institutions and some amount of decision-making power at the local level.¹

In this article we conceptualize the coordinating efforts and processes of a multitude of actors in terms of networks, arguing that some network structures are likely to be more successful than others in facilitating renewable energy development. By adopting a network approach to the study of renewable energy development processes, we can benefit from ideas elaborated on in policy network theory, innovation theory and public network management theory. There are important lessons to be learned concerning both the qualities of networks as well as how to manage the evolution of the networks, i.e., so-called *network management*. Moreover, we explicitly acknowledge that networks are situated within a given institutional framework, mainly set at the supra-national (e.g., EU) and/or national levels, and explore how the existing institutional arrangements may affect the evolution and the management of the networks.

By doing the above, the article contributes to the existing literature in two ways. *First*, while the article builds on previous network research, our analytical framework differs from earlier research in that it *explicitly* recognizes the ways in which networks, and the efforts to manage networking processes, are situated within an institutional (often national) context of rules. Our framework therefore draws on previous research (cf. [19]), yet elaborates more explicitly on the relation between institutions and the various management strategies that can be implemented to influence the networks. In achieving this, the categories of different institutional

¹ This does not preclude that even developed countries may differ considerably in terms of how much decision-making power the political systems place on the local levels (e.g., the Member States of the EU versus the United States). However, since our framework embraces the roles of both national institutions (institutional design) and the processes within local actor networks (process design), such cross-country differences will not be ignored.

rules suggested by Elinor Ostrom and co-workers are adopted (cf. [20,21]).

This should permit a clearer empirical understanding of how *institutional design* – i.e., strategies aimed at changing the underlying rules of collaboration – can affect the prospects for *process design* – i.e., strategies aimed at influencing the collaborative process itself within the context of the prevailing institutional framework. In the remainder of the article, we introduce a number of key concepts and develop these notions into a coherent analytical framework. This framework also allows us, at least in part, to re-examine the findings from existing studies of the local implementation of renewable energy development, pointing to where the empirics support our framework and suggesting where the use of this framework could have deepened the analysis and understanding of renewable energy development.

Second, while several previous studies of renewable energy development processes highlight the role of actor networks, the empirical analyses of these processes from a network process and network management perspective are generally lacking.² For instance, the technological innovation system (TIS) approach has been used to study energy and sustainability transitions with a focus on networks of actors interacting in a specific technological field under a particular institutional setting, being involved in the generation, adoption, and use of technologies (e.g., [22]). However, while this strand of the literature focuses on a set of innovation processes, it does not devote much explicit attention to how the networks can be managed over time. Despite the focus on actors, institutions and coordination, this work often privileges the *structure* of the system while downplaying agency and the roles that actors may take in policy-making.

In existing case studies of renewable energy development and innovation processes it is often evident *what* was done by different actors in terms of promoting (or hampering) increased renewable energy development, but not *how* it was done. The process by which something is done is at the heart of network management, and neglecting the importance of network processes in the analytical design of research will miss opportunities to understand how these processes can be influenced and ultimately strengthened. For this reason, we use existing research in the renewable energy field to provide empirical illustrations of the potential validity of the proposed analytical framework. These illustrations show how using our framework could have further elucidated the empirical cases in previous studies. It should be noted, though, that these cases are used only as illustrations of the potential of the proposed framework and do not represent a full-fledged review or synthesis of the existing research.

The empirical illustrations focus on the case of wind power, and studies addressing local wind power development processes and the role of actor networks. Wind power represents a key energy supply technology in the transformation to a sustainable energy system, and a wide variety of policies and voluntary efforts exist worldwide to encourage its further development. The wind power industry has witnessed a rapid expansion during the last decades, with declining costs and increasing electricity output. Still, the case of wind power provides a good illustration of the difficulties involved in gaining local acceptance, and of the sometimes growing disconnect between national policy aspirations and local collaboration dynamics (e.g., [18]).

² Giest [18] is a recent exception. Her work focuses on the role of the national (Swedish) government in “managing” and in part “leading” local wind power network structures, although without providing any full-fledged analytical framework. Furthermore, Parag et al. [41] adopted a network perspective in the study of energy governance in the UK.

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