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Wind Farm Siting and Protected Areas in Catalonia: Planning Alternatives or Reproducing 'One-Dimensional Thinking'?

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Abstract: Wind energy is an emblem of sustainability with the potential to promote a qualitative alternative to current energy systems and nuclear options for CO₂ reduction. However, wind farm siting often conflicts with aspirations to conserve traditional landscapes and wildlife habitats. In this paper we adopt a Critical Theory perspective, informed by Herbert Marcuse's work, to study the discourse concerning wind energy siting in Catalonia, Spain. We give particular attention to how tensions between potentially conflicting sustainability objectives are addressed and by whom. Based on a review of this siting discourse and the application of Marcuse's theory, we find that the Catalan wind energy siting discourse is both influenced by and reproducing what Marcuse referred to as the 'one-dimensional thinking' of technology as ideology: erasing the possibility of critical dialectical thought by subsuming the question of "what should be" under the question of "what is". This has implications both for how these conflicts are investigated and for the sustainability of decisions taken. We conclude that closer attention to the role of 'one-dimensional thinking' in wind energy siting discourses could improve not only the understanding of their logic but might also have the potential to help make them more democratic.

Keywords: wind energy; protected areas; one-dimensional thinking; wicked problems; discourse analysis; post-normal science

1. Introduction

Renewable energy has become, in recent years, an emblem of sustainability—an icon of the much-anticipated new ‘green economy’—and windmills and wind farms serve as one of its ideal types. Wind power is particularly attractive because it offers both a different basis for organizing energy supplies and a concrete alternative to the nuclear option for reducing anthropogenic CO₂ production. Advocating wind energy can be understood as part of a broader effort to liberate late-industrial political subjects from their dependence upon large scale, centralized (mainly nuclear and fossil fuel based) energy systems. Wind energy, which can be used on site or transferred to a central electricity grid, presents this subject with a chance to regain direct control of power production.

However, the dispersed, site-based character of wind energy production carries with it complications that highlight a basic, often underplayed aspect of sustainability problems: Suitable locations for wind farms can, and often do, conflict with other sustainability-oriented land use aspirations, such as the conservation of traditional landscapes and wildlife habitats. This type of clash between environmentalisms [1,2] has been repeatedly observed in wind energy studies, where general agreement on the need to promote wind energy is often found to turn into conflict during implementation [3].

Much attention has been given to public attitudes towards wind energy [4–6] and the motives behind the opposition to wind farms [7]. It is now generally agreed that these are not adequately explained by the Not In My Back Yard (NIMBY) concept [4,8,9] and that there is a need to study the associated planning and decision making process more closely, in order to better understand the origin and logic of these conflicts [9,10]. Previous research has highlighted a tendency for wind energy siting policies to be framed around scientific arguments and disagreements about facts, prioritizing an instrumental type of rationality [1,10]. Here we pick up on that observation and endeavor to tease out its origins and implications by using a set of analytical categories developed with the help of theory drawn from Marcuse [11] and Hajer [12], which we use to examine the discourse concerning wind energy siting in Catalonia, Spain.

Following Marcuse, this tendency to rely only on facts can be understood as a *de facto* rejection of normative considerations that are not compatible with the “given state of affairs” [13]. In Catalonia that “given state” is centralized electricity distribution and a heavy reliance on nuclear technology: An archetypical example of late-industrial technological rationality. Based on our review of the wind energy siting debate in the region over the past 30 years, we propose that this discourse is both influenced by and reproducing what Marcuse [11] referred to as the ‘one-dimensional thinking’ of technology as ideology: Erasing the possibility of critical dialectical thought by subsuming the question of “what should be” under the question of “what is”. The erosion of dialectical thought can be observed in this case through a dearth of value-based argumentation and a strong tendency for the discourse to be centered around fact-based propositions, concerning what is technically or scientifically appropriate.

We structure this paper as follows: In Section 2 we present our theoretical points of reference and our analytical framework; Section 3 then provides details of our research design and empirical methods; Section 4 presents a short history of the wind energy siting process in Catalonia and the results of a discourse analysis inspired by Hajer's concept of discourse coalitions [12]; in Section 5 we apply our analytical framework, classifying these discourse coalitions and the historical progression of the siting process according to *types of argumentation*; in Section 6 we then juxtapose the *types of argumentation* assigned to discourse coalitions with those assigned to the overall discourse on wind energy siting in Catalonia, in order to assess the influence and reproduction of "one-dimensional thinking"; in Section 7 we discuss our findings and in Section 8 we present our conclusions and some recommendations for future work.

2. Framing Complex "Wicked Problems": One-Dimensional Thinking and Discursive Closure

We propose that deciding where to site wind farms can be understood as what Rittel and Webber [14] have called a "wicked problem", which is persistent, complex, and difficult or perhaps even impossible to solve. Such problems are presumed to arise in late-industrial societies; where straightforward planning problems have largely been resolved; those that remain unsolved are presumed to be so because they are embedded in the logic of how late-industrial society operates. Here we find Hajer's approach to the study of such problems, which he describes as "the new environmental conflict", to be particularly helpful for guiding our work: it "should not be conceptualized as a conflict over a predefined unequivocal problem with competing actors pro and con, but is to be seen as a complex and continuous struggle over the definition and the meaning of the environmental problem itself" [15]. Bringing Hajer's insights to bear here, we explore how interactions between four key discourse coalitions, and their relationships to the overall debate, have led to some languages of valuation being imposed over others [16].

One-Dimensional Thinking and Discursive Closure: "Types of Argumentation"

In order to apply this analysis we adopt a Critical Theory perspective centered on the concept of "one-dimensional thinking" [11]. This enables us to consider systematically, how and to what end the wind energy siting discourse in Catalonia has developed over time and what type of discursive closure has been achieved.

One-dimensional thinking can be understood as a mode of reflection that erases the possibility of critical thought by subsuming the question of "what should be" under the question of "what is". Debate is confined to the dimension of "facts", the actuality or appearance of things, and debate about the dimension of "values", the potentiality or purpose of things, is suppressed or rejected outright [13]. We extract from Marcuse's works this one pivotal concept, as we find it shares many presumptions and descriptors with Rittel and Webber's idea of wicked problems [17].

Table 1. Four basic *types of argumentation* classified using Marcuse’s concept of “one-dimensional thinking”

	Topic of the Discourse	
	Means	Ends
	<i>the procedures used to make wind mill siting decisions</i>	<i>the layout of wind mill siting: where, what kind/number/density</i>
Realm of Justification		
Facts-based Arguments: <i>concerned with the question of “what is”</i>	<u>Facts-Means</u> <i>Fact-based arguments concerning the means for reaching end results</i>	<u>Facts-Ends</u> <i>Fact-based arguments concerning end results</i>
Values-based Arguments: <i>concerned with the question of “what should be”</i>	<u>Values-Means</u> <i>Value-based arguments concerning the means for reaching end results</i>	<u>Values-Ends</u> <i>Value-based arguments concerning end results</i>

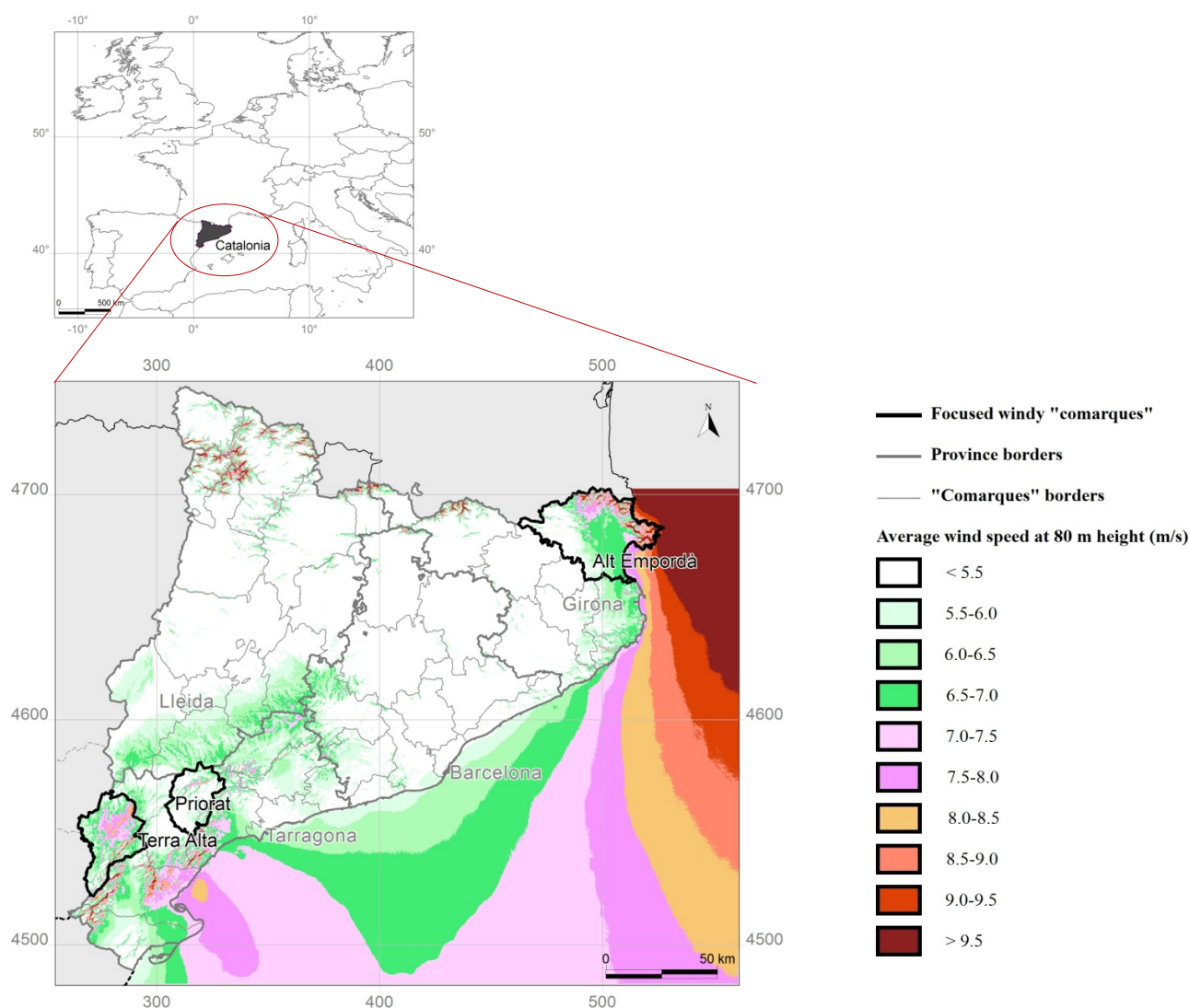
The analytical framework presented in Table 1 is informed both by our readings of Marcuse, from which we draw the *realm of justification* categories “facts-based” and “values-based” arguments, and by the data that we collected in the field, where we found two basic standpoints concerning the *topic of the discourse*: (1) how to make decisions about wind farm siting, which we here call “means” and (2) what these decisions should be, which we here call “ends” [18]. Juxtaposing these two axes provides us with four possible *types of argumentation*: (1) Values-Ends—arguments concerning the end result of where and according to what criteria wind mills are located, based on justifications that reflect social values and desires such as a moral imperative to protect the natural environment; (2) Facts-Ends—end result oriented arguments based on technical criteria, such as wind speeds, and/or compatibility with the *status quo*, e.g. grid connections; (3) Values-Means—value-based arguments concerning the means to be used for reaching decisions about end results, *i.e.* regarding desires and preferences for how the discourse should be organized, including for example demands for fairness and democracy; and (4) Facts-Means—fact-based arguments concerning how decisions about end results should be reached, *i.e.* justifications based on the technical characteristics of the problem and/or the *status quo* with regard to established siting procedures.

3. Research Design and Methodology

The research reported here is based on data collected in the form of a case study, as described by Yin [19], targeting key affected localities, in order to build a general picture of the wind energy siting debate across Catalonia. Wind intensity in the study region is concentrated in two exceptionally strong wind corridors: One to the south, coming down from the southern extreme of the Catalanides mountains, in Tarragona, and the other at the northeastern extreme of the region, where the Catalanides end and the Pyrenees begin (see Figure 1). Although the first wind farm in Catalonia was close to Costa Brava, it was dismantled in August 2007 following adoption of the “Special Plan for the protection of the environment and landscape of the Natural Park of Cap de Creus” (“Pla especial de

protecció del medi natural i el paisatge del Parc Natural del Cap de Creus”), which forbid wind farms in the Natural Park and therefore also the renovation of this wind farm, which had, by that time, become obsolete [20]. At the present time, all of the operating wind farms in Catalonia are located in the south corridor. Considering this skewed distribution of wind resources, we visited several key wind farm siting conflict areas in various *comarques* [21] located both throughout the southern (especially Priorat and Terra Alta) and northern (Alt Empordà) high-wind regions of Catalonia (see Figure 1). Criteria used to choose which siting areas to study were: the presence of social mobilization; the importance given to the case by both the media and gray documentation; and either the relatively high (Terra Alta) or low (Empordà and Priorat) degree of wind farm siting projects permitted and constructed in the area. In addition, wind farm projects identified either by the media or respondents as marking turning points in the wind energy siting discourse were studied, regardless of their location in Catalonia.

Figure 1. Situation and Wind Maps of Catalonia. Sources: [22–24].



Methods of data collection included participant observation, informal interviews and semi-structured interviews, which were conducted with the aim of identifying the key elements in

dispute. Local civil servants, local politicians, landowners in favor of wind farm development and representatives of local community platforms opposing the current siting policies were interviewed. We also conducted a second phase of semi-structured interviews with civil servants in the Catalan Department of Environment, environmentalist non-governmental organizations (NGOs) (including both conservationist-territorially focused and generalists pro-wind NGOs), representatives of the Catalan Institute for Energy (ICAEN), environmental consultants, members of the Catalan parliament, wind entrepreneurs and representatives of the wind industry lobby association Eoliccat. In total 68 interviews were conducted.

Interview data was examined using qualitative content analysis, as described by Bryman [25]. We identified key topics highlighted by interviewees and their perceptions of the relationships between these topics. Interview content was then compared and contrasted with relevant legal, gray and scientific documents on the topic. Further analysis of the collected data was then carried out through a discourse analysis inspired by Hajer [12], with the aim of identifying “social [discourse] coalitions on specific meanings” [26]. Here we understand discourse to mean “a specific ensemble of ideas, concepts, and categorizations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities” [26]. We presume that discourse coalitions are not necessarily based on formal alliances and that actors may be coordinating their arguments even in the absence of conscious intentions to do so. In order to identify discourse coalitions we looked first for story-lines—“narratives on social reality through which elements from many different domains are combined and that provide actors with a set of symbolic references that suggest a common understanding” [27]—and then identified the actors participating in their construction, based on the content of their interventions and the character of their actions [28]. We then applied the analytical framework outlined above by assigning *types of argumentation* to the statements comprising the storylines we had observed and to each of the four planning phases identified in our review of the history of the overall discourse. In a final stage we examined to what degree the *types of argumentation* employed by the various discourse coalitions were, or were not compatible with the *types of argumentation* found to be dominant in each of the four planning phases.

4. The Planning Process of Wind Energy Siting in Catalonia: Phases and Discourse Coalitions

Catalonia, in the northeast of Spain, is one of the country’s most industrialized regions and consumes nearly 20% of the country’s electricity, placing it first among the regions in electricity consumption [29]. The majority of the region’s electricity (56%) comes from nuclear power, with three of Spain’s eight nuclear power plants located in the region. In 2010 renewable energy (comprised almost entirely of wind power) covered 3% of the region’s electricity demand, in contrast to 16% of Spain’s electricity demand being covered by wind energy in that same year and coverage rates between 25 and 40% in other Autonomous Communities such as Galicia, Castilla-La Mancha, Castilla León, Navarra and La Rioja [29]. Power plant siting is heavily skewed towards the south. Energy consumption, by contrast, has always been highest in the central urban and northern touristic regions and anti-nuclear protests in the south have consistently included reference to this inequality.

The existence of two strong wind corridors (see Section 3 and Figure 1) and an uneven distribution of operating wind farms skewed towards the south have raised new political concerns that the existing

uneven development is being reinforced through the locating of new infrastructure in the south. Both wind corridors overlap with regions of special environmental status. The southern corridor, in Tarragona, overlaps with the habitat of 8% of Europe's endangered Bonelli's Eagle (*Aquila fasciata*) population [30–35], 80% of which (920–1100 pairs [31]) is concentrated on the Iberian Peninsula, where this raptor has suffered an average decline of 50% over the last three Eagle generations [32]. Wind corridors also overlap with areas of touristic importance especially in the north, including the picturesque landscape of the foothills of the Pyrenees, which run along Spain's world famous Costa Brava. In spite of having been one of the first regions to experiment with wind energy, with Spain's first modern wind farms connected to the grid near Girona some thirty years ago, Catalonia currently has only 4.5% of the country's total installed capacity [36].

4.1. Wind Energy Siting Planning Phases

Looking back over the history of wind energy siting in Catalonia, we have identified four distinct planning phases, which we use to help orient our discussion. Summaries of each phase are presented in Table 2, followed by a brief overview of how the overall discourse has progressed over time (detailed information of each phase can be found in Annexes I (descriptive) and III (analytical)).

The first phase of modern wind power development in the region, starting in the late 1970s, was initially backed by the government of the Autonomous Community of Catalonia (the Catalan Government). Between 1990 and 1999 the wind turbine manufacturing cooperative Ecotècnia, the private power company Endesa, various local authorities, the Catalan Government and the Spanish Ministry of Energy and Industry joined together to create public limited companies for five different projects. In 1998, a first attempt was made to formalize planning, when a Director's Plan for Wind Farms was adopted. This plan identified 75 sites as technically suitable for wind energy generation, with 69% of this potential capacity located in natural protected areas. Liberalization and tariff regulation introduced in 1997 (Ley 54/1997 [37]) provided incentives for private wind farm development and hundreds of projects entered into the permitting process, mainly taking the form of bilateral agreements between wind promoters and local councils. There is no clear and transparent public report with the exact number of projects of this period. However, interviews revealed that they were on the order of magnitude of hundreds: *i.e.* between 80 and 400 projects (see also Annex I for more details). The contents of these agreements were not regulated and public review of these agreements was not conducted.

Table 2. Phases of the Wind Energy Siting Debate in Catalonia: Summary with Main Events.

Phase I: Wind mills as new wizard players (1978–1999)
Key events and projects:
- First wind studies (1978–1995)
- Pioneer non-commercial (Garriguella-Vilopriu, 1984) and commercial (five farms from 1990–1997) projects
Regulatory-planning instruments:
- Ley 54/1997 Sector Eléctrico (liberalization and regulation of “special generation” of electricity) [37].
- Pla Director de Parcs eòlics de Catalunya for 1997–2010 established (first regional plan for the siting of wind farms in Catalonia) [38].

Table 2. Cont.

Phase II. Political fight around values (1999–2003)
<p>Key events and projects:</p> <ul style="list-style-type: none"> - Local platforms constitution (1999) and mobilization in "Terres de l'Ebre" (PHN and ENRON, 2000) - Debate and public consultation regarding the wind energy environmental restriction siting map (ME2002) (2000–2002) <p>Regulatory-planning instruments:</p> <ul style="list-style-type: none"> - Decret 174/2002, d'11 de juny, regulador de la implantació de l'energia eòlica a Catalunya (first wind farm siting procedure regulation) [39]. - Mapa d'implantació ambiental de l'energia eòlica a Catalunya 2002 (ME2002) (environmental zoning map for the location of wind energy in Catalonia: red (incompatible), yellow (environmental impact assessment (EIA) conditioned) and white (compatible)) [40].
Phase III. Battle between "facts": "rational siting" (2003–2010)
<p>Key events and projects:</p> <ul style="list-style-type: none"> - New left coalition government elected in Catalonia (2003) - Moratorium on new wind farm projects (2005) [41]. - ZDP map government agreement (Acord 108/2010) [42]. <p>Regulatory-planning instruments:</p> <ul style="list-style-type: none"> - Pla de l'Energia de Catalunya 2006–2015 (new energy planning for the region: 3500 MW target for wind energy in 2015) [43] - Natura 2000 Network (draft 2004, final 2006) - Decret 147/2009 Siting procedures for wind farms and photovoltaics and ZDP (Priority Development Zones) regulation [44]
Phase IV. Reasserting "values"? (2010–2012)
<p>Key events and projects:</p> <ul style="list-style-type: none"> - Temporary court restraining order barring the use of the ZDPs map (2011) - Court sentences resulting from Phase II (2011–2012) <p>Regulatory-planning instruments:</p> <ul style="list-style-type: none"> - Real Decreto Ley 1/2012 (removal of the feed-in tariff by the government of Spain) [45].

In 1999, the first local platforms opposing wind farm sitings began to take shape in the southern *comarques* of Priorat and Terra Alta. Shortly thereafter, at the close of 2000, the Catalan Government published a draft zoning map intended to regulate conflicts between natural protected areas and wind energy development. Both wind promoters and environmentalist critiqued the map, and a group of environmental NGOs, lead by the Group for the Study and Protection of the Ecosystems of the Countryside (GEPEC: Grup d'Estudi i Protecció dels Ecosistemes del Camp), prepared an alternative map which proposed an extension to the zoning in the draft and identified recommended and tolerable siting options [46], (see Figure I.1 in Annex 1). At the same time opposition arose to two other infrastructure projects in "Terres de l'Ebre" [47]: The Plan Hidrológico Nacional (PHN), which was a Spanish government initiative to redirect water from the Ebro River to other regions; and a proposed privately operated gas fired power plant. In response, the Catalan Parliament cancelled its support for both projects and decided to revise the proposed wind energy zoning map. However, efforts to achieve a definitive version of the map were widely critiqued, both by wind power promoters and by conservationists. From both sides, the main critique was that the map must set "clear rules of the game" and zoning rules must define the procedures to be followed in each zone, without leaving discretionary decisions to be taken in the late stages of siting. Local platforms, for their part, were critical of a

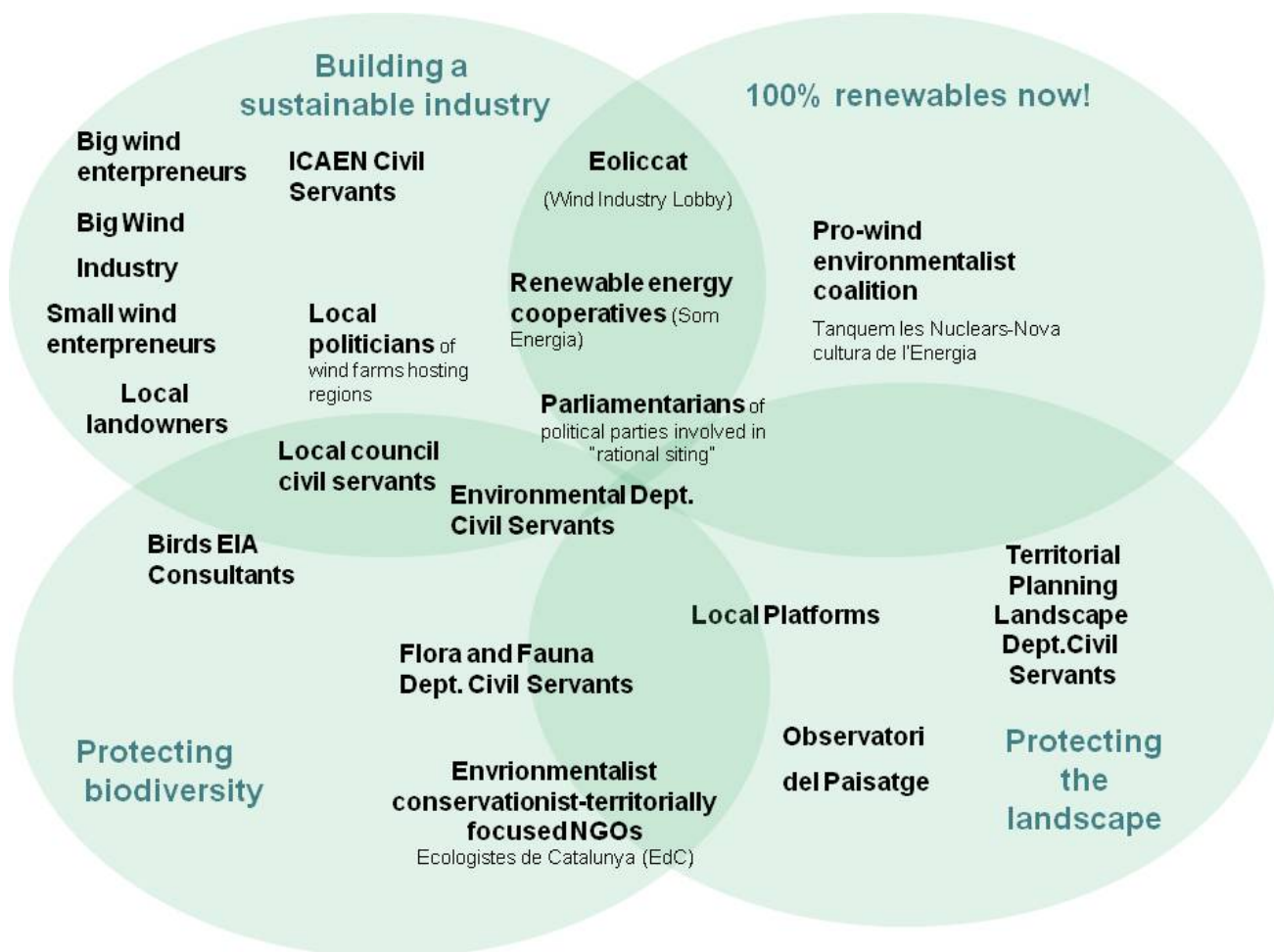
grandfathering clause that allowed projects located in restricted zones to proceed if they had been started or publicly debated before the new zoning rules came into effect.

In 2003 a new government was elected in Catalonia, and it was decided that wind farm planning would be rationalized, coordination improved and wind energy targets revised upward to 3500 MW by 2015 [43]. The new government's actions included a moratorium on new siting applications and a review of existing projects, with the aims of ensuring good access to wind resources and reducing the environmental impacts of planned turbines. This rationalization effort was also intended to lead to agreements with Red Eléctrica, the transmission system operator (TSO), regarding the boosting of grid connectivity. During this planning phase, installed capacity increased by a factor of ten, from roughly 100 MW in 2005 to nearly 1000 MW in 2010. At the end of this phase, a new permitting procedure (Decree 147/2009 [44]), based on the auctioning of rights to build in designated Priority Development Zones (ZDP in Catalan), was established in an effort to rationalize and speed up siting. Catalonia's Natura 2000 Network (see Figure. I.2 in Annex I) was also proposed, debated and finalized during this planning phase.

Following final approval of the ZDP map in 2010, conservationist, local residents in affected areas and even some members of the Catalan Government contested in some cases its final results and in others the process used to reach them. In March 2011 an order temporarily blocking the use of the ZDP map was issued by the superior court of Catalonia [48]. Subsequent court disputes concerning the regulations for providing permitted sites with suitable access to grid connections have been resolved in favor of wind promoters [49]. In addition, since the start of 2011, several pending court cases relating to decisions taken between 1999 and 2010 have also been decided in favor of local residents and conservationists [50–56].

4.2. Discourse Coalitions around Wind Energy Siting

We have identified a series of story-lines contributing to the overall Catalan discourse on wind energy siting, around which four discourse coalitions can be understood to have coalesced. Figure 2 shows the actor composition of each coalition, with areas of overlap providing a space for actors with ambiguous positions. The closer an actor is to an area of overlap, the more ambiguous their position. Below we provide a brief overview of the composition of each coalition, with further details to be found in Annex II.

Figure 2. Discourse coalitions around wind energy siting.

Building a sustainable industry—bringing rural development opportunities to Catalonia: The wind power industry is a flourishing and environmentally friendly economic growth sector that achieved a worldwide average annual growth rate of 20.5% from 2000 to 2005 [57]; it constitutes a development opportunity for Catalonia.

Here the wind power industry association of Catalonia, Eoliccat, emphasizes the contribution wind energy can make to society and the environment. Eoliccat is the most visible actor in this coalition, with civil servants from the Catalan Institute of Energy (ICAEN), local politicians and some parliamentarians also highlighting these perceived benefits.

100% renewables now! Stop climate change; shut down nuclear power: Urgent action is needed to stabilize greenhouse gas emissions in order to avoid the most dramatic consequences of climate change by stabilizing atmospheric CO₂ concentrations at between 445 and 490 ppm, and this should be done without resorting to other polluting options, such as nuclear power.

Fighting against climate change and its causes [58–60], perceived as excessive reliance on polluting power sources, is the main thread of this storyline, which also gathers together a strong historical set of anti-nuclear claims. The coalition is comprised mainly of pro-wind environmentalist NGOs associated with the campaign Tanquem les Nuclears—Nova Cultura de l'Energia (Shut down nuclear power stations: New Energy Culture).

Protecting the landscape—retaining the locals` control: Landscape is a common good with a symbolic importance; it contains both material and inscribed cultural values that are reflected in how it has been transformed [61]; it is part of a community's identity and a basis for securing one's livelihood.

Wind farms are called “wind power stations” in this discourse, in an effort to highlight their industrial character and link them to the larger issue of power supply based inequalities in the region. This story-line brings together small resistance platforms, mostly in the south, composed of residents in areas targeted for development, intellectuals and researchers working on landscape protection and also some civil servants from the territorial planning and public works departments of the Catalan Government.

Protecting biodiversity—wind farms cannot go everywhere! The Bonelli's Eagle is threatened by wind farm development [34,62]; biodiversity conservation should not be negatively affected by wind energy.

Here the Bonelli's Eagle (*Aquila fasciata*) of southern Catalonia, which is affected by modern wind mills mainly through habitat displacement [34,62] serves as an emblematic rallying point [63] for a complex set of interventions concerning environmental conservation in Catalonia. This storyline, although nuanced by controversies, brings together a broad array of environmentalist and conservationist NGOs, most of which belong to the “Ecologistes de Catalunya” federation, environmental consultants working on biodiversity issues and technicians from two specialist divisions in the Catalan Government's Department of Environment.

5. Types of Argumentations in Discourse Coalitions and Planning Phases

The discourse coalitions we found are similar to those found in other studies, as is the general tendency for the argumentative language to become technical and rational [1,10,64–66]. By employing the analytical framework presented in Section 2, regarding *types of argumentation*, we are, over time, able to systematically analyze how this tendency has manifested, both within each of the respective discourse coalitions and across them. We do this first by considering which of the four *types of argumentation* presented in Table 1 (*i.e.* Facts-Ends; Facts-Means; Values-Ends; Values-Means) are being used by which coalitions, and then by looking at how they manifest in the overall discourse over time, across the four planning phases (further detail about the content of this section can be found in Annexes III and IV).

5.1. Types of Argumentation Observed in the Discourse Coalitions

Starting again with the “Building a sustainable industry” storyline, we find numerous key Values-Ends type interventions, concerning what should be the purpose of wind energy: to reduce CO₂ emissions; to reduce dependency on foreign energy suppliers; to reactivate the economy by providing income and employment; to stop rural-to-urban migration [67,68]. However we also found numerous Facts-Ends interventions: Global impacts are more important than local ones, which are reversible; landscape claims are “subjective”; the Bonelli's Eagle is protected by other compensatory measures; government support is required to make investment attractive. Interventions regarding what means are required for reaching these ends are consistently formulated in terms of facts and the *status quo*

(Fact-Means): Regulation is required to ensure stability; permitting procedures must be fast and simple to ensure reliable returns on investments; planning and siting are technical matters to be guided by expert knowledge.

Moving next to the “100% renewables now!” storyline we find that one Values-Ends position—there is a moral imperative to urgently establish a 100% renewable electrical system—serves as this coalition’s central rallying point. More generally, however, the coalition relies on a reasonably balanced mix of Facts-Ends and Facts-Means interventions, arguing, for example, that there should be no limits on wind energy expansion because it is the most mature renewable technology and its environmental impacts are very low when compared with other technologies [69,70] (Facts-Means); and that the limited effectiveness of demand reduction initiatives, combined with a basic social need for energy, make wind power a necessity (Facts-Ends). Wind energy siting is viewed as a technical problem and objective scientific knowledge is presumed to be the appropriate foundation for addressing technical problems (Facts-Means). On this basis, it is argued that increased public participation in wind energy siting should be based on objective, scientifically contrasted arguments (Values-Means): (1) because the only important impact is on birds and this is a technical problem that must be addressed on a case by case basis (Facts-Means) and (2) because the dynamic character of landscape transformations means that all visual impact concerns are subjective and reversible (Facts-Means).

The “Protecting the landscape” storyline is characterized by a large number of interventions concerning the equity and fairness of wind mill siting objectives (Values-Ends) and procedures (Values-Means). It is argued, for example, that wind energy siting should not reproduce the uneven geographical development of the current Catalan energy system (Values-Ends), that promoters should not take advantage of comparatively poor, remote rural communities (Values-Means), that the economic benefits from wind farms should be better and that they should be fairly distributed (Values-Ends), that diversification of supply and reduction of demand should lead to a distributed energy generation system [71] where renewables serve a self-sufficiency agenda (Values-Ends) and that local public participation in siting decisions should come earlier in the process and have more influence (Values-Means). However, some fact-based interventions are also to be found in this discourse, particularly in the form of objections to direct local impacts such as night lighting, shadow flicker and noise pollution from the wind mills, concerns about the environmental effects of building new roads and power lines (Facts-Ends) and the need to tailor siting criteria to local situations in order to take into account cumulative impacts (Facts-Means).

Interventions contributing to the “Protecting biodiversity” storyline frequently refer to the moral imperative to protect Bonelli’s Eagle in particular and the under-valued biodiversity of Tarragona Province more generally [72] (Values-Ends). Here we also observed numerous fact-based arguments, claiming, for example, that wind energy development is incompatible with good management of special protected areas (Facts-Ends) and that environmental experts should be more involved in the early stages of strategic planning, in order to ensure that the most biologically important sites are the ones that receive protection (Facts-Means) [62].

5.2. Types of Argumentation Observed in the Planning Phases

Since the beginning of the 80s the discursive topic of wind energy siting in Catalonia has been formulated, contested, negotiated and reformulated several times. In Section 4 we identified four discrete planning phases that allowed us to talk about how this discourse had developed over time. Here we combine that information with our analytical framework by considering which *types of argumentation* have served to shape the overall discourse during each phase.

Phase I: Wind mills as new wizard players (1978–1999) was characterized mainly by a lack of regulatory planning. Initially wind farms sites were selected based on the Facts-Ends criterion that they had a good availability of suitably strong winds. At the end of this phase, in 1997, the Director's Plan for Wind Farms expanded the siting criteria to include connectivity to the electricity grid and attention to those special natural protected areas, as defined under Catalan law—*i.e.*, national parks, natural places of national interest, reserves (integral and partial) and natural parks [73]—that had already been established, thereby reinforcing the Facts-Ends orientation of the discourse. Environmental Impact Assessments (EIA), to be approved by the government on a case by case basis, were designated to be the appropriate way to ensure compatibility between wind energy siting and natural protected areas (Facts-Means). Values-based arguments were articulated mainly in terms of ends, with wind energy touted as an economic and environmental win/win solution, and bilateral siting agreements between companies and local councils were treated as a mere technical matter (Facts-Means).

Phase II: Political fight around values (1999–2003) was characterized by the expression of values, both with regard to how the siting processes should operate (Means) and what the final results should be (Ends). Values-Ends arguments were advanced mainly from within the “Protecting the landscape” discourse coalition, where concerns relating to the fairness of site distribution were raised, and the “Protecting Biodiversity” coalition, where concerns were raised that biodiversity protection should not take a back seat to development. This highly political (Values-Ends) discussion, which eventually reached the regional Parliament, led to the Facts-Means solution of a wind farm siting map designed to provide technical information about how to coordinate site development and nature protection. From that point forward siting was cast as a mainly technical problem and actors were required to formulate their opposition to siting decisions using facts-based *types of argumentation*.

Phase III: Battle between “facts”: “rational siting” (2003–2010), which was ushered in with the finalization of the siting map mentioned above, was dominated by discussions concerned with finding suitable places to locate wind farms. This pushed contentious value-based arguments to the side and sped up the siting process, ensuring a substantial growth of installed capacity, as compared to the two previous phases. The conversion of value concerns raised in the previous phase into facts-based objective criteria was considered to be both possible and appropriate. Ensuring that wind energy would be developed in all those areas with suitable wind resource was seen as a way to simultaneously correct the unbalanced distribution of installed capacity, which was skewed toward the south, and to meet steadily increasing production targets. Value based interventions regarding the need for territorial consensus (Values-Means) and the need to cancel permits for projects located in some natural protected areas (Values-Ends) were criticized as obstructive [74]. The inclusion of criteria relating to visual impact on the landscape (Values-Means), though Decree 147/2009 [44], was contested by both the “100% renewables now!” and the “Building a sustainable industry” coalitions, who argued against

what they saw as the imposition of subjective concerns onto an objective planning process. In contrast, both of these coalitions were able to use fact-based arguments to reassert their original value-based positions, by talking about the density of sites required to meet installed capacity targets (Facts-Ends) and the importance of speeding up the siting process to ensure their economic viability (Facts-Means). In the end, the Catalan Government's Facts-Means based approach of designating Priority Development Zones, which had served as the main discursive object of this planning phase, was finally adopted in 2010 [42].

Phase IV: Reasserting "values"? (2010–2012) has been characterized, so far, mainly by political stalemate and a shower of court decisions regarding failures to comply with the legal *status quo* during earlier planning phases. Following Marcuse, these court decisions can be understood as fact-based interventions, where the referent is not "what should be" but rather "what is": in this case, what is the law. The most influential intervention of this phase has been the Fact-Means superior court decision to temporarily prohibit the use of the Priority Development Zone map. While this, and a series of other decisions against several individual sitings, have opened up an opportunity for value-based interventions to be reintroduced into the discourse, so far there have been only a few marginal interventions like this, coming from the "Protecting the landscape" coalition.

6. Reproducing 'One-Dimensional Thinking'?: Comparing *Types of Argumentation* of Phases and Discourse Coalitions

By juxtaposing our preceding analyses of storylines and planning phases, we can now evaluate the degree of discursive compatibility between each discourse coalition and each progressive phase of the overall wind farm siting process. As shown in Table 3, we use a simple four value ordinal scale to measure this compatibility and a simple weighting system of 0, 1, 2, or 3 *'s to indicate the degree of emphasis given to each *type of argumentation* within each discourse coalition. The dominant *types of argumentation* observed in each of the planning phase are listed to the right and the composition of each discourse, to the left. These qualitative indicators are based on the data reported in Annexes III and IV.

This historically contextualized representation of how the interactions between the four discourse coalitions and the overall site planning discourse have changed over time allows us to address our main proposition: that technology as ideology has influenced how the Catalan wind farm siting discourse is developing and that this influence has led to the suppression of value-based arguments in favor of fact-based ones that are compatible with "one-dimensional thinking".

Table 3. Juxtaposition of *types of argumentation* in Planning Phases and Discourse Coalitions.

				Planning Phases				
				Phase I	Phase II	Phase III	Phase IV	
				1978–1999	1999–2003	2003–2010	2010–2012	
				Predominant <i>type of argumentation</i>				
				Facts	Values	Facts	Contested	
				Ends	Ends	Means	Facts	Values
							Means	Means
Discourse Coalitions				Compatibility Ratings				
<i>Weightings of argumentation types employed</i>				<i>Discourse Coalition against Planning Phase</i>				
Facts	Values	Facts	Values					
Ends	Ends	Means	Means					
<i>Building a sustainable industry</i>				<i>Strong</i>	<i>Weak</i>	Moderate	Moderate	
***	*	**						
<i>100% renewables now!</i>				<i>Strong</i>	Moderate	<i>Strong</i>	<i>Strong</i>	
***	**	***						
<i>Protecting the landscape</i>				<i>None</i>	<i>Strong</i>	<i>Weak</i>	<i>Weak</i>	Moderate
	***	*	**					
<i>Protecting biodiversity</i>				Moderate	<i>Weak</i>	<i>Strong</i>	<i>Strong</i>	
**	*	***						

As indicated above, we found that Phase I of the planning discourse—“Wind mills as new wizard players”—was dominated by a Facts-Ends *type of argumentation* advanced mainly by the “Building a sustainable industry” coalition. During this first phase the “Building a sustainable industry” coalition had a strong compatibility with the prevalent *type of argumentation* as did the “100% renewables now!” coalition. “Protecting biodiversity” was not actively involved in the discourse during Phase I, arriving first during Phase II, when impacts on the Bonelli’s Eagle were detected. However, this coalition had a moderate compatibility with the Facts-Ends orientation of Phase I, which can be understood to have created opportunities for it to collaborate with the first two in pulling the overall discourse back toward a facts basis in Phase III. Similarly, many of the value-based arguments of the “Building a sustainable industry” coalition were easily converted into facts based ones (MW targets and selection of the most efficient sites) in later phases. The “Protecting the landscape” coalition, which came about as a response to the unregulated siting that took place during Phase I, not surprisingly, was found to employ *types of argumentation* that were not compatible with the prevalent discourse of that Phase.

The upheaval of value-based claims in Phase II—“Political fight around values” forced a shift in the prevailing *type of argumentation* towards final causes (Values-Ends). This favored mainly the “Protecting the landscape” coalition but it also provided a moderately compatible discursive context for the “100% renewables now!” coalition and a point of entry for the “Protecting biodiversity” coalition. During this phase, all four coalitions had some degree of compatibility with the prevailing *type of argumentation*, making it possible for each of them to hold a position within the discourse. However, only one, “Protecting the landscape”, prioritized the Values-Ends type within their coalition, whereas all three of the others prioritized fact-based positions.

Among the two coalitions that were involved in Phase I, “100% renewables now!” had stronger compatibility with the Phase II discourse. It was also the only coalition to have two equally weighted top priorities in terms of *argumentation type*; one of which it shared with the “Building a sustainable industry” coalition (Facts-Ends), the other with “Protecting biodiversity” (Facts-Means). This suggests that there may be some logic to the shift toward a Facts-Means orientation in Phase III. Although the debate in Phase II was mainly about Values-Ends, a strong fact-based orientation remained present among these three discourse coalitions. With the entry of the “Protecting biodiversity” coalition, which strongly prioritized Facts-Means *types of argumentation*, this fact-based tendency was reinforced. For example, while the “Protecting biodiversity” coalition argued that there was a moral imperative to protect the Bonelli’s Eagle (Values-Ends), these actors also preferred that the discussion not be led by what they referred to as “subjective” landscape criteria. Instead, they favored developing tools that could objectively identify “the right thing to do”.

In Phase III—“Battle between “facts”: “rational siting” the discourse was dominated by arguments about facts. Rational siting was seen by all coalitions as an opportunity to achieve closure in the debate, finally making successful wind energy siting possible. However, this process of rationalization excluded democracy and justice value claims, which could not be justified in terms of efficiency or appropriateness. This favored coalitions with fact-based position and those that were able to translate their value-based arguments into facts-based ones. For example, Values-Means positions of the “100% renewables now!” and “Building a sustainable industry” coalitions, such as “Business and environmentalism should work together: green business is good” (“100% renewables now!” coalition) and “Wind farm siting should be facilitated through the mediation of the regional government. Local councils should not have the right to take the final decision.” (“Building a sustainable industry” coalition) can be found in the structure of the Priority Development Zones (ZDP in Catalan). There, prioritization of wind speed criteria, attention to grid connectivity and the centralized auctioning of permits are all justified as things that new sites need, in order to be economically competitive.

Although the main Values-Ends desire of these two coalitions—to have unrestricted wind energy development—was no longer an option after the political upheaval of Phase II, the core of this position could be converted into a Facts-Means criterion concerning the technical question of how to optimize renewable electricity generation. Similarly, the Values-Ends moral imperative of the “Protecting biodiversity” coalition—avoiding impacts on the Bonelli’s Eagle—could be articulated in the concrete, objective language of environmental impact assessment (Facts-Means), which had a clear place within this ‘rational siting’ discourse.

The “Protecting the landscape” coalition was less successful with this translating work. For example, while the ZDP eventually included rules regarding the minimum distance of new sites from villages

and of new sites from existing wind farms, this did little to address the concerns of southern communities regarding uneven development, which was a region-wide, not a local matter. Their arguments for distributed energy generation and more local democratic participation in the siting process were left largely unaddressed or vaguely formulated in the ZDP (see Annex IV). Where these *were* incorporated, it was in terms that were compliant with the “given state of affairs”, such as the agreement negotiated on the coalition’s behalf by the Left Republicans of Catalonia (ERC: Esquerra Republicana de Catalunya) political party, which guaranteed local representation in the form of two local councils members who were to sit on the commission responsible for project selection at the permit auction (see Annex IV).

During Phase III claims that the planning procedures were legally wrong and threatened the existence of endangered species (Facts-Means) were viewed by actors as strategically more effective than appeals based on value-based motivations, such as respect for local communities or protecting the environment. Several interviews with actors inclined toward the “Building a sustainable industry” and “100% renewables now!” storylines included the accusation that local platforms were “dressing visual impacts as environmental impacts that don’t exist”. Actors involved in the “Protecting the landscape” discourse, for their part, found that emphasizing increased efficiency, brought about through distributed energy generation, was more important than addressing the political aspects of decentralization because this made it easier for them to reach agreement with others. A similar pattern could be seen in the argumentative strategy of the “100% renewables now!” coalition. Although their value-based argument regarding changing “the given state of affairs” by breaking up the Catalan energy supply oligopoly was a primary motivation for this coalition, these actors chose to argue in Phase III with the comparative environmental and economic benefits of wind energy as compared to other technologies. Value-based arguments about generating qualitative changes were progressively marginalized during Phase III and the discourse concerning what should be the place of wind energy in the Catalan economy turned into a discussion about how to improve the traditional electricity sector. As stated by a politician that we interviewed, this was because the electricity sector “is, logically, in reality, dedicated to energy generation” and therefore the appropriate context for talking about wind power.

Phase IV—Reasserting “Values”?, as discussed above, has been characterized by political deadlock and a number of interventions by the courts. Here the Values-Means arguments of the “Protecting the landscape” coalition, regarding the democratic accountability of the siting process, have been brought back into the discourse, through the help of the Facts-Means intervention of a court decision, in which it was ruled that the ZDP map was not prepared in a manner compliant with Catalan law. However, as can be deduced from Table 3, the other three discourse coalitions, whose argumentation tends to be more toward fact-based positions, have preferred to push the discourse back towards Phase III. We can understand Phase IV as an attempt to reassert value based positions that had been silenced in Phases II and III. However, the Ends orientation of earlier arguments has now been translated into Means (e.g., critiques that the ZDP map development procedure was not participatory) and values-based arguments have been translated into fact-based ones (e.g. the environmental impacts associated with prioritizing energy efficiency). For the “Protecting the landscape” coalition, the result of Phase III meant that a change in the *argumentation type* of the overall discourse would be required before they could once again achieve standing for their values. Their claims in Phase IV can be understood,

following Marcuse [11], as an attempt to express a refusal of the political *fait accompli* resulting from Phase III. However, even this refusal has now been translated into a *type of argumentation* that is more compatible with technology as ideology, with their interventions now making reference to what is allowed under existing law and what can be proven based on scientific studies (Fact-Means).

7. Discussion

The results reported in Section 6 support our original proposition: that the wind farm siting discourse in Catalonia has both been influenced by and is reproducing what Marcuse [11] referred to as the ‘one-dimensional thinking’ of technology as ideology. Political concerns raised in Phase II, which were subordinated to the technical criteria of ‘rational siting’ in Phase III, have now, in Phase IV, been replaced by technical and juridical arguments, with facts and the ‘given state of affairs’ serving as reference points. We understand this tendency—to replace disagreements about values with disagreements about facts—as an indication that the politics of the siting discourse are being shaped by technology as ideology. Technological rationality is bearing such a strong influence on how the discourse is proceeding that it may be understood to be functioning as an ideology in its own right [11,75–77], leading to a discourse focused almost entirely on facts and things, dominated by what Marcuse has called an ‘overwhelming concreteness’ [78].

In the Catalan discourse upon which we report here, being pro or con wind mills has become a synonym for agreeing with, or opposing the wind energy model that is technically possible today: grid-based and commercially cost efficient. Inside this technical debate there is no space for discussion of social-environmental goals such as using wind power as the basis for building an alternative energy system. Nor is it possible to place the existential question of how to manage the balance between human and non-human uses of natural resources onto the table for discussion. Within a discourse where argumentation is performed in fact-based language, these value-based interventions are classified as complaints rather than valid standpoints: egoist NIMBY; human hating bird lover; utopian cooperativist. Our findings suggest that there is a need for studies of wind farm siting conflicts to give closer attention to the dynamics, both temporal and spatial, of relationships between facts and values in the associated discourse(s). This also has implications for determining the sustainability of planning decisions taken under such conditions. In particular, it raises the possibility that the existential question of how a society chooses to manage its relationship with the non-human environment is being reduced to a mere technical problem.

Assuming that value-based positions should have a standing in the Catalan wind energy siting discourse, which we do, we are then left with the question: How might this be possible? In his classic text *One-Dimensional Man*, Marcuse proposed that a New Science, a new idea of what constitutes Reason, originating from within the scientific logic that brought technology as ideology into being, might offer a route of escape from ‘one-dimensional thinking’ [79]. His discussion of this New Science can be interpreted as an anticipation of the recently developing discourse on post-normal science [17,75,76,80,81]. Post-normal science takes its name from the Kuhnian concepts of normal-science and scientific revolution [82], with the revolutionary proposition of post-normal science being that “under certain conditions, “normal” puzzle-solving science is not a scientific approach, because sometimes the puzzle in question cannot be solved” [14,75,83]. Coming from *within* the fact-based

discourse of science, the ensuing proposition, that it is necessary to democratize expertise concerning some types of complex, late-industrial scientific problems [81,84], presents a logically grounded position from which to resist the tendency of hard scientific facts to achieve the kind of discursive closure we observed in this case. If the assessment of fact claims employed in the wind energy siting discourse in Catalonia were to be opened up to an extended community of actors, beyond the experts, who were allowed to participate in the work of determining what constituted a valid fact [17,81,85], then the guiding presumption of Phase III of this discourse—that scientific arguments are automatically right and uncomplicated—would need to be abandoned. By creating a discursive context where fact and value-based arguments can be discussed side by side, such an ‘extended’ peer-review process could perhaps help open up new possibilities for Catalonia to think and go beyond the “given state of affairs”.

8. Conclusions

Our findings suggest that the analytical framework we developed, using Marcuse’s concept technology as ideology and Hajer’s definition of discourse coalitions, can indeed provide new understanding regarding the logic of conflicts about wind energy development. We began with a proposition: that wind energy siting can be understood as a “wicked problem” without a definitive formulation or solution [14], where environmental conflicts are performed as disputes over discourse hegemony and discursive closure [12]. Following Hajer [12], we conducted a discourse analysis of the last 30 years of wind energy siting in the Spanish region of Catalonia, through which we identified four key discourse coalitions and four key historical phases within the overall siting discourse in the region. Based on four analytical categories of *types of argumentation* (Facts-Ends; Facts-Means; Values-Ends; Values-Means), inspired by Marcuse’s concept of “one-dimensional thinking”, we analyzed the argument styles of each discourse coalition and each phase of the discourse. We then juxtaposed these results, one against the other, in order to study the patterns of compatibilities across discourse coalitions, and between coalitions and the overall discourse over time.

We found that actors have coalesced around four reasonably clear storylines that are similar to those found in other wind and renewable energy studies [64-66]: “Building a sustainable industry”; “100% renewables now!”; “Protecting the landscape”; and “Protecting biodiversity”. We also found that the dynamics of interactions between these discourse coalitions during the different planning phases showed a tendency towards increasing “disagreements about facts” [1], which favored reliance upon the instrumental types of rationality (Facts-Ends; Facts-Means) [10] that are most compatible with technology as ideology.

We proposed, at the close of our discussion, that Marcuse’s idea of a New Science [79], as manifested in the discourse on post-normal science [81], might provide ways to avoid the trap of “one-dimensional thinking” in wind energy siting and we have recommended further research in this direction. More generally, we find that considering the place of the value-based propositions in discourses concerning wicked problems may help reveal ways to escape the ‘overwhelming concreteness’ [78] of discourses that are focused only on what is ‘true’ and possible according to the ‘given state of affairs’ [13]. We believe that this approach could help to advance democracy and environmental protection in energy planning because it would allow both scholars and political

subjects to raise questions concerning: (1) what constitutes fair democratic control over the production of power and (2) what is the appropriate balance between human and non-human use of natural resources.

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Conflict of Interest

The authors declare no conflict of interest.

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