

Online Research @ Cardiff

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository: <https://orca.cardiff.ac.uk/id/eprint/144074/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Cowell, Richard ORCID: <https://orcid.org/0000-0002-1639-8004> and De Laurentis, Carla ORCID: <https://orcid.org/0000-0002-6510-9926> 2023.
Understanding the effects of spatial planning on the deployment of on-shore wind power: insights from Italy and the UK. *Journal of Environmental Planning and Management* 66 (2) , pp. 241-264.
10.1080/09640568.2021.1987866 file

Publishers page: <https://doi.org/10.1080/09640568.2021.1987866>
<<https://doi.org/10.1080/09640568.2021.1987866>>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies.

See

<http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



Understanding the effects of spatial planning on the deployment of on-shore wind power: insights from Italy and the UK

Pre-publication version; accepted for publication in the *Journal of Environmental Planning and Management*, 07.09.21

Richard Cowell^a and Carla De Laurentis^b

^aSchool of Geography and Planning, Cardiff University, Glamorgan Building, Cardiff, CF10 3WA; Tel: +44 (0)29 20876684, Email: cowellrj@cardiff.ac.uk

^bSchool of Management, Cardiff Metropolitan University, Llandaff Campus, Western Avenue, Cardiff, CF5 2YB, Email: cdelaurentis@cardiffmet.ac.uk

Abstract

Despite sustained interest in spatial planning approaches for steering renewable energy development, the effect of these practices remains poorly understood. This paper addresses this knowledge deficit through comparative analysis of the effects of spatial planning approaches on wind energy deployment in Italy and the UK. Our approach elucidates the different roles that spatial planning approaches can perform using a ‘modes of governing’ framework that, innovatively, recognises the unavoidable compromises involved in their construction. Several distinctive findings emerge. First, governments deploy spatial planning approaches with different governance purposes, thus explaining why the effects on RE outcomes can be ambiguous. Second, many of the challenges that beset spatial planning approaches arise not from technical-methodological issues but from difficult-to-resolve governance challenges of cross-scalar coordination. Third, we show that the efficacy of spatial planning approaches in shaping RE deployment is contextual in nature, reflecting how far their inherent compromises are accepted by key actors.

Key words: renewable energy; spatial planning; wind energy; governance; devolution; siting

Introduction

In the global challenge to expand renewable energy (hereafter RE), finding sites for generation facilities is an enduring concern that is unlikely to diminish soon. Countries worldwide continue to set ambitious targets for RE, driven by the growing urgency of decarbonising energy systems (IPCC, 2019). Achieving these targets will depend significantly upon the dynamics of siting decisions, not least because falling costs mean that the availability of market support becomes a less decisive factor. Furthermore, the spatially extensive nature of many RE technologies such as wind and solar has long been recognised as creating challenges in reconciling them with other land uses (e.g. Walker, 1995).

Given this situation, land use planning and project consenting become critical institutions shaping RE deployment, and numerous commentators have advocated some form of spatial planning as a valuable policy mechanism to help expand RE and manage the potential disruption to existing environments (e.g. Warren and Birnie 2009; IEEP 2009; Frantál et al. 2018). Kenworthy (2010, 2) neatly encapsulates the claims often made:

‘(S)mart and resourceful land use policies could help accelerate the growth of clean renewable energy ... and still protect treasured public lands and wildlife’.

By ‘spatial planning’, we mean some form of policy framework that is created to steer siting processes. Viewed simply, spatial planning approaches often entail some form of analytical exercise, centred on the construction of maps which assess an area’s potential RE resources against environmental and social constraints, and use this to inform policy development and/or guide projects towards preferable, less-sensitive locations (see also Nadaï, 2007). A further defining feature is that spatial planning approaches work *ex ante* of individual project decisions, and thus do some of the ‘political work’ of reconciling multiple objectives.

The apparent merits of spatial planning approaches to RE development has driven a sizeable research effort into methodologies and decision tools, typically based on GIS (e.g. de Vries et al, 2007; Palmas et al 2015; Gauglitz et al 2019; Wu et al 2020). Nevertheless, this cavalcade of prospective technical and methodological aides for decision-makers has not been matched by careful analysis of how spatial planning tools or approaches are used in practice, or their effects on RE deployment (Leibenath et al 2016). While there is voluminous research examining the factors shaping individual project outcomes (Hobarty et al 2012), much of this work downplays the rules that govern siting and consenting processes (Wolsink, 2017), such as spatial planning policies. If we are to better understand how further space could be made available for RE, then there is an urgent need to better understand how spatial planning approaches perform in practice. Such studies remain rare (for exceptions see Cowell 2010; Wolsink 1996; Moragues-Faus and Ortiz-Miranda 2010; González et al 2016; Frantal et al, 2018; Lauf et al 2019).

This paper examines the extent to which spatial planning approaches to RE development are used in practice, how they are used, and the effects on RE deployment. In particular, the analysis presented here argues that understanding effects requires attention to a prior but much neglected question: *what are the governance purposes that spatial planning policies and tools are actually enrolled to perform?* Despite the sustained interest in spatial planning

approaches, much existing literature ignores the governance context, or assumes a linear cause-effect relationship between the creation of spatial planning approaches and a specific outcome – usually RE expansion. However, there is evidence that spatial planning approaches ‘for’ RE can be created and utilised for diverse purposes (Nadaï 2007). Linked to this, there has been insufficient theorisation of how spatial planning approaches ‘work’ and what ‘to work’ should mean.

To investigate spatial planning approaches in use, the paper adopts a ‘modes of governing’ analytical framework (Bulkeley et al 2005; 2007; Watson et al 2008). Such an approach offers a way to examine the diverse uses made of spatial planning approaches by situating them in relation to the wider distribution of authority, and tracing the ‘means through which governing power is exercised and orchestrated in particular contexts’ (Bulkeley et al 2005, 16-17). In a further innovation, we conceptualise modes of governing not as wholly internally coherent but as characterised by compromises between a series of incommensurable principles (Boltanski and Thévenot 2006), which we see reflected in the construction and mobilisation of spatial planning approaches to RE deployment. The paper also makes an empirical contribution, by applying this framework to analyse the effects of spatial planning approaches on on-shore wind energy in Italy and the UK.

The next section of the paper explains how our modes of governing framework helps tease out the diverse elements that shape the policy and practices of spatial planning for RE deployment. Taking this conceptual framework, we use the cases of onshore wind energy deployment in Italy and the UK, to examine the take up, construction and mobilisation of spatial planning approaches, and investigate the relationship to wind energy outcomes. The paper concludes by summarising the key findings, practical implications and presenting areas for further research.

Understanding spatial planning for renewable energy resources

Modes of governing as a conceptual framework

As noted above, there has been consistent research and practitioner interest in spatial planning approaches for facilitating RE development, but relatively little evidence as to their effects. This is partly because much research focuses on the development of mapping and visualisation techniques, without investigation of take up and use in practice. Certainly, methodology developers often indicate *potential* governance purposes, such as informing RE target-setting and strategic policy-making (e.g. Gauglitz et al 2019), as well as supporting planners in guiding project location and regulation. While much work tacitly adopts a technocratic view of how such tools might work – i.e. that creating ‘better knowledge’ should itself be influential (Owens et al 2004) - few consider issues of use more explicitly. Some analysts have considered the democratic potential of spatial planning approaches in methodology design, such as supporting stakeholder and public engagement (e.g. Berry and Higgs 2012). Even here, however, most research has operated in the world of ideal models, or one-off experiments, detached from the contexts in which real decisions are made.

Consequently, to better understand how spatial planning approaches work in practice requires a conceptual framework that sees them not as a-contextual, technical tools, but which locates their construction and operation within the wider operation of the state and its relations with other actors. A useful start point is the ‘modes of governing’ concepts developed by Bulkeley et al (2005, 2007; Watson et al 2008). For Bulkeley et al, modes are constituted by the diverse elements that combine in the act of governing (Bulkeley et al 2007) - i.e. by particular goals, rationalities, instruments (regulation, markets, but also techniques) and infrastructure - which together shape the ‘social, political and material relations at work’ (Bulkeley et al 2005: 2). Such conceptualisations thus helpfully make visible how elements that could be conceived as purely ‘internal’ to a spatial planning technique (like choice of scale or constraint criteria) are *constitutive of* wider governance processes. Another merit of this approach is its sensitivity to the *multiple* modes of governing through which policy is constructed and (potentially) contested (Bulkeley et al 2005, 2) and so, for present purposes, to the diverse ways in which spatial planning approaches could be mobilised.

However, there is another dimension - arguably implicit in Bulkeley et al’s approach – that warrants more consideration. This is that scholars can too easily assume the coherence of particular governance forms. Foucault-inspired governmentality approaches, for example, tend to collapse the evolution of state action and failure into a binary of technique/action versus resistance (Hacking and Flynn, 2018), which risks obscuring the messy compromises built into implementing devices and governance arrangements themselves (Riles, 2006; Cowell et al 2020). To address this, we take broad inspiration from the post-foundational perspective of Boltanski and Thévenot (2006), which views society not as a single order, but indeterminately structured by a plurality of models of the public good by which issues can be addressed. These models include the ‘industrial’ (emphasising instrumental efficiency in goal delivery), ‘market’ (emphasising the pursuit of profit) or ‘civic’ (emphasising transparent public decision-making); importantly, they are incommensurable in that they each entail different registers of value that are not reducible to each other. Consequently, constructing new modes of governing to address an emergent problem must grapple with this plurality, with the distinct likelihood – especially in a complex field like energy and planning (Cowell and Devine-Wright 2018) – that any resultant institutional ‘fix’ is a compromise i.e. a balance is struck between different models of the public good that cannot be fully settled.

Such an approach sensitises researchers to the potential incoherence of governance arrangements, and to potential causes of vulnerability. In the next section we apply this thinking to spatial planning for on-shore wind.

Conceptualising compromises and dilemmas in spatial planning approaches

Table 1 summarises the potential dilemmas that permeate the creation and use of spatial planning approaches. They are drawn from the existing wind power, RE and spatial planning research literature. These dilemmas are integral to the modes of governance that spatial planning approaches entail because, as compromises between plural and incommensurable principles, there is always the potential for the choices and trade-offs made to generate disagreement.

<Insert Table 1 near here>

i) Macro problem framing

Governments generally intervene in the dynamics of RE development because they perceive the status quo to be problematic, but can 'frame' the problem (Rein and Schön 1996) in various ways, affecting the construction of spatial planning approaches (Leibenath et al 2016). Often, the problem frame prioritises 'the need to expand RE'; governments thus require that spatial analysis identifies sufficient potential development space to deliver RE capacity targets. However, other rationales can prioritise environmental objectives i.e. a concern that the distribution of RE emerging spontaneously, from individual developer decisions, is suboptimal (e.g. causing severe cumulative effects) and requires control. Spatial planning can also serve other political purposes, for example restricting RE to further other energy policy goals (e.g. nuclear power in France – Nadaï 2007). In addition, the choice to adopt spatial planning approaches at all may reflect wider political attitudes to state steering, markets, or whether cross-territorial consistency in siting practices is considered important.

ii) Socio-technical properties

Here we are concerned with which elements of the environment, the technology and energy resource are deemed sufficiently important and practical to warrant assessment and incorporation in spatial planning techniques. Selectivity is integral to spatial planning approaches, as it is only by extracting characteristics from complex situations, and combining them into new pictures, that government is then able to "see" issues at a wider spatial scale' (Murdoch 2000: 513). Yet by doing so, they are invariably reductionist in their treatment of the territory that they cover, reducing 'the complex web of socio-ecological relations' to standard quantifiable measures or lines on maps (Flannery et al 2008, p.35).

Selectivity also arises in conceptions of the 'RE projects' for which spatial planning techniques are designed. Assumptions may be made about the physical scale of projects that require spatial steering (e.g. typical turbine size). Spatial planning approaches may also vary in how they delimit RE projects, especially in relation to grid infrastructures. In practice, spatial planning approaches may focus solely on siting generation infrastructure and ignore the grid, or treat existing grid capacity as a firm mappable constraint, affecting RE location (Wu et al 2020).

iii) Spatial focus

Adjusting the scale at which spatial planning is conducted can be a deliberate strategic choice, entailing an array of governance dilemmas. Widening the spatial scale may better encompass cumulative effects from multiple RE projects, or allow states to evaluate 'the best' spatial distribution of facilities across their territory. But increasing the spatial scale can come with fewer, consistent datasets (see Gauglitz et al 2019), and increase reliance on existing land designations. Any increasing 'resolution gap' with expanding scale may also blind spatial mapping exercises to the nuances of place that matter most to local publics (Devine-Wright 2011).

iv) Participation

Various analysts have posited 'better public participation' as a mechanism for increasing support for RE decision-making, but deciding how to open up spatial planning approaches faces choices, trade-offs and challenges (Leibenath et al 2016). Modes of governing could

entail public participation at various stages: in problem framing, methodology design (selecting variables, attaching weighting, delineating zones) and in operation. Whether participation processes are essentially consultative or more collaborative can also shape ‘buy in’ to outcomes (Petersen 2018). Scale is a factor, too. Whereas public participation around projects can be intense, governance processes at wider scales tend to be the province of selective, stakeholder-based engagement (Meadowcroft, 2009), creating risks that outputs from strategic planning arenas will fail to achieve public support ‘on the ground’.

v) Actor alignment

Actor alignment is integral to governance, and intertwined with participation processes, but here we are concerned with two specific aspects. The first concerns how the distribution of power to create and apply spatial planning approaches is allocated across the multiple tiers of government, and how this affects legitimacy and control. Research shows that ‘top down’ and ‘bottom up’ approaches both have their dilemmas. Development zones for on-shore wind created by ‘higher levels’ of government and imposed on localities can face resistance (e.g. Moragues-Faus and Ortiz-Miranda 2010), whereas decentralising responsibility for spatial mapping to local areas risks inconsistency and – in areas with strong politics of landscape protection – under-delivery of RE (e.g. González et al 2016). Problems can also arise where powers of policy creation and project decision-making are held by separate levels of government (Petersen 2018).

The other dimension of actor alignment concerns the regulatory status of the maps and zonings created by spatial planning approaches. Is it obligatory that individual project consent decisions comply with them, or are they purely advisory? The latter allows more flexibility, which may counter-balance the inevitably crudity of the spatial representations produced, but at the expense of steering effect.

The above discussion has highlighted the diverse elements that come together in constructing and mobilising spatial planning approaches. The trade-offs struck across these elements also shape the space available for market decisions versus state action. Viewing the results as compromises, we argue, provides a useful way of understanding the diversity of modes of governing in which spatial planning approaches can be embedded. It also shows why identifying the best spatial fit’ or ‘optimal scale’ for addressing an environmental problem can be so indeterminate (see Moss and Newig 2010). Highlighting the trade-offs that permeate the construction of spatial planning approaches also opens up the prospect of a more nuanced way of explaining their effects, because actors that perceive themselves as losing from the compromises struck may seek to resist or destabilise the mode of governing. To test these propositions, we now present our analysis of spatial planning approaches for on-shore wind in Italy and the UK.

Methodology

Addressing the question - ‘*what are the governance purposes that spatial planning policies and tools are actually enrolled to perform in practice?*’ – requires a research design able to capture a plurality of modes of governing, and their operation over time. To deliver this

plurality, the research conducted here compares the experiences of Italy and the UK, which – in their contextual similarities and contrasts - confers a number of analytical benefits. Both Italy and the UK have been subjected to similar pressures for RE expansion from EU Directives (especially 2009/28/EC). Coincident with this, both nations have undergone processes of governance re-scaling, embracing aspects of energy and land use policy. Hence, Italy and the UK share propensities for intra-national divergence of response to the challenges of RE development. The basic differences in the allocation of formal powers for planning and energy policy that prevail in Italy and the UK are outlined in Table 2.

<Insert Table 2 near here>

In Italy, energy only arrived on planning agendas at the start of the 21st century (Alberti et al., 2015), whereupon it became a key object in constitutional changes. The 2001 reform of the Italian Constitution included spatial planning in the list of ‘concurrent’ legislative competences shared by the national and the regional levels (Servillo and Lingua, 2014). The national government provides an overarching framework for RE development- and the market support for RE promotion - while regions have responsibility for a number of pertinent areas, including regional energy plans for the development of renewable resources, aspects of authorisation procedures and the power to delegate procedures to lower levels.

In the UK, the basic spatial organisation of planning – for RE and for all other development – is characterised by a division of responsibility between national and local government levels. Local councils have the prime role of drawing up local development plans and determining most individual project applications, but do so in the context of national policy guidance that steers their actions, and provision for national determination of ‘major’ energy infrastructure projects (for definitions see Table 2). There are no explicit national burden sharing arrangements for achieving RE goals, a reflection of generally weak intergovernmental coordination. However, political devolution in 1998 gave the government institutions of Northern Ireland, Scotland and Wales very significant autonomy over planning, with the UK government taking responsibility for England.

Our research embraced two regions in Italy (Tuscany and Apulia), and the four devolved nations of the UK (England, Northern Ireland, Scotland and Wales) within their respective national settings (see Figure 1).

<Insert Figure 1 near here>

The research design also needed a longitudinal element, to trace the take up, construction, evolution and effects of spatial planning approaches over time. The spine of this analysis was provided by documentary analysis, covering regional and national government documents that contained spatial planning policies or were otherwise relevant to the development and decision-making status of spatial planning approaches for RE. This included legislation, policy statements, plans and methodological-procedural advice. Documents were collected from the first stirrings of significant policy interest in RE in the 1990s through to December 2019. Documents were supplemented by semi-structured interviews, using blocks of interview data collected by the authors for cognate research projects in which spatial planning had formed an important part. This amounted to 23 interviews from Italy (gathered April and October in

2015 and November 2017) and 98 from the UK (2007-08, 2011-13 and 2017), embracing interviewees from national level and across the relevant regions. Interviews typically lasted one hour, were conducted in the native language of each nation, and were recorded and transcribed. An 'elite interview' strategy (Hakim 1987) was taken, selecting actors that are integral to the modes of governing: from government (officials and politicians, at local and regional levels), businesses (energy developers, grid companies and trade associations) and environmental bodies (governmental and non-governmental) that shaped the development, delivery or (potentially) contestation of spatial planning approaches.

Both the documents and interview transcripts were subject to thematic analysis (Braun and Clarke 2012), focusing on deliberations surrounding the merits, utilisation (or not) of spatial planning approaches and their effects, in relation to the deployment of on-shore wind. The themes used reflect the dimensions of the inherent dilemmas in spatial planning approaches, as summarised in Table 1. In the next section we give the results of this analysis, for Italy and then the UK: first explaining the problem framings within which the notion of spatial planning approaches emerged, then examining the socio-technical properties, scale-based dilemmas and issues of actor alignment that affected their construction and use.

Results: spatial planning approaches in practice

Italy: Post-hoc catch up of national steering and varied regional responses

Problem framing: urgency, economic development and environmental sustainability

In Italy, expanding RE sources has traditionally been seen as a way of increasing security in the energy system, which lacks domestic hydrocarbons. Nevertheless, overall strategy has been heavily influenced by EU legislation. It was clear that reaching the target of 17% of energy from renewable sources required by Directive 2009/28/EC necessitated a sustained acceleration of development, especially wind and solar (MISE, 2010). RE projects and related infrastructure were therefore considered of national importance, with the national government designating appropriate ways to pursue them. To facilitate RE deployment, there has been a shift in national control from simply promoting RE deployment via economic incentives towards an attempt to regulate the spatial distribution of RE (via binding regional target settings, national guidelines and simplification of authorisation procedures for RE projects). However, the methodologies to define regional targets and the national guidelines were only published in 2012 (DM, 2012) and 2010 (DM, 2010), respectively. Delays in setting out this national overarching framework created a temporal window under which the regions were able to adopt their own framings of RE development issues, generating a variety of governance responses.

In Apulia, RE was represented as 'a big opportunity' (ARTI, 2008: 12) to exploit abundant wind and solar resources to reverse patterns of economic under-development, deliver on energy targets, and oppose (new) nuclear development. Capitalising on favourable geographical conditions (ibid.) meant that RE developments could provide opportunities for Apulia to become a RE leader and break fossil-fuel path dependencies in the region. To achieve this,

initially the regional government assumed the role of an 'entrepreneurial state', streamlining and accelerating license concession procedures.

While in Apulia, in 2006, wind represented the main RE deployed (468.4 MW of wind installed capacity), Tuscany already possessed 711 MW of installed geothermal capacity and only 1.8MW of wind power. Moreover, its presence influenced problem framings as it was assumed that any regional RE targets could be achieved largely by geothermal alone. This enabled the regional government to be highly selective in which other technologies it promoted, and where. In Tuscany, economic development opportunities of RE have been framed around *inter alia* the need to respect environmental and landscape protections. Thus RE development needed to be achieved in 'compatibility with the needs of the environment and the preservation of the socio-economic and cultural characteristics of the territory' (Regione Toscana, 2008: 25).

Spatial planning approaches: socio-technical properties, scale and actor alignment

Across Italy, the sense of urgency to stimulate RE investment gave new impetus to the assessment of potential resources, at all government levels, including the selection, calculation and mapping of indicators. At national level, it also provided the basis for the development of a burden-sharing methodology to determine RE targets for each region. Data considered for the burden-sharing calculations included the characteristics of the territory and regional (and provincial) availability of energy resources, areas available for agriculture and forestry, urban and industrial areas and national environmental constraints. However, the methodology only calculated the '% share of energy consumption from renewable sources' 14.2% for Apulia by 2020, 16.5% for Tuscany (DM 2012) - leaving regions to determine the mix of RE sources.

Tuscany utilised a methodology (Regione Toscana, 2000) that included geo-referential data to map wind resources. This was developed in collaboration with academic expertise in the region driven by an overall aim of reducing carbon emissions while limiting the environmental implications of RE deployment. The regional government used this to produce a thematic map to identify potential areas for wind power: areas without constraints (cultural or historical) and average wind speed exceeding five meters per second. The map also includes locations and availability of transmission and distribution infrastructure, as the regional energy plan expressed a desire that there should be sufficient grid capacity in the vicinity of new plant, as well as suitable roads to transport project components (Regione Toscana, 2008: 50). In terms of actor alignment, the mapping provided *guidance* on project siting, not firm spatial regulation.

In Apulia, the regional government commissioned a 'regional wind atlas' (De Risi et al, 2008), mapping the wind resource in the region, that aimed to become a planning tool for site identification at municipality level. Nevertheless, it is the 'availability of agricultural land' that has shaped Apulia's RE development path, 83 % of its territory being agricultural land. Hence land availability acted as a 'reservoir' for RE projects, favoured by the assumption, at national level, that agricultural land is compatible with RE deployment *ex-lege*.

Different problem framings also manifest in other divergences in regional response to national agendas. When the national Italian government introduced a single authorization process for RE projects, to resolve problems of slow and complex procedures (Malandrino and Sica, 2011), Tuscany followed the national regulation, but Apulia extended it from 60kW to embrace wind projects (and other RE technologies) of up to 1 MW (see Table 2).

National guidelines (Linee Guida) designed to provide a common framework and criteria for the siting of RE plants were also slow to emerge. Tuscany filled the vacuum with its own thematic maps, emphasising landscape protection, as noted above. In Apulia, efforts to institute spatial planning approaches emerged later and were weaker in their coordinating effects. Regional-level interest in spatial approaches was sparked by the need to respond to an unfolding 'wind rush', driven by national subsidies and the region's own consent streamlining measures, including cumulative effects as projects concentrated in particular areas. During the peak demand period (end of 2011) 37,000 MW of wind projects were proposed (PEAR, 2014). Apulia's approach encouraged coordination across different spatial levels, inviting municipalities to introduce regulatory plans for wind energy deployment to identify unsuitable and exclusion zones. The Regional Regulatory plan for Wind projects (BURP, 2006) provided guidance in areas to be excluded (e.g. protected areas, urban areas, areas of landscape importance), existing infrastructure constraints and cumulative effects. Municipalities were also encouraged to collaborate via inter-municipal plans.

Apulia's spatial planning approaches faltered, for a number of reasons. Firstly, coordination was problematic with 255 municipalities in the region. Secondly, areas where wind resources are concentrated were perceived to be less constrained in landscape terms. Thirdly, municipalities stood to gain from RE projects through land rent and generous royalties from developers. Consequently, the adoption of municipal regulatory plans was patchy. Attempts by the regional level to specify criteria for exclusion zones were judged un-constitutional, because regions could not identify limitations and exclusion zones without the guidance published in the national Linee Guida.

As our data shows, the roll-out of spatial planning approaches in Italy has been uneven and problematic, characterised by contradiction and misalignment across the different governmental levels. Public participation in developing regional energy plans and spatial planning approaches has been limited, too, but this is arguably not a major factor explaining success or failure. Public participation in RE planning has not been the norm in Italy, beyond individual project EIA, and neither of our selected regions experienced widespread public resistance to on-shore wind expansion.

Tuscany shows high levels of coordination and participation between the different tiers of subnational government and existing organised stakeholders, which encouraged alignment of different interests. Unquestionably, the region has also acquired high levels of institutional capacity from regulating the planning and permitting of new geothermal capacity and managing opposition. This coupled with a strong organisational capacity at regional government level has to some extent limited the ability of RE developers and small municipalities to exert influence over regional decision-making (RSE, 2011, Lauf et al., 2020). In Apulia the dominant forces for actor alignment have been economic - rather than civic or

environmental concerns about siting - bringing together farmers, municipalities and intermediary bodies as potential financial beneficiaries of wind farm development.

UK: divergence in spatial planning approaches, to divergent ends

Problem framing: planning in support of RE expansion

Problem framings across the UK have been shaped by tensions between the desire to increase RE capacity, reinforced by EU obligations, whilst dealing with social conflicts arising from the expansion of onshore wind in particular. However, the balance struck between these imperatives has varied between the four territories, and over time, with implications for the modes of governing that have unfolded.

Central government/England has displayed the greatest turbulence in modes of governing. Until 2010, a persistent element of the problem framing was a pro-market stance entailing, *inter alia*, sustained central government rejection of spatial planning approaches that might restrict the freedom of RE developers to define their preferred sites. This positioned planning in a largely reactive mode, with only loose connections to RE targets, which were themselves defined only in the broad, aggregate terms of EU Directive – obtaining 15% of energy from renewable sources by 2020. However, this frame shifted markedly with the mounting electoral salience of anti-wind protests, which saw post-2010 governments de-prioritise onshore wind and move towards a localist ideology, emphasising local control.

Expansionist problem framings remained in place across the devolved governments, which kept onshore wind tied to economic development agendas. Where Wales and Northern Ireland accented the rural development benefits, for Scotland national energy and economic independence were to the fore.

Spatial planning approaches: socio-technical properties, scale and actor alignment

Given their shared institutional inheritance, the factors that require to be taken into account when determining consents for major RE projects have been broadly similar across the UK, embracing impacts on landscape and wildlife (e.g. designated sites), visual impacts, proximity to settlements, countryside access, noise, aviation and defence interests etc (see, for example, DoENI 2009; ODPM 2004; Scottish Government 2014; WAG 2005). There is marked variation, however, in the extent to which the four nations have sought to aggregate these constraints to construct *ex ante* spatial planning approaches to pro-actively steer wind energy siting.

In England before 2010, spatial approaches were not used, with national guidance calling for local planning authorities to adopt a positive stance on RE applications but take into account a list of potential criteria – i.e. a criteria-based approach. Through the period 1998-2010, English regional government bodies were charged with mapping RE resources within their territory, in order to spatially disaggregate national targets and divide them between technologies. However, although this generated considerable analytical work (Power and Cowell 2012), it never translated into governance action for target-setting and burden-sharing

and in only one English region (the north-east) were preferred areas for on-shore wind identified. Post-2010, central government moved to abolish the regional level of government and institute local control over on-shore wind. This brought with it a new interest in spatial planning approaches, with policy requiring that ‘a proposed wind energy development ... should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan’ (MHCLG 2019, footnote 49). However, by not mandating that sites be identified, nor specifying any methodology, the measure effectively handed veto powers to local government.

In Northern Ireland, there was no specific planning policy for RE until 2009 and a largely liberal approach, resisting state-steering of siting, has prevailed throughout the period of analysis. In contrast, both Wales and Scotland have invested in explicit, spatial planning approaches. The process in each gave comparable attention to ‘strong’ environmental constraints (such as steering development away from National Parks and top-level wildlife sites). In each arena, one can also observe deliberation on whether to incorporate landscape qualities that, although mapped, were not associated with protective policies and which covered considerable areas of territory: ‘wild lands’ in Wales; ‘wilderness’ in Scotland. However, the main differences between the spatial planning approaches in Scotland and Wales lie less in the socio-technical properties of criteria selection, and more in terms of actor alignment, which is where key compromises were made.

In Wales, the spatial planning approach was constructed centrally, by the Welsh Government, for Wales as a whole. Their consultants mapped and aggregated wind energy resource and constraints data, generating seven ‘Strategic search areas’ (SSAs), to which the Welsh Government attached a policy presumption in favour of large-scale wind farms (25MW or over). The SSAs were not a simple product of overlaying constraint maps to identify less-sensitive ‘gaps’. They were also defined to give force to political judgements about the desirability of spatially concentrating wind energy development in ‘wind farm landscapes’ over market-driven dispersal. The spatial approach has also co-evolved with Wales’s RE targets. Each SSA had a notional [target] for wind energy that would together, if forthcoming, deliver national goals: initially targeting 800MW of new onshore wind by 2010, subsequently upping its aspirations to 2GW by 2020/25 (WAG 2010). Public engagement in national policy formulation was concentrated in a multi-stakeholder collaborative exercise (not entirely successful; Stevenson 2009), then conventional consultative practices of producing a draft policy for comments. The draft spatial policy (WAG 2005) elicited a remarkable 4000 responses, but was little changed by it. Rather, the spatial policy was deployed within strongly vertically-aligned governance arrangements, in which individual local planning authorities needed to incorporate the SSAs into their local plans, and give them considerable weight in project decisions.

The Scottish Government differs from Wales in promulgating its spatial planning approach through methodological guidance to local planning authorities, giving them the responsibility for mapping opportunities and constraints, to identify areas where wind farms would be supported and areas where they would be inappropriate. This flexibility led to significant diversity in spatial planning approaches across Scotland, with some local planning authorities prioritising landscape conservation and others promoting strategic wind energy sites with a view to accruing financial benefits.

This diversity brought industry complaints about inconsistency and the Scottish Government, very keen to support RE expansion, responded by progressively reducing local planning authorities' flexibility. Successive revisions of the guidance greatly diminished the scope for using *local* assessments of landscape quality or capacity to restrict wind energy development, leading to a spatial planning methodology in which only national landscape constraints (e.g. National Parks) should form the basis of exclusion zones (Scottish Government 2014). The Scottish Government has worked assiduously on actor alignment in other ways, too, using its powers to police local plan-making to prevent local planning authorities from drawing up zoning policies that it regarded as too restrictive, and making use of its consenting powers for larger projects (see Table 2).

Understanding the outcomes of spatial planning approaches

Across the two states and six regions, our research has identified diverse modes of governing for onshore wind in relation to spatial planning approaches. How do these approaches relate to deployment patterns? Figure 2 summarises the wind energy development trajectories for our case study regions, showing an array of upward trends. Constructing cause-effect relations is a hazardous enterprise, given that spatial planning approaches are just one variable affecting wind energy development (Lauf et al., 2020). Across our UK and Italian cases, the shifting rates of RE expansion to date can be substantially attributed to the shifting availability of market support, with the effects of diminishing support from 2012/13 onwards being observable across the trend lines in decelerating growth. Nevertheless, a number of patterns can be identified that reflect more closely the spatial planning approaches pursued.

<Insert Figure 2 near here>

The first finding is that, in some settings, engaging in strong *ex ante* spatial steering is unnecessary to achieving rapid RE deployment, and may be inimical to rapidity per se. Apulia and Northern Ireland are our examples here; neither has made much use of spatial planning approaches yet both witnessed accelerated development rates. In both Tuscany and Wales, the use of strong spatial steering has co-existed with slow levels of wind energy development, compared to other parts of the same nation. While most Italian regions exceeded their burden sharing targets by 2016, Tuscany took until 2018. In Wales, the superimposition of the new spatial framework itself caused a virtual hiatus in new wind energy development from 2005-09 (see Figure 2), as developers adjusted to the redistribution of available sites.

Of course, we might judge outcomes differently if environmental protection is the main goal. Across our cases in UK and Italy the highest tiers of protected landscape and wildlife sites have been largely excluded from wind energy development, whether modes of governing embraced spatial approaches or not. What seems to make more difference for outcomes – environmental and developmental – is whether governments legitimise spatial planning approaches that move beyond acknowledged national environmental constraints to enable local judgements of environmental value to be included. Doing so can place significant constraints on onshore wind development – sometimes deliberately so, notably in England

where a highly restrictive mode of governing helps explain the flat-lining installation rate from 2017.

Teasing out the net effect of spatial planning approaches is inevitably trickiest in those territories that have utilised spatial planning approaches for governance purposes that emphasise supporting RE growth *alongside* environmental protection, since analysts are left to assess whether a 'better' balance has been achieved. The use of spatial planning approaches has scarcely hindered the rapid roll-out of on-shore wind in Scotland, which experienced the UK's highest volumetric growth. This may be attributed to practices of actor alignment pursued by the Scottish Government, as discussed above, and the fact that 'preferred zones' had an advisory rather than prescriptive status i.e. it was still permissible for developers to attain assent for wind farms that fell outside them. Local planners would therefore judge the environmental outcomes to be ambivalent.

In Wales, few significant windfarms have come forward outside the Strategic Search Areas: to that extent, the strategy delivered on the environmental objectives embodied in the spatial planning approach and its goal of spatially concentrating wind energy development. Instead, ambivalence lies in whether the mode of governance delivered desired wind energy development outcomes, with development falling short of successive targets. In accounting for the shortfall, we can see the effects of the compromises built into the Welsh spatial planning approach, particularly in the selectivity of the technical parameters included, and issues of actor alignment. To understand these effects, it is insightful to disaggregate spatially what happened across Wales as the SSAs 'worked' in some areas but not others.

All of the SSAs stimulated significant development interest, but projects in the south and north Wales SSAs materialised, mainly because there was extant grid capacity nearby, more limited protective aspirations for the land resource and limited organised opposition. In mid-Wales, few SSA wind farms materialised, and the contextual conditions were different. There was little grid capacity, meaning major new high voltage lines were required across the countryside. This led to increasingly organised opposition, at all tiers of government, which exacerbated other problems of actor alignment. Because the SSAs had stimulated larger wind farms, over 50MW, this meant responsibility for consenting the applications fell to the UK Government (see Table 1), which was able to mobilise its anti-wind stance by rejecting them. A feature of the efficacy of the spatial planning approaches adopted by Scottish and Northern Irish governments is actor alignment i.e. stronger central control over consenting to enable their approaches to be implemented.

Tuscany also showed central control over consenting, and stronger coordination across the different tiers of subnational government and existing stakeholders. Unquestionably, such coordination was facilitated by widely shared landscape discourses that become an integral part of the regional 'fabric', with cultural and historical constraints becoming key features of the mapping methodology, used together with grid infrastructure capacity constraints. Apulia, by contrast, perceived as a territory less constrained by the landscape, delayed its attempt to spatially regulate wind energy siting until after significant capacity had already been installed. Here, problem of poor coordination between multiple sites and tiers of government had detrimental effects on regional legitimacy and control.

Discussion

Our analysis across the six regions of Italy and the UK has generated some valuable insights about the effects of spatial approaches to developing onshore wind, and identified a number of intriguing propositions.

Firstly, our analysis shows a diversity of approaches to governing the spatial distribution of on-shore wind, which we have synthesised as a series of archetypes in Table 3. Each situates the spatial planning approach adopted within its wider mode of governing. These include modes where governments eschewed *ex ante* plan-led spatial steering entirely (*'developer siting flexibility'*), but also different modes of using spatial planning techniques: *'central specification'*, *'spatial puzzling'*, *'local spatial control'* and *'meta-governance by methodology'*. Each can be seen as striking different compromise in the face of the inherent dilemmas of spatial planning approaches (as set out in Table 1). Our analysis also shows that these different modes are constituted by more than differences in spatial assessment techniques - i.e. the socio-technical properties included in any mapping – which exhibit many commonalities across the cases. What makes each mode distinct often lies in responses to the dilemmas around governance scale and mechanisms of actor alignment.

<Insert Table 3 near here>

Not only do approaches vary between territories, but we see regions shifting their spatial planning approach over time. A common pattern is the belated, *post-hoc* rolling out of spatial planning to deal with accumulating landscape and grid capacity problems generated by earlier, pro-development strategies. We see this at Italian central state level and in Apulia, where pending grid connection requests reached 30,000MW of wind power in 2013 (BURP, 2014). In England, the move from *'developer siting flexibility'* to *'local spatial control'* over onshore wind represents a response to the mounting political salience of organised opposition.

Secondly, our research has confirmed the difficulties of separating assessment of the effects of spatial planning approaches for RE from the diverse governance purposes that such approaches are constructed to perform. This makes judging the effectiveness of spatial planning approaches *in general* a highly ambiguous exercise. The way that decisions to adopt spatial planning approaches are intimately linked to the different problem framings attached to RE and onshore wind is an important factor here. Much depends on how much urgency is attached to RE expansion, and beliefs about the desirability or necessity of state orchestration of siting to achieve that goal. Both Wales and Tuscany moved to deliver firm spatial guidance on wind energy development, but with different conceptions of 'success'. For Tuscany, spatial planning approaches were used to reinforce landscape protection priorities in the belief that little wind energy development was necessary to meet RE targets; in Wales, spatial planning approaches have been constructed to deliver significant wind energy expansion, reconcile that with particular environmental outcomes and align local government decision-makers with those goals.

Although for heuristic purposes Figure 1 separated out the various dilemmas involved in composing modes of governing into different dimensions, our analysis shows that these dimensions are interconnected in the compromises that are struck in practice. A key example is the way that key actors clearly appreciate the intricate relationship between spatial mapping of constraints and strategic energy targets, and sought compromises that favoured particular goals. We observed governments in Wales and Scotland reluctant to allow certain environmental qualities to be elevated to the status of absolute constraints, and enter mapping processes, because doing so would reduce the notionally unconstrained space for RE development and threaten desired expansion. In Tuscany, *a priori* beliefs about a minimal need to expand wind facilitated a pro-landscape protection spatial planning approach, with numerous tight constraints. Apulia on the contrary, saw the plentiful RE sources in the region as an economic opportunity and emphasised speed over spatial distribution. In terms of our Table 1 framework, our research shows how choices about socio-technical properties of mapping techniques are affected by and constitutive of problem framings. These inter-relationships show the problem of treating wind energy outcomes as a ‘dependent variable’ *shaped by* spatial planning approaches (as with Lauf et al. (2020)), given desired wind energy outcomes so clearly shape actors’ approaches to spatial planning.

Attention to the diverse elements brought together by each mode of governing, and the compromises entailed, also expands our understanding of the factors that explain the emergence, persistence and (often uncertain) effects of spatial planning approaches on wind energy deployment. While there may be value in developing technically ‘better’ mapping methodologies, as devices for spatial ‘puzzling’ (after Hecló 1974), tracing how spatial planning approaches get used in modes of governing shows how notionally ‘external’, non-methodological dimensions of the mode of governing regularly exert far greater effects on outcomes. Thus in Italy, the merits and practical effects of spatial planning approaches was caught up in shifting intergovernmental constitutional complexities, affecting who had the legitimacy to direct who, at what level, on whether and how to implement spatial planning approaches. For Apulia, but also Wales, the means-ends efficiency of spatial planning approaches was dissipated because the powers to draw up zonings were separated from the powers to secure compliance. Enduring institutional arrangements governing the distribution of powers between governmental scales strongly configure how spatial planning approaches for onshore wind are operationalised in practice (see also Lauf et al. 2020).

Undertaking research across a diversity of national and regional settings, and tracing the adoption and effects of different modes of governing constructed around onshore wind, enables us to suggest more general causal propositions about spatial planning tools and their efficacy. As we have shown, the modes of governing we have observed are constituted by compromises, entailing exclusions of certain issues, the marginalisation of particular actors and so on. However, although spatial planning approaches are always potentially contestable compromises, the strategies adopted - for all their partiality and trade-offs - do not obviously and immediately fail, in the sense of provoking repeated resistance to the desired goals. Generalisation about efficacy thus needs to be able to say something about techniques in context.

What our research shows is that spatial planning approaches - including non-uses – are more likely to persist and deliver the desired effects in those contexts that more strongly resemble

the simplified image of them constructed by policy-makers, and where the elements omitted or compromised against in the mode of governing do not foment effective opposition. So '*developer siting flexibility*' modes did not thwart expansion in Apulia and Northern Ireland, because in both places dominant forces in rural politics are the farming sector, economic development, and the readiness to allocate agricultural land to on-shore wind on a market-driven basis. In Wales, '*central specification*' of spatial zonings worked in south Wales, because the allocation of SSAs to large tracts of industrial forestry, distant from most settlements, badged as 'less environmentally sensitive', did not encounter major opposition. The same compromises unravelled in mid-Wales because these contextual conditions did not pertain, hence the SSAs remain under-exploited. A key variable is whether those elements marginalised by the compromises struck in spatial planning approaches become subject to effective, organised opposition.

However, there is one omission that appears to consistently problematise all modes of governing for on-shore wind - grid capacity. Across our cases, a failure to treat grid capacity seriously, side-lining it in the spatial planning approaches adopted, only resulted in its later re-emergence as wind farm proposals came forward. We observed this both in regions that encouraged '*developer siting flexibility*' (Apulia) and those with strong '*central specification*' of preferred wind development areas (Wales).

Conclusions

Our research sought to further our understanding of the effects of spatial planning approaches on wind energy deployment, by examining the take-up, construction and mobilisation of spatial approaches in practice. In particular, we have insisted on the importance of examining the broader modes of governing in which spatial planning approaches have been enmeshed. A key finding is that spatial planning approaches take a diversity of forms and have been constructed to fulfil different governance purposes. Understanding these purposes is integral to any coherent discussion of effectiveness, and confounds simplistic cause-effect modelling. Across Italy and the UK, spatial planning policies and tools have been enrolled as devices to support central-state led RE growth, to respond *ex post* to emergent cumulative impacts, to constrain wind energy deployment, and to orchestrate environmentally-desirable spatial configurations. Moreover, states may seek to reconcile multiple goals through the use of spatial planning approaches, and the desired purposes may shift over time. The diversity of governance purposes that spatial planning approaches are used to perform explains why clear 'generalisable' knowledge of the effects of spatial planning approaches is elusive.

Our research in Italy and the UK generated a series of archetypal spatial planning approaches (in Table 3) that reflect this diversity of form and purposes. We do not claim that this set is exhaustive: governments may strike an almost infinite variety of different compromises between the key elements that constitute spatial planning approaches (Table 1). Nevertheless it is possible to discern these archetypes in other settings: 'developer siting flexibility' characterises the limited state interest in spatial steering of wind farm siting in Texas (Bohn and Lant 2009); spatial planning approaches in the Republic of Ireland were rolled out across the nation using 'meta-governance by methodology' (Gonzalez et al 2016); the high level of

local veto in Sweden's regional zoning system (Lauf et al 2019) gives it features of 'local spatial control'. However, it is the components of our analytical approach that we suggest has value for further research, both in other geographical settings and for other spatially extensive energy technologies, like off-shore wind and field-scale solar.

The first component of our approach highlights the importance of studying spatial planning approaches as part of wider modes of governing, and the need to be alert to the governance purpose for which they are utilised. The second component is to recognise the unavoidable compromises entailed in constructing spatial planning approaches, which embrace the socio-technical properties of any spatial mapping methodologies but also choice of scale, forms of public participation and other aspect of actor alignment. By being attentive to these aspects, our research showed that although much effort is aimed at developing spatial planning techniques, many of the challenges that beset spatial planning approaches in practice arise from difficult-to-resolve governance dilemmas around scale and national-to-local coordination. The third component of our approach is to establish that the effects of spatial planning approaches are the joint product of the mode of governance and the social, political and environmental context in which it is deployed. Our research has shown how despite their inevitable selectiveness and contestable compromises, spatial planning approaches can 'work' where the context strongly resembles the simplified image of it constructed by policy-makers, such that dominant local actors (developers, publics) accept the various compromises involved and do not foment resistance around aspects that are marginalised.

Our research also has relevance for practitioners and policy-makers. It shows the need for greater nuance in making claims for spatial planning approaches. Speed, higher volumes of RE delivered and avoidance of environmental conflicts are not all immediately achievable at the same time. Nor are they outcomes that automatically arise from strongly directive spatial planning approaches. The contextual nature of the efficacy of spatial planning approaches offers a warning against the easy transfer of 'good practice' from other settings. Our research also identified factors that repeatedly undermined the efficacy of spatial planning approaches: where promoters of spatial policies do not control project consenting, and where grid network capacity is ignored. Neither are matters of 'better spatial analysis technique' and practitioners, as well as analysts of spatial planning approaches, would be well-advised to give close attention to these governance issues.

References

- Alberti, V., De Ioris, D., De Pascali, P., Di Pasqua, G. & Reginaldi, M. 2015. L'energia nelle trasformazioni del territorio. Ricerche su tecnologie e governance dell'energia nella pianificazione territoriale, Milano, Franco Angeli.
- ARTI 2008. Le energie rinnovabili in Puglia. Quaderni Arti. Bari: Agenzia Regionale per la tecnologia e l'innovazione.
- BEIS (2020) Regional Statistics 2003-2019: Installed Capacity and Generation. London: Department for Business, Energy & Industrial Strategy. Berry R and Higgs G (2012) 'Gauging levels of public acceptance of the use of visualisation tools in promoting public participation: a case study of wind farm planning in South Wales, UK', *Journal of Environmental Planning and Management* 55(2), 229-25
- Boltanski, L. and Thévenot, L. (2006) *On Justification: Economies of Worth*. Princeton, NJ: Princeton University Press.
- BURP 2006. Regolamento Regionale 23 Giugno 2006, n. 9, Regolamento per la realizzazione di impianti eolici nella Regione Puglia Bari: Regione Puglia.
- BURP 2014. Bollettino Ufficiale Regione Puglia n. 51 del 15/04/2014 'Analisi di Scenario della produzione di energia e fonti energetiche rinnovabili sul territorio regionale. Criticità di sistema e iniziative conseguenti. Bari: Regione Puglia.
- Bulkeley H, Watson M, Hudson R and Weaver P (2005) 'Governing municipal waste: towards a new analytical framework', *Journal of Environmental Policy and Planning* 7(1), 1-23.
- Bulkeley, H., Watson, M., Hudson, R., 2007, "Modes of governing municipal waste" *Environment and Planning A* 39 2733-2753
- Cowell, R. 2010. Wind power, landscape and strategic, spatial planning-The construction of 'acceptable locations' in Wales. *Land Use Policy* 27(2), pp. 222-232.
- Cowell, R., Flynn, A. and Hacking, N. 2020. Conceptualizing environmental governance in turbulent times: insights from Brexit and waste in the UK. *Political Geography* 81
- DoENI (Department of Environment Northern Ireland) (2009) *Planning Policy Statement 18: Renewable Energy*, Belfast
- De Risi, A., Tornese, I. & Laforgia, D. 2008. Atlante Eolico della Regione Puglia, Agenzia regionale per la tecnologia e l'innovazione, Bari
- de Vries, B. J. M. et al. 2007. Renewable energy sources: Their global potential for the first-half of the 21st century at a global level: An integrated approach. *Energy Policy* 35(4), pp. 2590-2610.
- Devine-Wright, P.(ed.) (2011)*Renewable Energy and the Public. From NIMBY to Participation*, Earthscan

- DM, 2010, Decreto Ministeriale 10 Settembre 2010, Linee guida per l'autorizzazione degli impianti alimentati da fonti rinnovabili, Ministero dello Sviluppo Economico, Rome: Gazzetta Ufficiale
- DM. 2012. Decreto Ministeriale 15 marzo 2012 'Burden Sharing', Ministero dello Sviluppo Economico, Rome: Gazzetta Ufficiale
- European Commision 2009. Directive 2009/28/EC Renewable Energy Directive Brussels: European Commision.
- Flannery W, Healy N and Luna M (2018) 'Exclusion and non-participation in Marine Spatial Planning' *Marine Policy* 88, 32-40
- Frantál, B., Van der Horst, D., Martinát, S., Schmitz, S., Teschner, N. A., Silva, I., Golobic, M. & Roth, M. 2018. Spatial targeting, synergies and scale: Exploring the criteria of smart practices for siting renewable energy projects. *Energy Policy*, 120, 85-93.
- Gauglitz P, Chickentanz S and Pape C (2019) 'Nature conservation as a driver in wind enegy scenraios', *Energy, Sustainability and Society* (on-line)
- González A, Daly G and Gleeson J (2016) 'Congested spaces, contested scales -a review of spatial planning for wind energy in Ireland', *Landscape and Urban Planning* 145, 12-20
- GSE 2018. Rapporto Statistico 2018 Impianti a fonti rinnovabili, Settore Elettrico. Roma: Gestore Servizi Elettrici.
- Hacking, N. and Flynn, A. 2018. Protesting against neoliberal and illiberal governmentalities: A comparative analysis of waste governance in the UK and China.. *Political Geography* 63, pp. 31-42
- Hakim C (1987) *Research Design: Strategies and Choices in the Design of Research*, London: Allen and Unwin
- Heclo, H. (1974) *Modern social politics in Britain and Sweden: from relief to income maintenance*, Yale University Press, New Haven
- Hobarty, R., Huber, S. and Ellis, G. (2012) 'Large-scale wind deployment, social acceptance', *WIREs Energy and Environment*.
- IEEP (Institute of European Environmental Policy) (2009) 'Positive Planning for Onshore Wind. Expanding Onshore Wind Energy Capacity While Conserving Nature', a report for the RSPB, Sandy, Beds.
- IPCC 2019. Global warming of 1.5°C: Summary for Policymakers (revised version). Switzerland: Intergovernmental Panel on Climate Change.
- Kenworthy, T. (2010) 'Big Land, Big Opportunity. Smart Land Use in the Fight Against Climate Change', Center for American Progress

- Lauf, T., E., K., Gawel, E., Lehmann, P. & Söderholm, P. 2020. The regional heterogeneity of wind power deployment: an empirical investigation of land-use policies in Germany and Sweden. *Journal of Environmental Planning and Management*, 63, 751-778.
- Leibenath M, Wirth P and Lintz G (2016) 'Just a talking shop? – Informal participatory planning for implementing state wind energy targets in Germany', *Utilities Policy* 41, 206-213.
- Malandrino, O. & Sica, D. 2011. Il contributo dei meccanismi di incentivazione all'affermazione delle fer nel paradigma energetico nazionale. *Esperienze D'Impresa*, 2, 69-79
- Meadowcroft, J. 2009. What about the politics? Sustainable development, transition management, and long term energy transitions. *Policy Sciences* 42(4), pp. 323-340.
- MHCLG (2019) *National Planning Policy Framework*, February, MHCLG.
- MISE 2010. Piano di azione nazionale per le energie rinnovabili (direttiva 2009/28/CE), Piano Economico, Rome: Ministero dello Sviluppo Economico. Moragues-Faus, A. and Ortiz-Miranda, D. (2010) 'Local mobilisation against windfarm development in Spanish rural areas: new actors in the regulation arena', *Energy Policy* 38(8), 4232-4240.
- Moss T and Newig J (2010) 'Multilevel water governance and problems of scale. Setting the stage for a broader debate', *Environmental Management* 46 (1), 1–6
- Murdoch J (2000) 'Space against time: competing rationalities in planning for housing', *Transactions of the Institute of British Geographers* 25: 503-519.
- Nadaï, A. (2007) "'Planning", "siting" and the local acceptance of wind power: some lessons from the French case', *Energy Policy* 35, 2715-2726.
- ODPM (2004) *Planning Policy Statement 22: Renewable Energy*, The Stationery Office
- Owens S, Rayner T and Bina O (2004) 'New agendas for appraisal: reflections on theory, practice and research', *Environment and Planning A* 36, 1943-1959
- Palmas, C., Siewert, A., & von Haaren, C. (2015). Exploring the decision-space for renewable energy generation to enhance spatial efficiency. *Environmental Impact Assessment Review*. 52, 9-17
- PEAR 2014. Regional Plan for Energy and Environment (PEAR) Piano Energetico Ambientale Regionale Regione Puglia. In: PUGLIA, R. (ed.). Bari: Regione Puglia.
- Petersen J (2018) 'The application of municipal renewable energy policies at community level in Denmark: a taxonomy of implementation challenges', *Sustainable Cities and Society* 38, 205-218
- Power, S. and Cowell, R. 2012. Wind Power and Spatial Planning in the UK. In: Szarka, J., Cowell, R., Ellis, G., Strachan, P., Warren, C., ed. *Learning from Wind Power*,

Governance, Societal and Policy Perspectives on Sustainable Energy. London: Palgrave Macmillan, pp. 61-84.

Regione Toscana (2000) *Piano Energetico Regionale*, Firenze: Regione Toscana.

Regione Toscana 2008. Piano di Indirizzo Energetico Regionale (PIER), Firenze: Regione Toscana.

Rein, M and Schön, D 1996 'Frame-critical policy analysis and frame-reflective policy practice' *Knowledge and Policy* 9 (1):85-104

Riles, A. (2006) *Documents. Artifacts of Modern Knowledge*, University of Michigan Press.

RSE 2011. Energia eolica e sviluppo locale Territori, green economy e processi partecipativi. Rome: Ricerca Sistema Energetico - RSE SpA.

Scottish Government (2014) *Scottish Planning Policy*, Scottish Government, Edinburgh

Servillo, I. & Lingua, V. 2014. The Innovation of the Italian Planning System: Actors, Path Dependencies, Cultural Contradictions and a Missing Epilogue. *European Planning Studies*, 22, 400-417.

Stevenson, R. 2009. Discourse, power, and energy conflicts: Understanding Welsh renewable energy planning policy. *Environment and Planning C: Government and Policy* 27(3), pp. 512-526.

Walker, G. 1995. Energy, land use and renewables. A changing agenda. *Land Use Policy*, 12, 3-6.

WAG (Welsh Assembly Government) (2005) Technical Advice Note 8: Planning for Renewable Energy, July, WAG: Cardiff.

WAG (Welsh Assembly Government) (2010) *A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement*, March

Warren, C. R. and Birnie, R. V. (2009) 'Re-powering Scotland: wind farms and the 'energy or environment?' debate', *Scottish Geographical Journal* 125(2), 97-126.

Watson M, Bulkeley H and Hudson R (2008) 'Unpicking environmental policy integration with tales from waste management', *Environment and Planning C: Government and Policy* 26, 481-498.

Wolsink M (1996) 'Dutch wind power policy: stagnating implementation of renewables', *Energy Policy* 24(12), 1079-1088.

Wolsink, M. 2017. Co-production in distributed generation: renewable energy and creating space for fitting infrastructure within landscapes. *Landscape Research*, 1-20.

Wu, G. et al (2020) 'Low-impact land use pathways to deep decarbonization of electricity', *Environmental Research Letters* 15

Figure 1: Case study locations

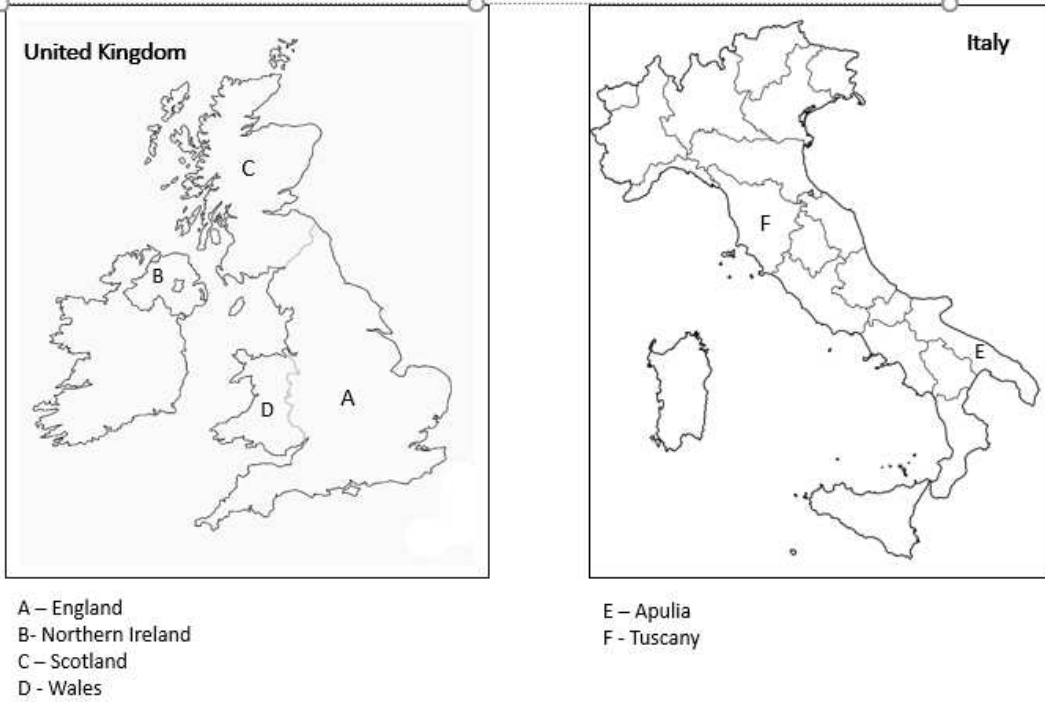


Figure 2: Installed capacity (MW) of on-shore wind energy in six UK and Italian regions

Source: BEIS (2020); GSE (2018).

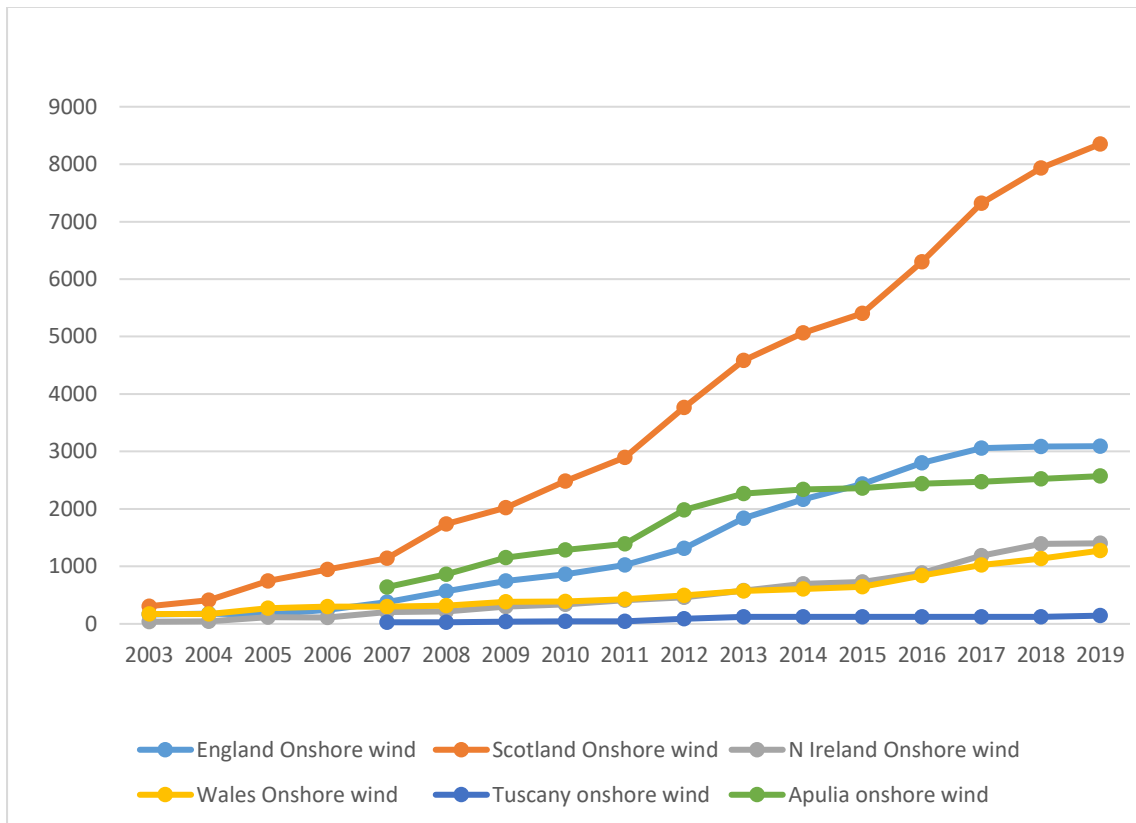


Table 1: Inherent dilemmas in spatial planning approaches to renewable energy development

<i>Dimension</i>	<i>Description</i>	<i>Trade-offs/ dilemmas</i>
<i>Macro problem framing</i>	The way that the overarching policy problem is constructed shapes what is regarded as a suitable solution, a 'good outcome' and an important (energy or environmental) resource	Are spatial planning approaches used to deliver RE targets, defined outwith the planning process, or used to define what RE targets should be, based on spatial constraints? To what extent should landscape/ecological conservation be considered ex ante constraints on RE expansion?
<i>Socio-technical properties</i>	The 'internal', technical properties of spatial planning approaches i.e. the selection and calculations of indicators, the mapping processes involved, and the way that indicators are aggregated.	Which environmental or social elements should be selected for inclusion in spatial planning approaches, and which values should thereby be represented? To what extent should the complexity of land and societal attachments to it be simplified?
<i>Spatial focus</i>	The spatial scale at which spatial planning approaches are constructed	Should proponents defer to existing spatial jurisdictions or adopt a new, issue-appropriate spatial scale? Is it more important to adopt a broader spatial scale, increasing the scope for strategic decision-making, but at the expense of reduced resolution?
<i>Participation</i>	How publics and stakeholders are involved in shaping the mapping methodology or in implementation	How should the process balance the close involvement of key stakeholders with wider, inclusive public participation?
<i>Actor alignment</i>	How responsibility for creating and applying spatial planning exercises is distributed across different tiers of governance, affecting legitimacy and control. This includes whether different levels of governance have flexibility to interpret instructions from other levels	Are spatial planning approaches designed and delivered 'top-down' or 'bottom-up', from local arenas? Do spatial planning approaches defer to existing distribution of formal powers between government scales, or alter them? Are resultant spatial zones for RE development mandatory or advisory?

Table 2: The distribution of formal energy and spatial planning powers in Italy and the UK

Spatial level	Italy	Spatial level	UK
National	<p>Energy policy: compliance with international law (e.g. EU Directives); market support for renewable energy (RE) and grid regulation and long term infrastructure planning</p> <p>Energy strategy and spatial planning: the National Energy Plan- Piano Energetico Nazionale embraces (i) 'Burden Sharing' Targets; (ii) simplified authorisation procedures; (iii) the Linee Guida, including consistent cross-national rules for EIA (since 2017); (iv) facilitation of grid access and connections</p> <p>Project consenting for: marine energy (including offshore wind), hydroelectric plants over 30 MW and thermal plants above 300 MW</p>	National	<p>Energy policy: compliance with international law (e.g. EU Directives); market support for renewable energy (RE) and grid regulation (not for Northern Ireland).</p> <p>Energy strategy and spatial planning: limited cross-UK energy strategy-making; UK government makes spatial planning policy for England only.</p> <p>Project consenting: UK government authorises consents for energy generation projects of 50MW+ for England and Wales, <i>but</i> (i) after 2017 only over 350MW in Wales, and (ii) not for on-shore wind since 2016</p>
Regional	<p>No powers over market support.</p> <p>Energy strategy and spatial planning: regions publish Regional Energy Plan(s), offering strategic direction and coordination.</p> <p>Project consenting for: grid/ infrastructure renewal; for almost all types of plants requiring EIA (i.e. wind > 60kW).</p> <p>Regions can expand the scope of the 'simplified authorization scheme' (PAS) to power plants up to 1 MW and delegate this to municipality level</p> <p>Regions can also delegate their consenting, EIA duties and simplified authorisation powers to the Province.</p>	Devolved (Northern Ireland, Scotland and Wales)	<p>Northern Ireland has formal powers over market support for RE and grid regulation in Northern Ireland; Scotland has limited executive powers over some, now historic, market support systems; Wales has no powers in these spheres.</p> <p>Energy strategy and spatial planning: Devolved governments permitted to create energy strategies; each has full control over spatial planning policy.</p> <p>Project consenting: devolved governments authorise consent for some energy generation projects: over 50MW in Scotland; for all energy generation in Northern Ireland until 2015, thereafter only projects over 30MW; Wales acquired consenting powers on projects over 10MW (from 2016) up to 350MW (from 2017).</p>
Provincial/ Municipality level	<p>Energy strategy and spatial planning: Provincial/ Municipal Energy Plan(s) and EIA and Simplified authorisation duties, <i>if delegated to them by region</i>; guidelines for interventions to planners;</p> <p>Project consenting: issuing consent; providing simplified authorization schemes (PAS) for power plants up to: Wind 60 KW; PV 20 KW, hydro 100 KW, Biomass 200 KW; biogas 250 KW</p>	Local govt.	<p>Energy strategy and spatial planning: drawing up local land use plans (in Northern Ireland, from 2015)</p> <p>Project consenting: for energy projects up to 50MW in England until 2016, thereafter for all onshore wind; up to 50MW in Scotland; up to 50MW in Wales (until 2016), thereafter up to 10MW; in Northern Ireland only since 2015 and projects up to 30MW</p>

Source: the authors.

Table 3: Modes of governing on-shore wind: diverse roles for spatial planning

Mode of governing		Common characteristics	Examples
Label	Description and goals		
<u>Developer siting flexibility</u>	Approach eschews or fails to effectively engage in robust spatial steering, leaving siting choice to developers, in belief that this best expedites RE expansion	Criteria-based approaches, no spatial zoning	Apulia, Italy, (before publication of Linee Guida) Northern Ireland England, until 2010
<u>Spatial puzzling</u>	A learning-based exercise, for refining technology choices and spatial targets	Assessing technologies against constraints; detached from regulatory role	English regions, 1998-2010
<u>Local spatial control</u>	Requires spatial zoning but gives task largely to local level government. Local environmental and economic concerns and control pre-eminent	Minimal central prescription of approach. Indifference to RE outcomes	England post-2016
<u>Meta-governance by methodology,</u>	Spatial planning approaches required but 'higher' level government steers practice by setting down methodology, allowing flexibility to local actors.	Lists of required characteristics to be considered and relative weighting; propensity for constant flux	Scotland Italy (Linee Guida/ burden sharing)
<u>Central specification</u>	Higher level government draws up spatial planning approach and specific development/ exclusion zones; expanding wind energy but co-delivering landscape outcomes	Defining preferred development areas and holding them over time	Tuscany Wales Apulia (after publication of Linee Guida)