



Original research article

Policy inclusiveness and niche development: Examples from wind energy and photovoltaics in Denmark, Germany, Finland, and Spain



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ABSTRACT

In this article, we analyse the influence of the inclusiveness of policies on niche development. We focus on political inclusion. A typology is developed for analysing the influence of the relative degree of inclusion in policy processes and outcomes on niche development. The electricity industry is used as the empirical example of a regime, and wind energy and photovoltaics for niches. A qualitative case study of the relative inclusion in policies in Denmark, Germany, Finland, and Spain is presented. We found that the policies in Denmark and Germany are the most inclusive, then those in Spain, and those in Finland the least. The same countries have the most and the least developed niches. It seems that a relatively high degree of inclusion in policy processes and outcomes enhances niche development. Our findings also suggest that the role of the government is more political than is often proposed.

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1. Introduction

Sociotechnical changes for sustainable development involve multiple actors and complex change processes. For example, there is an increasing need for renewable electricity technologies in response to global warming. Similarly, increasing democracy and citizen participation are among the goals of sustainable development.

These goals can be perceived as mutually inclusive. For example, the European Union (EU) aims at increasing renewable electricity generation and introducing new actors in the electricity sector. Though the share of electricity from renewable sources is on the raise in the EU, fossil fuels and conventional energy technologies still dominate electricity generation, with about a 75% market share [1]. Similarly, regardless of the efforts to privatise and liberalise the electricity markets, the changes in the electricity market have been rather modest (see e.g. [83,2,3]).

However, the differences between the EU member states are quite large in terms of renewable electricity generation and the privatisation and liberalisation of the market. Using Denmark, Germany, Finland, and Spain as examples, we show in Table 1 that Denmark and Germany have significantly increased their share of renewable electricity generation since the late 1990s, whereas in

Spain and Finland the pace of development has been slower [1] (Directive 2001/77/EC).

Table 1 also depicts the national targets for renewable electricity as defined by the EU and the national targets agreed within the EU directives [4–8,91,90]. Denmark and Germany have the most ambitious targets in the long term, while Finland and Spain have decided to follow the targets agreed upon in the EU. Denmark is the only one of these countries that has announced its intention of transforming the whole electricity generation system to renewables by 2050. Although Germany has an energy policy target of phasing out all nuclear capacity (about 20 GW) by 2022 and increasing the share of renewables in electricity production to 80% by 2050, the country is planning to construct 17 GW of new gas- and coal-fired power generation [6].

Looking into renewable electricity generation in more detail by using wind energy and photovoltaics as examples, it can be noted that in relative terms Denmark has the highest per capita wind energy generation capacity (852 W/capita), followed by Spain (491 W/capita), Germany (419 W/capita), and Finland (83 W/capita) [1,9]. In photovoltaics Germany has the highest per capita generation (436 W/capita), and Spain is rather far behind (116 W/capita), while Denmark (98 W/capita) and Finland (2 W/capita) are even more marginal in photovoltaics [10].

These four countries also differ from each other quite considerably in the way the national electricity industries have been privatised and markets liberalised, as presented in Table 2 [11,6–8,90].

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Table 1
Renewable electricity: shares and targets.

	Denmark	Germany	Finland	Spain
Share of electricity from renewable sources in gross final consumption:				
In 1997	9%	4%	25%	20%
Target for 2010	29%	12%	31%	29%
Share in 2012	39%	24%	30%	33%
National targets for renewable electricity	50% by 2020 100% by 2050	80% by 2050	–	–

As can be seen from Table 2, there are differences in the timing and scope of liberalisation in these countries. The Danish electricity industry is the most liberalised. It was the first country within the EU to introduce feed-in tariffs for consumer-owned renewable electricity generation, and so far the only country to liberalise power distribution. Germany was also quick to introduce feed-in tariffs for consumer-owned generation and to open the market. Contrary to Denmark and Germany, in Finland and in Spain feed-in tariffs have not been introduced for consumer-owned generation. The opening of the Spanish market was rather late; however, only in Spain have the utilities been fully privatised.

Using Denmark, Germany, Finland, and Spain as empirical examples, we aim to understand why, such differences in technological changes and changes in the electricity industries exist. To analyse that conceptually, these issues are linked to the literature on socio-technical changes, particularly to strategic niche management. Strategic niche management focuses on the deliberate development of radical innovations to introduce socio-technical changes towards sustainable development. However, most niches fail to develop and to initiate regime changes [12]. Therefore, more research is needed on factors that influence niche development.

Below, we examine niche development and inclusion in policies and their influence on niche development. We continue by presenting the methodology, which is followed by a case study, discussion, and conclusions.

2. Niche development and inclusion

According to strategic niche management, socio-technical changes originate from niches. However, the development of niches is slow because regimes are resistant to changes. The regime's persistence is influenced by its institutional and market dominance, maintained by the regime's selection criteria for innovations, which refers to established industry structures, dominant technologies and infrastructures, guiding principles and socio-cognitive processes, markets and dominant user practices, public policies and political power, and the cultural significance of the regime [13,92,93]. For example, regimes can prevent the development of a niche, or they can turn a niche into an incremental innovation [14,15]. Only if the niche is developed outside the regime's influence can a radical innovation be developed.

Niches are protective spaces, temporary sites that allow experimentation with the co-evolution of technology, user practices, and regulatory structures, outside the regime and its selection criteria.

The development of a niche, a radical innovation, requires changes in the selection criteria [13,92,93], which also requires changes in actors [16,17,94].

Niches are developed by niche actors, who can be scientists, technology users, and various societal groups, people who are interested in and directly involved in niche development. Much of the early research focused on the internal activities of niches, such as the building of social networks, learning processes, and the articulation of expectations and visions connected with the development of the niche [18–20]. In the more recent literature, the focus has turned to improving the quality of learning and institutional embedding to improve niche development (see e.g. [13,15,17,20]).

Though policy support is crucial for niche development (see e.g. [19,21]), policy processes have been less analysed.

To create changes in regulatory and policy measures the government has an important role. In the literature the government is often suggested to be a rather neutral and apolitical “manager” of niche development [22,18,23,14,92,95]. However, it has been argued that the theoretical ideal is rather far from the reality and that the government is often involved in the politics of change processes [24,25].

The role of the public is not often discussed in relation to policy changes. Strategic niche management assumes that markets and user demand for sustainable innovations do not exist but must be created through policies and legislation because the innovations are radically different from existing technologies [14,15,20,13]. Hence, elections and the influence of public opinion on policies are rarely discussed in strategic niche management. Nor is the role of the consumers (see also [26]), though the gap between research and development and market introduction is one of the central research themes in strategic niche management. However, there is also evidence that public interest and demand for renewable electricity technologies exists [27,28,96]. Therefore, more information is needed on the role of the public in niche development.

Finally, sustainability changes have been analysed in rather narrow terms, in terms of technological changes. Less attention has been paid to other aspects of sustainable development, such as increasing democracy or citizen participation [29]. Thus, more information is needed about democracy, citizen participation, and niche development.

To gain more insights into niche development we analyse the policy processes in more detail. We focus on the role of the public in policy processes by analysing inclusion in policies. Inclusion is one of the fundamental principles of democracy [30]. Inclusiveness is evaluated according to political inclusion; inclusion in policy

Table 2
Privatisation and liberalisation in Denmark, Germany, Finland, and Spain.

	Privatisation	Full opening of the markets	Feed-in tariffs introduced	Opening of distribution for competition
Denmark	Partially	2004/2007	1986	2003
Germany	Partially	1999	1990	Not opened
Finland	Partially	1997	2011	Not opened
Spain	Fully	2004	1994	Not opened

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