The Role of Environmental Assessment and Planning in Renewable Energy Diffusion in the US and Germany

vorgelegt von
Dipl.-Ing. Landschaftsplanung
Gesa Geißler
aus Verl

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Promotionsausschuss:

Vorsitzende: Prof. Dr. Birgit Kleinschmit
Gutachter: Prof. Dr. Johann Köppel
Gutachterin: Prof. Dr. Miranda A. Schreurs

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Abstract

The worldwide generation of energy from renewable resources such as wind, sun, biomass, water or ground heat, is constantly growing. Numerous countries have adopted renewable energy goals, often as part of their policies on fighting climate change. However, despite ambitious policy goals and increasing numbers in installed capacity, difficulties in the diffusion of renewable energy technologies occur and are jeopardizing the achievement of the targets. Several aspects have been identified to account for these difficulties in renewable energy diffusion.

In order to successfully realize the diffusion of renewable energy technologies and to reach the goals for their future contribution to energy generation, the existing hindrances need to be addressed and solved.

Planning and permitting, as the relevant decision-making processes, are one element of successful siting and deployment of renewable energy. Part of these planning and permitting processes often are environmental assessments (EA) requiring the consideration of the effects and impacts of the proposed renewable energy projects on the environment.

The goal of this PhD thesis is the generation of hypotheses on the role of EA in the diffusion of renewable energy technologies, and on the need for innovation/adaptation of EA to fit the innovation system of renewable energy technology diffusion. This goal will be pursuit by the analysis of EA systems and EA practice related to renewable energy diffusion. Two cases will be analyzed and compared, namely the United States of America and Germany.

In general, the conclusion can be drawn that EA for renewable energy diffusion needs to be improved in certain aspects in order to be able to meet the special requirements of this energy system. Some elements in EA legislation and practice pose certain problems in renewable energy diffusion.

One field for further research would be the characterization of the role of environmental EA in renewable energy technology diffusion and its validation by qualitative means.

Furthermore, in order to achieve the necessary changes of EA, it is important to enhance the understanding of the processes of change of this instrument. In particular, how cross-national policy learning and transfer of experiences impact the occurrence of such changes needs to be further studied.

Zusammenfassung

Die weltweite Nutzung von Energie aus erneuerbaren Quellen wie Wind, Sonne, Biomasse, Wasser oder Erdwärme steigt kontinuierlich. Eine Vielzahl von Ländern hat im Rahmen ihrer Aktivitäten zum Klimaschutz Ziele für den zukünftigen Ausbau von erneuerbarer Energien verabschiedet. Trotz dieser vielfach ambitionierten Vorgaben und ansteigender installierter Kapazität von erneuerbaren Energien, treten Hindernisse bei der Umsetzung der politischen Ziele zu Tage und deren Erreichen wird gefährdet. Vielfältige Gründe für diese Schwierigkeiten konnten bisher identifiziert werden. Um erfolgreich die Diffusion von erneuerbaren Energietechnologien voranzutreiben und die politischen Zielvorgaben zu erfüllen, müssen die bekannten Hindernisse adressiert und Lösungen gefunden werden.

Planungs- und Genehmigungsprozesse als Teil der Entscheidung über die Zulassung erneuerbarer Energieprojekte sind ein Faktor für die erfolgreiche Diffusion dieser neuen Technologien. Ein Element von Planung und Genehmigung sind oftmals Umweltprüfungen. Diese erfordern die Ermittlung und Berücksichtigung der Auswirkungen von erneuerbaren Energieprojekten auf die Umwelt.

Das Ziel diese Dissertation ist die Ableitung von Hypothesen zur Rolle von Umweltprüfungen bei der Diffusion von erneuerbaren Energien und zur Notwendigkeit von Innovation bzw. Adaption dieses Instruments. Dieses Ziel wird erreicht durch die Analyse von gesetzlichen Vorgaben sowie der Praxis von Umweltprüfungen im Bereich von erneuerbaren Energien. Dazu werden zwei Fallbeispiele, die Vereinigten Staaten von Amerika sowie Deutschland, untersucht und verglichen.

Grundsätzlich kann die Schlussfolgerung gezogen werden, dass Umweltprüfungen in bestimmten Aspekten verändert werden müssen, um den besonderen Herausforderungen bei der Diffusion von erneuerbaren Energien gerecht zu werden. Einige Bereiche der gesetzlichen Vorgaben sowie der Praxis von Umweltprüfungen stellen derzeit Hindernisse dar.

Als ein Feld für zukünftige Forschung wird die Charakterisierung sowie empirischer Validierung der Rolle von Umweltprüfungen bei der Diffusion von erneuerbaren Energietechnologien gesehen. Weiterhin ist es nötig, die Prozesse, durch die eine Veränderung von rechtlichen Grundlagen sowie der Praxis von Umweltprüfung erreicht werden können, besser zu verstehen. Dabei ist es von besonderem Interesse zu analysieren, welche Rolle länderübergreifendes Lernen und der Transfer von Erfahrungen haben.

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List of Abbreviations

Abbreviation	Expression
cf.	confer, ‘compare’
CSP	Concentrating Solar Thermal Power
e.g.	exempli gratia, 'for example'
EA	Environmental Assessment
ed.	edition
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ESA	US Endangered Species Act
et al.	et alii, 'and others'
etc.	et cetera
EU	European Union
GHG	Greenhouse Gases
i.a.	inter alia
i.e.	id est, 'that is'
IA	Impact Assessment
ibid.	ibidem, 'in the same book or passage'
NEPA	National Environmental Policy Act
PEIS	Programmatic Environmental Impact Statement
PPPP	Policy, program, plan, project
PV	Photovoltaic
RPS	Renewable Portfolio Standard
SEA	Strategic Environmental Assessment
SEPA	State Environmental Policy Act
US	United States of America
US FWS	US Fish and Wildlife Service

Chapter I
Introduction

1 A Low Carbon Future – the Goal of Renewable Energy Deployment

The worldwide consumption of energy from renewable resources as wind, sun, biomass, water or ground heat, is constantly growing (cf. Figure I-1).

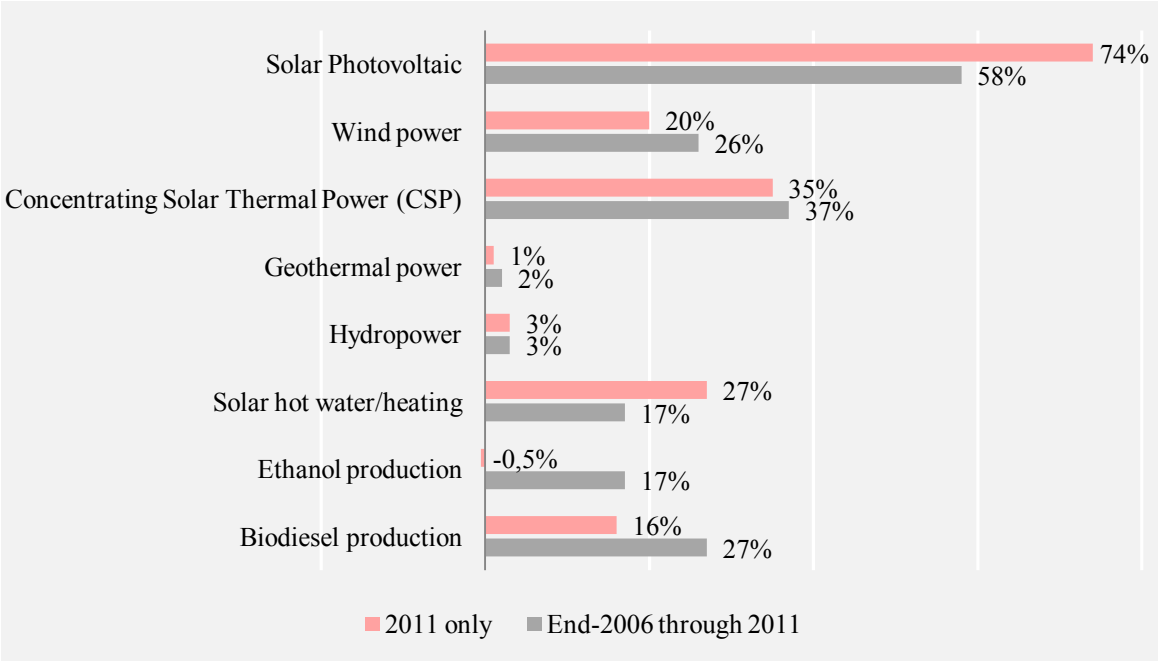

Figure I-1. Average annual growth rates of renewable energy capacity and biofuels production, 2006–2011 (Data: REN21 2012).

In the power sector, renewable resources accounted for almost half of the electric capacity added worldwide in 2011 (REN21 2012). In general, renewable energy supplied about 17% of the global final energy consumption in 2011 (REN21 2012). In particular wind power, which has seen a global growth rate of 20% in 2011, supplied the largest capacity addition of all renewable sources with about 40 GW (REN21 2012). Solar photovoltaic (PV) and Concentrating Solar Thermal Power (CSP) have seen even larger growth rates in 2011, albeit, with smaller total capacity additions of about 30 GW (solar PV) and 450 MW (CSP) (ibid.).

The reasons for the development of renewable energy are manifold. Several benefits are seen such as the reduction of greenhouse gas (GHG) emissions, reduced energy import dependency, security of energy supply (meeting rising energy demand), energy access in remote rural areas, job creation as well as improved health conditions (air, water quality). In particular, the contribution of renewable energy sources to a low carbon or even carbon neutral energy system is crucial for climate protection efforts. The Intergovernmental Panel on Climate Change (IPCC) stressed this relevance in its 2012 special report "Renewable Energy Sources and Climate Change Mitigation" (IPCC 2012).

As a result of this situation, more and more countries globally have adopted renewable energy goals, often as part of their policies on fighting climate change. By early 2012, 118 countries worldwide have renewable energy targets in place, and 109 have agreed on policies supporting renewable sources for electricity supply (REN21 2012). Germany, for example, has mandated that by 2030 50% and by 2050 80% of electricity shall be

provided by renewable sources (REN21 2012). This goes even beyond the European goal which requires that by 2020 at least 37% of the electricity generation has to be provided by renewable energy sources (European Commission 2011). On average, policy targets for electricity from renewable sources aim at annual share increases of 0.2-1.5% (REN21 2012).

Achieving these goals requires a considerable further growth of installed facilities for renewable energy generation. Regarding wind power, about 199,064 wind turbines have been installed worldwide by the end of 2011 with 23,640 turbines having been newly built in 2011 (GWEC 2012).

2 Challenges in Renewable Energy Diffusion

Despite the ambitious policy goals and increasing numbers in installed capacity, difficulties in the diffusion of renewable energy technologies occur and are jeopardizing the achievement of the targets. One example is the German goal for offshore wind energy development, which had been announced in the 2002 Offshore Strategy (Bruns et al. 2011). The goal was to develop 2,000 to 3,000 MW of offshore wind capacity until 2010 (Bundesregierung 2002). This target was not met however: in 2010 only about 140 MW of offshore wind energy capacity have been installed. Also Holburn (2012) for example describes the case of Ontario, Canada where the government in 2003 had set a policy target for renewable energy generation until 2007 which they fell short of meeting with only about 35% of the intended capacity being installed.

Several aspects have been identified to account for the difficulties in renewable energy diffusion. One reason are market factors, meaning for example financial support and incentives such as tax credits or feed-in remuneration (Bird et al. 2005, Carley 2009, Fthenakis et al. 2009, Langniss & Wiser 2003, Menz & Vachon 2006). Another relevant aspect, which also in the case of offshore wind energy deployment in Germany has proven crucial (Bruns et al. 2011) are technological hurdles (Fthenakis et al. 2009).

Several other studies about the success conditions for renewable energy deployment have identified further influencing factors such as regulatory risk and policy stability (e.g. Bruns et al. 2011, Fischlein et al. 2010, Holburn 2012), administrative structure (Bruns et al. 2011) as well as social and public acceptance (Agterbosch et al. 2009, Firestone et al. 2009, Firestone & Kempton 2007, Wolsink 2007, 2010, Wüstenhagen et al. 2007, Zoellner et al. 2008). The lack of social and public acceptance[1] for renewable energy facilities has been primarily described related to wind power development (Wolsink 2010, 2007, Firestone & Kempton 2007, Nadaï 2007, Nadaï & van der Horst 2010, Pasqualetti 2001, Wüstenhagen et al. 2007, Toke et al. 2008, Ferguson-Martin & Hill 2011; but also Walker 1995, Oud 2002, Holburn 2012). In several of these studies the relevance of transparent and collaborative decision-making including the public has been identified as critical for social and public acceptance (Haggett 2011, Cass & Walker 2009, McLaren Loring 2007, Walker 2011).

[1] For differences in concepts of social and public acceptance refer to Wüstenhagen et al. (2007).

Planning and permitting as the relevant decision-making processes have been identified as being relevant parameters of successful siting and deployment of renewable energy more recently (Lüthi & Wüstenhagen 2012, Lüthi & Prässler 2011, Bruns et al. 2011, Lüthi 2010, Ferguson-Martin & Hill 2011, EWEA 2010, Valentine 2010, Toke et al. 2008, Bruns et al. 2008, Portman et al. 2009, Bohn & Lant 2009). Lüthi & Prässler (2011) for example analyzed wind power developers' perception of risk factors. "Administrative approval duration" showed to be among the leading aspects. The authors conclude that lengthy processes can be a major barrier for wind power plants. Analyzing photovoltaic (PV) diffusion in Germany, Spain and Greece, Lüthi (2010) concludes that market diffusion is strongly correlated with policy risk and for the case of Greece she could show that administrative processes had a crucial role in PV market deployment. The duration and difficulty of securing licenses, permits, environmental impact assessments and grants was a risk factor in PV diffusion in the case of Greece (Lüthi 2010). Lüthi & Wüstenhagen (2012) could in a larger study support the relevance of the duration of administrative processes as a risk factor for the diffusion of PV. Part of these planning and permitting processes often are environmental assessments (EA)[2] requiring considering the effects and impacts of the proposed renewable energy projects on the environment.

3 Conceptualizing Renewable Energy Diffusion

In order to successfully realize the diffusion of renewable energy technologies and to reach the goals for their future contribution to energy generation, the existing hindrances need to be addressed and solved.

Negro et al. (2012) refer to the "systemic character of innovations" for explaining the difficulties in renewable energy technology diffusion. They see the diffusion of renewable energies as an innovation process whose "speed, direction and success [is] strongly influenced by the environment in which [the] innovations are developed" (p. 3837). This environment is called the "innovation system", a "socio-technical configuration of actors, rules, physical infrastructure and their relations" (p. 3837). The existing environment for renewable energy technology diffusion or the existing "innovation system" however, appears to fail in supporting the innovation process as shown by the various barriers described before (also described by Bruns et al. (2011) for Germany). Negro et al. (2012) describe these failures as "systemic problems"[3] which are "all systemic factors that block the operation and development of [the] innovation system […]" (p. 3838).

[2] Environmental Assessment (EA) in the context of this PhD thesis is used as an overall term for procedures assessing environmental impacts of policies, plans, programs, and projects (following Holder (2004)). The procedure used to assess the impacts of **projects** is in most contexts known as Environmental Impact Assessment (EIA) or Environmental Impact Statement (EIS). For superordinate decision-making by **programs, plans, and policies**, Strategic Environmental Assessment (SEA) or Programmatic Environmental Impact Statement (PEIS) apply. Environmental Assessment as overall term here shall not be confused with environmental assessment as applied in the US under the National Environmental Policy Act (NEPA) for a screening whether an EIS is required.

[3] also referred to as "system failures" or "system imperfections" by other authors (Negro et al. 2012).

Reasons for the occurrence of systemic problems in renewable energy technology diffusion are the different characteristics of this new form of energy generation compared to the traditional fossil sources based generation (cf. as well Negro et al. 2012). Renewable energy technologies differ from established energy generation in terms of "source, technical characteristics, structural organization, economic and social elements" (Tsoutsos & Stamboulis 2005). The major differences between the incumbent fossil based energy development and new renewable energy technologies are:

- ***centralized power production facilities vs. widely decentralized energy generation*** (technical characteristics and characteristics of the sources)
  While energy generation from fossil fuels (oil, gas, and coal) as well as nuclear power generation occurs in large-scale, centralized facilities, renewable energy generation from wind, solar, geothermal and water energy is realized by a large number of decentralized facilities. This decentralized renewable energy development mainly takes place in rural areas with often predominantly agricultural land use (Nadaï & van der Horst 2010). This results in larger, landscape-level changes through the development of renewable energy facilities compared to spatially confined, single location changes by traditional energy generation.
- ***negative environmental impacts vs. positive and negative environmental impacts*** (technical characteristics and characteristics of the sources)
  While traditional energy generation from fossil fuels results in negative environmental effects on almost all environmental features (water and air quality, flora and fauna as well as human health and landscapes) renewable energy generation is perceived as rather environmentally benign. One major difference are the GHG emissions which in the case of fossil energy sources are a threat to the global climate, whereas renewable resources do not emit GHG and thus have no negative impact on the climate (Kaldellis et al. 2013). Besides these positive effects for the climate however, the diffusion of renewable energy sources does not necessarily occur without other environmental conflicts (Yonk et al. 2012, Blood 2010, Woody 2010, Maloney 2008). The possible negative environmental impacts include alterations of the visual impression of land- and seascapes; impacts to flora, fauna and biodiversity; impacts to soil and water as well as certain impacts to human health and well-being (Yonk et al. 2012, Bagliani et al. 2010). Several authors have described the likely negative environmental effects of the different renewable energy sources and technologies.[4]

[4] Impacts to visual appearance of land- and seascapes: e.g. Möller (2006), Meyerhoff et al. (2010) for wind power; e.g. NREL (2009) or Torres-Sibille et al. (2009a, 2009b) for solar power. Impacts on biodiversity (flora, fauna and habitats): e.g. Hötker et al. (2006), Johnson et al. (2004), Pruett et al. (2009), Leung & Yang (2012), Köller at al. (2006), Smallwood et al. (2009), Smallwood & Karas (2009), NWCC (2010) for wind power; e.g. Glicksman (2011), Lovich & Ennen (2011), Turney & Fthenakis (2011), Leitner (2009), Tsoutsos et al. (2005), Abbasi & Abbasi (2000) or Chiabrando et al. (2009) for solar power; e.g. Rivinoja et al. (2001), Ferguson et al. (2011) or Noonan (1991) for hydropower; e.g. Schultze & Köppel (2007) or Köppel & Hagen (2010) for bioenergy. Impacts on soil and water: e.g. Glicksman (2011), Lovich & Ennen (2011), Turney & Fthenakis (2011), Leitner (2009), Tsoutsos et al. (2005) or Abbasi & Abbasi (2000) for solar power; e.g. Schultze & Köppel (2007) or Köppel & Hagen (2010) for bioenergy.

These likely negative environmental effects of renewable energy sources can lead to conflicts between the positive contributions to climate protection and the possibly negative effects on other elements of the ecosystem. This situation has been described as "green against green" for example by Woody (2010), referring to the solar power development in the Californian desert. Also Salter (2011) and Yonk and his colleagues (2012) describe such "Green vs. Green" conflicts for wind, solar, geothermal, and hydroelectric power development. Nadaï and van der Horst (2010) see this as "an unusual configuration of interests in environmental issues" (p. 182).

- ***economic interests vs. mix of environmental and economic interest*** (configuration of social elements)
  In the case of traditional energy generation, a clear positioning of economic interest on the side of the energy generation company versus environmental conservation interests on the side of opposing groups and the public could be observed. In the deployment of renewable energy technologies, a mix of economic interests on the side of the investors with environmental protection interest can be found. Stakeholders can no longer be clearly categorized as opposing or supporting as renewable energy technology diffusion pursues both economic and environmental goals. There are no clear cut positions and interests anymore. Nadaï & van der Horst (2010) describe this as "renewable energies, […], give a taste of forthcoming environmental controversies in which greenness is no longer opposed to economic development or market interest, and society is facing the question of *what kind of greenness* it wants."

Finally, renewable energy companies often differ from traditional energy generation companies in terms of size, financial resources, and professionalization of staff. This might lead to a different ability in dealing with complex planning and permitting processes.

As the existing context for renewable energy technology diffusion is geared to the incumbent form of energy generation system, problems occur. According to innovation system theory, such a situation is characterized by "path dependency" and "lock-in" (Unruh 2000, Walker 2000). Lüthi (2010) for example attribute the problems of PV diffusion to path dependency and as well Bruns et al. (2008, 2011) for Germany have identified path dependency as a problem in renewable energy diffusion.

In order to overcome the systemic failures of the existing innovation system, several authors point to the need for a larger socio-technical transition to a different system of energy generation (cf. e.g. Lehmann et al. 2012, Tsoutsos & Stamboulis 2005). Negro et al. (2012) call for "system innovation" that will be needed for a new innovation system to be built-up (p. 3837).

Following the argumentation for the need of a "new" system for the diffusion of renewable energy technologies and the existence of "systemic problems" of the existing system, the question addressed in this dissertation will be, whether impact assessments

(IA) as part of the planning and permitting processes and the incumbent system pose a "systemic problem" in the process renewable energy diffusion.

Environmental assessments are an element of the diffusion system in which renewable energy deployment takes place. They are part of the socio-technical regime (Geels 2005), namely a set of formal rules that guide the activities of actors. Environmental assessments originate from the 1960s/1970s as a reaction to environmental problems occurring from post-war industrialization and fossil fuel use. Besides smaller and incremental environmental problems, iconic events such as the Santa Barbara Oil Spill or the Cuyahoga River Burning fueled the adoption of the first environmental assessment regulation in the world, the National Environmental Policy Act (NEPA) in the US (Köppel 2011, Karkkainen 2008, Holder 2004). Thus, environmental assessment was envisaged applying to polluting industrial developments which have adverse environmental impacts.

Environmental assessment requires the transparent assessment and consideration of the environmental impacts as well as the involvement of the public in the decision making about projects, programs, plans, and policies (for details on the concept of environmental assessment refer to the exhaustive body of environmental assessment literature such as textbooks by Wood (2003), Köppel et al. (2004), Holder (2004) or Therivel (2012)). From the first adoption of EA regulation in the US in 1969, the idea spread during the following decades and is now part of the regulatory system in a large number of countries globally (Lee 1995, Holder 2004).

With the occurrence of renewable energy technologies, which are differing in specific characteristics from traditional energy generation as described above, the question whether EA in its current form must be regarded as support or a barrier to renewable energy technology diffusion comes up. Although planning and permitting processes already have been identified as certain barriers, authors of these studies (e.g. Walz 2007, Lüthi 2010, Lüthi & Prässler 2011, Lüthi & Wüstenhagen 2012) have not explicitly looked at EA as part of the planning and permitting regimes. This however, will be the focus of this PhD thesis and hypotheses on the role of EA in renewable energy technology diffusion shall be developed.

4 State of Research in Environmental Assessment and Renewable Energy Diffusion

So far, there have been few international publications focusing on EA in renewable energy development generally.[5] One chain of studies has analyzed single cases of EA application in renewable energy plan making or permitting such as Josimović & Pucar (2010) analyzing the SEA for a local wind energy development plan in Serbia. Similarly, Hirokawa & Wilson (2010) have analyzed a Programmatic Environmental Impact

[5] This conclusion has been drawn after systematic search in thematically especially relevant international journals. For impact assessment: Impact Assessment and Project Appraisal, Journal of Environmental Assessment Policy and Management, Environmental Impact Assessment Review. For renewable energy technology: Renewable Energy, Energy Policy and Renewable & Sustainable Energy Reviews.

Statement (PEIS) for a local wind power plan in Washington State. These studies derived certain strengths and weaknesses of the individual cases and identified good practice elements.

Another set of studies have analyzed the general EA regulation regime in renewable energy permitting such as Spengle (2011), Salter (2011), Glicksman (2011) or Thaler (2012). All of these have focused on the US and from a rather legal perspective.

And finally, another group of authors have started to deal with questions of methodology in renewable energy related EA and the question of EA quality and effectiveness in renewable energy diffusion. As the only research team known to the author Chang et al. (2013) have focused on the question of EA quality in renewable energy development. These authors developed and tested a qualitative approach for the assessment of avian and bat impact assessments in US wind energy EIAs, based on review criteria they derived from wildlife assessment guidelines and literature. Portman (2009) developed a framework for public participation for application in EIAs for offshore renewable energy development. Another group of authors have focused on the development of methodologies for the assessment of visual impacts of renewable energy development (e.g. Torres-Sibille et al. 2009a, 2009b, Chiabrando et al. 2009, 2011).

The authors of these studies have differing views regarding the potential role of EA in the context of renewable energy technology diffusion.

The first position is that EA in its current form and practice poses a certain barrier to renewable energy technology diffusion. Salter (2011), for example, argues that current EA practice in the US is too much favoring wildlife and land protection compared to renewable energy development and therefore constitutes a hurdle for renewable energy diffusion. Spengle (2011), in reviewing siting practice for wind energy projects on public lands in the US, concludes that “the most significant near-term issue facing wind project development on public lands […] [concerns] the timing and uncertainty of NEPA compliance” (p.1196). He bases this conclusion on the average time that the permitting agency, the Bureau of Land Management (BLM), needs to complete EIAs, and on one case of a recent wind power project (Spengle 2011).

In contrast, a second role other authors like Portman et al. (2009) and Chang et al. (2013) see, is that EAs are rather a procedural opportunity to balance environmental goals, and thus to reach policy integration. Thus, EA is not seen as a barrier, but rather as a supportive element in renewable energy technology diffusion. This notion is further supported by those authors who stress the value of IAs in terms of deliberation and legitimization of decision-making. For example, Hirokawa & Wilson (2010) as an outcome of their analysis of the programmatic EIS for wind power planning in a county in Washington State, see the benefits of EA in possibly enhancing public acceptance for renewable energy technologies by providing transparency and public involvement. This function is pronounced by Chang et al. (2013) and Portman (2009) as well.

5 Overall Goal and Research Design

The major goal of this dissertation is the generation of hypotheses on the role of EA in the diffusion of renewable energy technologies and on the need for innovation/adaptation of EA to fit the "new innovation system" for renewable energy technology diffusion called for (cf. Section 3). Does EA, as having emerged from and being part of the "traditional" innovation system, need to change or need to adapt?

This goal will be pursuit by the analysis of EA systems and EA practice related to renewable energy deployment.[6] To gain an in-depth insight, two cases will be analyzed and compared, namely the United States of America and Germany. The use of such comparative approaches has for example been argued for by Foxon & Pearson (2008). Reasons for the choice of these two specific cases will be given in Section 5.1 below.

The following questions have been identified to guide the research:

Question 1: How is EA regulated in the US and Germany in the field of renewable energy? What are differences and similarities and mutual strengths or shortcomings?

Question 2: How do Germany and the US cope with the specific challenges of renewable energy diffusion in environmental assessment practice? What are respective strengths and weaknesses?

Question 3: How do Germany and the US realize participation in renewable energy diffusion? How is the relation of public involvement in EA and other forms of public participation?

5.1 Research Design

Cross-national comparative studies of EA systems are widely applied in environmental assessment research. Such studies are an essential tool for explaining differences and similarities between countries and in that way developing environmental assessment theory. A second demand they meet, is the transfer of experience from one country to another. Masser (1984) values these two functions as the reasons for conducting comparative planning studies. He sees one benefit in "*the evaluation of policies that have the capacity to stimulate fresh ways of looking at the same problem in the home country. The potential for transfer, then, lies in encouraging innovation rather than making carbon copies of foreign models.*" (Masser 1984: 143).

Wolman (1985) adds, "*a more valuable benefit to be gained from comparative analysis is that such analysis can both broaden the sense of the possible and provide a framework for better understanding our own behavior. The process of comparative analysis should lead to questioning what frequently is simply assumed without question"* (p. 117).

[6] The analysis of existing regulatory systems and the comparison of systems operating under different rules in order to identify system failures is for example promoted by Foxon & Pearson (2008) and has been carried out for example for UK renewable energy systems (Foxon et al. 2005). This study however, did not include looking at environmental assessment regulations and practice.

The comparative analysis of the US and Germany in terms of environmental assessment regulation and practice in renewable energy diffusion will thus provide a broader basis for achieving the stated research goal. Germany and the US have been chosen as case studies in this PhD thesis due to their characteristics and performance in three major aspects (considering general rules for case study research by Seawright & Gerring (2008) and Yin (2009)): environmental assessment regime, renewable energy diffusion, and their planning structures and decision-making traditions. These aspects are outlined in more detail below.

First, both countries have regulations in place mandating ***environmental assessment*** for certain proposed activities. Although both exhibit several years of experience with impact assessments, the United States as the origin of environmental assessment regulations have considerably longer practical experience (Köppel et al. 2012).

The **United States** have been the "trailblazer" (Dryzek et al. 2002, 665) for environmental assessment regulations worldwide with the adoption of NEPA. With several other environmental protection regulations being passed in the early 1970s, the US was the leader in environmental policy during that time (Dryzek et al. 2002, Schreurs 2012). As NEPA covers all "major Federal actions significantly affecting the quality of the human environment" (42 U.S.C. § 4332(C)), and many renewable energy projects will involve some kind of Federal action (permits, loans, grants etc.), renewable energy projects in the US will very likely be subject to NEPA and require an EIS (Salter 2011). Furthermore, several US states have similar regulations in place requiring impact assessments (Ma et al. 2009) and thus projects not being subject to NEPA might be covered by these regulations.

With this early adoption of environmental assessment regulations, the US has the longest history of carrying out impact assessments and several issues have been detailed and defined by judicial decisions or regulations guiding implementation (as the Council of Environmental Quality NEPA regulations).[7]

Germany has introduced its environmental assessment legislation after the adoption of the European Union directives in 1985 (EIA), respectively 2001 (SEA).[8] Thus, for EIA, Germany has about two decades of experience, and SEA is applied for about ten years now.[9] However, before the adoption of the Environmental Impact Assessment Act (EIAA) in 1990, Germany already had strong national nature conservation legislation. The "Bundesnaturschutzgesetz" (Federal Nature Conservation Act) had been adopted in 1976. Although not mandating environmental assessment in the form of the US model, the regulation already included mitigation requirements for alterations of nature and landscape.

[7] For a detailed discussion of reasons for the introduction of NEPA and the rule making process refer for example to Karkkainen (2008).
[8] For a description of the development of environmental assessment on the level of the European Union refer for example to Krämer (2008).
[9] For general accounts on EIA and SEA in Germany refer e.g. to Köppel et al. (2004).

The longer experience with EA in the US might have resulted in a more advanced state of EA practice compared to Germany.

Second, both countries are amongst the leading countries globally in terms of ***renewable energy technology deployment***. They rank amongst the first five nations worldwide for non-hydropower renewable energy capacity (REN21 2012).[10] Similarly, both countries have recently experienced high renewable energy growth rates in particular with regard to onshore wind power development. In terms of per capita renewable energy development, Germany, however, ranks first worldwide, while the US is following on rank four (REN21 2012).

Table I-1. General information on research areas.

	United States of America	**Federal Republic of Germany**
Total land area	9,161,966 km² [a]	348,672 km² [a]
Population	311,591,917 (2011) [d]	81,726,000 (2011) [d]
Population density	34 persons/km²	233 persons/km²
	Political and Planning System	
Government type	Federal Republic: federal level & 50 states and District of Columbia; representative democracy	Federal Republic: federal level & 16 states *(Bundesländer)*; representative democracy
Law system	common law [a]	civil law [a]
Policy style	pluralism [c]	legal corporatism [c]
	Energy Facts	
Per capita total electricity consumption	13,394 kWh (2010) [e]	7,215 kWh (2010) [e]
Total Non-Hydro[11] Renewable Electricity Net Generation	194.993 Billion kWh (2011) [f]	109.089 Billion kWh (2011) [f]
Percentage of Non-Hydro Renewable Electricity Generation Capacity	4.8% (2011) [g]	13% (2011) [g]
Total Installed Non-Hydro Renewable Electricity Generation Capacity	68 GW (2011) [b]	61 GW (2011) [b]
Per capita Non-Hydro Renewable Electricity Generation Capacity	0.22 kW/inhabitant (2011) [b]	0.75 kW/inhabitant (2011) [b]

[a] CIA (2012a)
[b] REN21 (2012)
[c] Dryzek et al. (2002)
[d] The World Bank Group (2013a)
[e] The World Bank Group (2013b)
[f] US Energy Information Administration (n.y.)
[g] CIA (2012b)

[10] China, which ranks first lately, has not been considered for comparison in this dissertation due to its very different political system.
[11] only biomass, solar, geothermal, wind

In the **United States**, renewable energy development has seen a considerable growth within the last years putting them on rank two amongst the leading nations worldwide for non-hydropower renewable energy capacity (REN21 2012). Table I-1 provides more detailed numbers on renewable energy development in the US.

The US has not adopted a federal renewable energy policy. However, several states have done so. The dynamic in renewable energy development in the US has clearly been driven by the states (Rabe 2006, Rahm 2006, Portman et al. 2009, Bohn & Lant 2009, Wilson & Stephens 2009). In particular, state renewable portfolio standards (RPS), which mandate a certain share of electricity to come from renewable sources, have proven relevant (Carley 2009, Jordan-Korte 2011). Particularly in Texas, the RPS has led to a boom in wind farm development (Langniss & Wiser 2003, Bohn & Lant 2009).

Besides these state policies, in particular federal tax credits (Production Tax Credits, Investment Tax Credits) for renewable energy investments have supported the wind power development (AWEA 2010, Bolinger et al. 2009, Wiser et al. 2007). However, the uncertainty surrounding reauthorization of federal incentives has historically delayed renewable energy development (Bird et al. 2010, Wald 2012). A debate regarding the establishment of a federal RPS (Federal Renewable Electricity Standard; Union of Concerned Scientists 2010, Sullivan et al. 2009), which might be a powerful driver of renewable energy development (Heiman & Solomon 2004), has not resulted in the adoption of federal policies. Generally, renewable energy technology deployment has taken off only few years ago, as for example Laid & Stefes (2009) showed in their analysis.

Even though it has limited hydropower resources, **Germany** has been a decisive driver in the deployment of renewable energies on a national scale, primarily through wind, solar, and biomass usage (Ohlhorst et al. 2008, Büsgen & Dürrschmidt 2009, Bruns et al. 2011). Rising revenues and workforce also testify this remarkably (BMU 2012). Germany is on rank three amongst the first five nations worldwide for non-hydropower renewable energy capacity (REN21 2012). On a per capita basis Germany is even leading worldwide (REN21 2012).

Renewable energy development in Germany is currently strongly influenced by federal policies such as the “Energiekonzept” of 2011. This concept mandates targets for the share of electricity from renewable sources. Until 2030, 50% and until 2050, 80% of the generated electricity shall come from renewable sources (BMWI & BMU 2010). This has been underlined by the “Energiewende” (Energy System Transition) which was announced in 2011 following the nuclear hazard in Fukushima. This policy has formulated the phasing out of nuclear power in Germany and has stressed the importance of renewable energy as part of this transition.

Besides these renewable energy policy targets, the supporting “Erneuerbare Energien Gesetz (EEG)” (Renewable Energy Sources Act) of 2000 has been decisive for the development of renewable energy in Germany (Büsgen & Dürrschmidt 2009, Lauber

2004). This regulation established a uniform system of remunerating renewable-generated electricity with fixed minimum tariffs (Jordan-Korte 2011).

In comparison to the US, Germany started off with the deployment of renewable energy technology, in particular wind and solar energy, significantly earlier (cf. Laid & Stefes 2009). To illustrate this, Figure I-2 shows the development of installed wind energy capacity in both states. It becomes apparent that only in 2008 the US overtook Germany while the years before little wind energy development occurred in the US. This difference in years of engagement with renewable energy technology deployment, including permitting and planning processes and impact assessments for these technologies, might be a relevant aspect regarding the overall question of this thesis. The longer experience in Germany might have already triggered changes in the environmental assessment regulations and practice, as problems might have become visible already. Therefore, this difference between the two cases provides another reason for choosing them as case studies in this work.

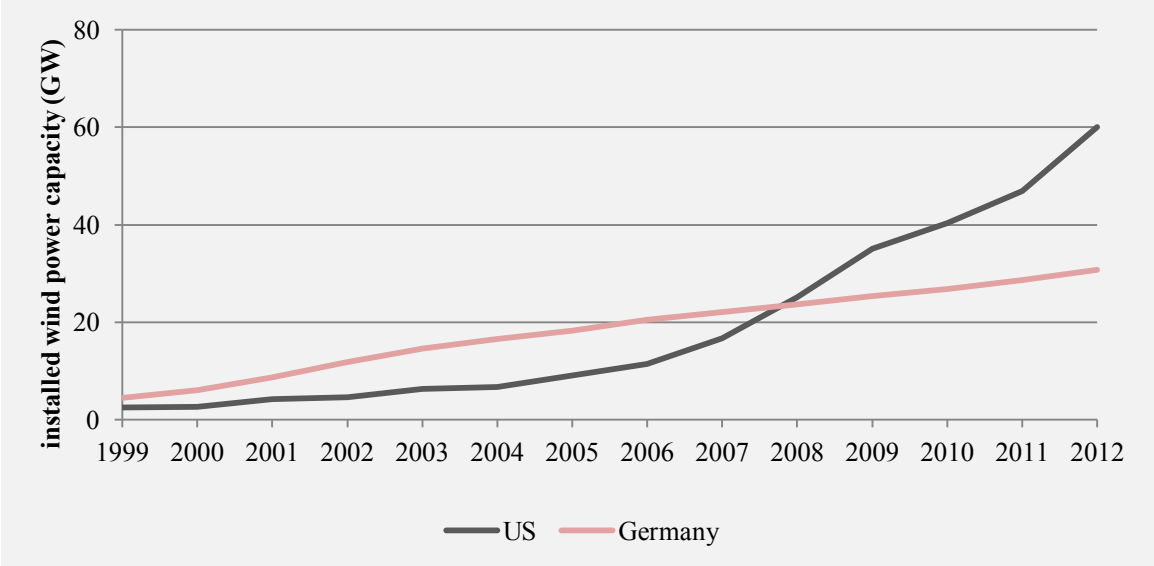

Figure I-2. Installed Wind Energy Capacity at the end of each year in Germany and the US. Data source Germany: IWES, IWET (2013); data source US: AWEA (2012) and NREL (2012).

Third, the two countries express certain similarities, but as well differences in their ***planning structures and decision-making traditions*** which make them interesting for comparative analysis as already has been pointed to by others (e.g. Reisert 2012, Hansjürgens 2000, Dryzek et al. 2002).

Both countries are democratic systems and federal republics, meaning they share powers between the federal and the state and local level. Although the autonomy and legislative powers of the state levels differ between Germany and the US, the general structure is similar. Differences exist in the law systems and the policy styles of both countries, aspects which might be relevant for environmental assessment regulations and practice. While Germany is characterized by civil law based on statutes passed by the legislature, the US system is based on common law being rather built upon case decisions by judges in court. The US environmental assessment system accordingly has been much shaped by

court rulings (Karkkainen 2008). Regarding the political system, Germany is characterized by legal corporatism based on the tradition of the "Rechtsstaatsprinzip" and is characterized as a "passively exclusive" state regarding its orientation to civil society (Dryzek et al. 2002). This means that the German policy and decision-making processes are largely hallmarked by administrative secrecy and comparatively little effort is devoted to public involvement. The US instead shows a pluralistic policy style and is characterized by Dryzek et al. (2002) as a "passively inclusive" state (p. 661). This entails a climate for social movements to organize and lobby government for their interests (ibid.).

These differences in policy and decision-making style and tradition already have triggered comparative studies focused on analyzing participatory processes in both countries (e.g. Reisert 2012, Koontz in press) and have been described for both countries with regard to renewable energy deployment, e.g. by Portman et al. (2009).

The research method is described in detail in the following chapters. Generally, data collection was done using multiple venues such as literature review, document and regulations analysis. Moreover, expert interviews with key stakeholders in renewable energy development and environmental assessment processes were utilized. Overall, a qualitative approach for data analysis and interpretation was used.

6 Structure of the Thesis

The dissertation is structured into seven chapters (cf. Figure I-3). Chapter II to Chapter VI form the core part of the PhD thesis (highlighted by red color in Figure I-3) and contain the major contributions regarding the overall goal and questions of this thesis. These chapters consist of articles that have been published or have been submitted for publication in scientific journals. The articles are listed at the end of this section. Chapter I and Chapter VII frame the core part of the thesis by providing an introduction (Chapter I) and overall conclusions and an outlook for further research (Chapter VII). In the following, the chapters are briefly introduced.

Chapter I develops the introduction to this thesis. The theoretical background for the dissertation, the state of research as well as the overall goal and questions that have guided this PhD thesis are outlined.

The following two chapters provide a generic characterization of the environmental assessment and impact mitigation systems in the US and Germany. Background information for the following chapters is presented.

Chapter II – "Environmental Assessment in the US and Germany" describes and compares major elements of environmental assessment systems in Germany and the US. There is a lack of comparative analysis of the two countries' environmental assessment systems which is filled by this paper. The comparison of the EA systems and the identification of major differences serve as basis for the Chapters IV and V.

Chapter III – "Impact Mitigation and Compensation in the US and Germany" focuses on impact mitigation procedures in both countries, giving special attention to recent changes in the US system and application to renewable energy projects. Similarly to Chapter II,

main differences between the two countries are drawn and provide the basis for the analysis of the environmental assessment systems with regard to renewable energy diffusion.

The Chapters IV and V contain the results of the analysis of environmental assessment regulations and practice related to renewable energy diffusion in the US and Germany (addressing research questions 1 and 2).

Chapter IV – "Environmental Assessment in Wind Energy Diffusion in the US and Germany" describes and compares the application of environmental assessment to one specific renewable energy technology, namely to wind power. The chapter focuses on the regulatory conditions for EA in renewable energy diffusion in both countries.

Chapter V – "Strategic Environmental Assessment in Renewable Energy Diffusion in the US and Germany" compares two sets of SEAs conducted for renewable energy plans, programs, and policies from the US and Germany. The analysis highlights strengths and weaknesses of the SEAs in terms of assessment of alternatives, consideration of cumulative effects, and public participation.

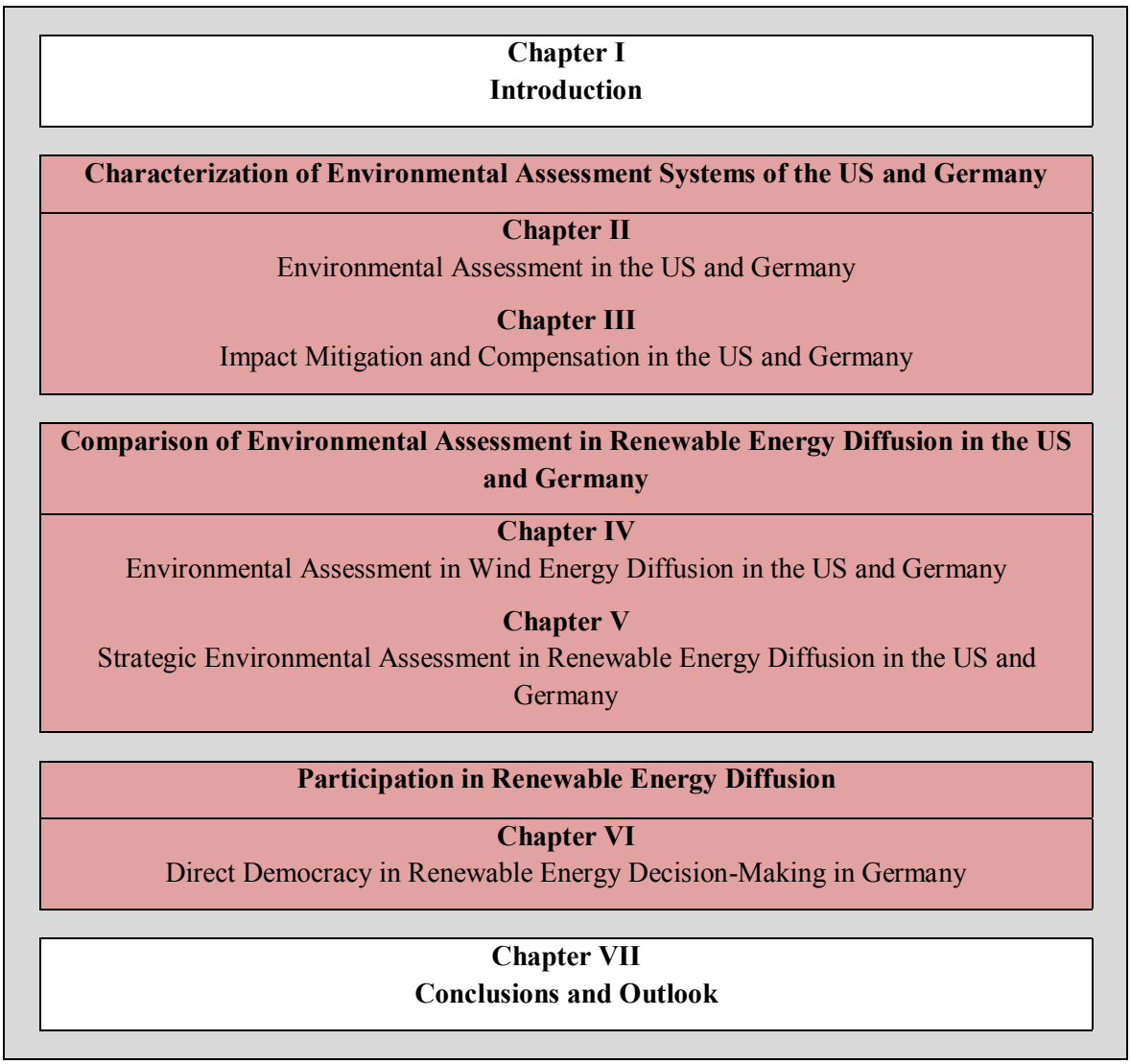

Figure I-3. Structure of the Thesis.

The following Chapter VI focuses on one key element of environmental assessment and decision making in renewable energy diffusion, namely the participation of the public (research question 3).

Chapter VI – "Direct Democracy in Renewable Energy Decision-Making in Germany" analyzes the regulations and the practice of citizen votes in renewable energy diffusion in Germany. The relation of direct democracy as one form of public participation to consultations of the citizens during environmental assessments as another form is discussed.

Finally, **Chapter VII** summarizes the results of the preceding chapters and outlines hypotheses and questions for future research.

Chapters II to **VI** were written as stand-alone manuscripts published or submitted for publication in national and international peer-reviewed journals. For articles with more than one author, the "Author Contribution Statement" in the Annex provides details about each authors' contributions. The articles were published or submitted as follows:

Köppel J, Geißler G, Helfrich J & J Reisert (2012). A snapshot of Germany's EIA approach in light of the United States archetype. Journal of Environmental Assessment Policy and Management 14 (4): 1250022-1 – 1250022-21.

Geissler G & J Köppel (2012). Upside down –Weiterentwicklung von US-amerikanischen Konzepten zur naturhaushaltlichen Kompensation (Wetland Mitigation and Conservation Banking). Naturschutz und Landschaftsplanung 44 (11): 364-370.

Geißler G, Köppel J & P Gunther (2013). Wind Energy and Environmental Impact Assessments - a hard look at two forerunners' approaches: Germany and the United States. Renewable Energy 51: 71–78.

Geißler G (2013). Strategic Environmental Assessments for Renewable Energy Development - comparing the United States and Germany. Journal of Environmental Assessment Policy and Management 15 (2): 1340003-1 – 1340003-31.

Geißler G (in preparation). Direct democracy and renewable energy deployment in Germany.

References

Abbasi SA & N Abbasi (2000). The likely adverse environmental impacts of renewable energy sources. Applied Energy, 65, 121–144.

Agterbosch S, Meertens RM & WJV Vermeulen (2009). The relative importance of social and institutional conditions in the planning of wind power projects. Renewable and Sustainable Energy Reviews 13, 393-405.

AWEA (2010). U.S. Wind Industry Annual Market Report – Year Ending 2009. http://www2.grist.org/pdf/AWEA.pdf.

AWEA (2012). AWEA U.S. Wind Industry Fourth Quarter 2012 Market Report. http://www.awea.org/learnabout/publications/reports/upload/AWEA-Fourth-Quarter-Wind-Energy-Industry-Market-Report_Executive-Summary-4.pdf.

Baba A & H Ármannsson (2006). Environmental Impact of the Utilization of Geothermal Areas. Energy Sources Part B, 267–278.

Bagliani M, Dansero E & M Puttilli (2010). Territory and energy sustainability: the challenge of renewable energy sources. Journal of Environmental Planning and Management 53, 457-472.

Bird L, Bolinger M, Gagliano T, Wiser R, Brown M & B Parsons (2005). Policies and market factors driving wind power development in the United States. Energy Policy 33, 1397–1407.

Blood MR (2010). Rare tortoise makes things hairy for solar development. The Huffington Post, 2 January 2010.

BMU (2012). Erneuerbare Energien geben in Deutschland bereits mehr als 380.000 Menschen Arbeit. http://www.bmu.de/bmu/presse-reden/pressemitteilungen/pm/artikel/erneuerbare-energien-geben-in-deutschland-bereits-mehr-als-380000-menschen-arbeit/

BMWI & BMU (2010). Energiekonzept für eine umweltschonende, zuverlässige und bezahlbare Energieversorgung. http://www.bmwi.de/BMWi/Redaktion/PDF/Publikationen/energiekonzept-2010,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf

Bohn C & C Lant (2009). Welcoming the wind? Determinants of wind power development among U.S. States. The Professional Geographer 61 (1), 87-100.

Bolinger M, Wiser R, Cory K & T James (2009). PTC, ITC, or Cash Grant?-An Analysis of the Choice Facing Renewable Power Projects in the United States. http://eetd.lbl.gov/ea/emp/reports/lbnl-1642e.pdf

Bruns E, Köppel J, Ohlhorst D & S Schön (2008). Die Innovationsbiographie der Windenergie unter besonderer Berücksichtigung der Absichten und Wirkungen von Steuerungsimpulsen. Berlin: LIT Verlag.

Bruns E, Ohlhorst D, Wenzel B & J Köppel (2011). Renewable Energies in Germany's Electricity Market. A Biography of the Innovation Process. Springer Publishing.

Bundesregierung (2002). Strategy of the German Government on the use of off-shore wind energy in the context of its national sustainability strategy. http://www.erneuerbare-energien.de/fileadmin/ee-import/files/pdfs/allgemein/application/pdf/offshore.pdf

Büsgen U & W Dürrschmidt (2009). The expansion of electricity generation from renewable energies in Germany: A review based on the Renewable Energy Sources Act Progress Report 2007 and the new German feed-in legislation. Energy Policy 37 (7), 2536–2545.

Carley S (2009). State renewable energy electricity policies: An empirical evaluation of effectiveness. Energy Policy 37, 3071–3081.

Cass N & G Walker (2009). Emotion and rationality: The characterization and evaluation of opposition to renewable energy projects. Emotion, Space and Society 2 (1), 62–69.

Chang T, Nielsen E, Auberle W & FI Solop (2013). A quantitative method to analyze the quality of EIA information in wind energy development and avian/bat assessment. Environmental Impact Assessment Review 38, 142-150.

Chiabrando R, Fabrizio E & G Garnero (2009). The territorial and landscape impacts of photovoltaic systems: Definition of impacts and assessment of the glare risk. Renewable & Sustainable Energy Reviews 13 (9), 2441–2451.

Chiabrando R, Fabrizio E & G Garnero (2011). On the applicability of the visual impact assessment OAISPP tool to photovoltaic plants. Renewable & Sustainable Energy Reviews 15 (1), 845-850.

CIA (2012a). The World Factbook: Country Comparison Area. https://www.cia.gov/library/publications/the-world-factbook/rankorder/2147rank.html

CIA (2012b). The World Factbook: Country Comparison Electricity - from other renewable sources. https://www.cia.gov/library/publications/the-world-factbook/fields/2240.html#gm

Dryzek JS, Hunold C, Schlosberg D, Downes D & H-K Hernes (2002). Environmental Transformation of the State: the USA, Norway, Germany and the UK. Political Studies 50, 659-682.

European Commission (2011). Renewable Energy: Progressing towards the 2020 Target. Communication from the Commission to the European Parliament and the Council. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0031:FIN:EN:PDF

EWEA (2010). WindBarriers. Administrative and grid access barriers to wind power. http://www.windbarriers.eu/fileadmin/WB_docs/documents/WindBarriers_report.pdf

Ferguson JW, Healey M, Dugan P & C Barow (2011). Potential Effects of Dams on Migratory Fish in the Mekong River: Lessons from Salmon in the Fraser and Columbia Rivers. Environmental Management 47 (1): 141-159.

Ferguson-Martin CJ & SD Hill (2011). Accounting for variation in wind deployment between Canadian provinces. Energy Policy 39, 1647-1658.

Firestone J & W Kempton (2007). Public opinion about large offshore wind power: Underlying factors. Energy Policy 35, 1584-1598.

Firestone J, Kempton W & A Krueger (2009). Public Acceptance of Offshore Wind Power Projects in the USA. Wind Energy 12, 183-202.

Fischlein M, Larson J, Hall DM, Chaudhry R, Peterson TR, Stephens JC & EJ Wilson (2010). Policy stakeholders and deployment of wind power in the sub-national context: A comparison of four U.S. states. Energy Policy 38, 4429-4439.

Foxon T & P Pearson (2008). Overcoming barriers to innovation and diffusion of cleaner technologies: some features of a sustainable innovation policy regime. Journal of Cleaner Production 16 (1), S148-S161.

Foxon T, Gross R, Chase A, Howes J, Arnall A & D Anderson (2005). UK innovation systems for new and renewable energy technologies: drivers, barriers and systems failures. Energy Policy 33 (16), 2123–2137.

Fthenakis V, Mason JE & K Zweibel (2009). The technical, geographical, and economical feasibility for solar energy to supply the energy needs of the US. Energy Policy 37, 387–399.

Geels FW (2005). Technological Transitions and System Innovations. A Co-Evolutionary and Socio-Technical Analysis. Cheltenham.

Glicksman RL (2011). Solar Energy Development on the Federal Public Lands: Environmental Trade-Offs on the Road to a Lower-Carbon Future. San Diego Journal of Climate and Energy Law 3, 107-158.

GWEC (Global Wind Energy Council) (2012). Wind in Numbers. http://www.gwec.net/global-figures/wind-in-numbers/.

Haggett C (2011). Understanding public responses to offshore wind power. Energy Policy 39, 503-510.

Hansjürgens B (2000). Umweltpolitik in den USA und in der Bundesrepublik Deutschland – Ein institutionenökonomischer Vergleich. In: Wentzel B & D Wentzel (eds.). Wirtschaftlicher Systemvergleich Deutschland/USA anhand ausgewählter Ordnungsbereiche. Stuttgart: UTB für Wissenschaft, 181-222.

Heiman MK & BD Solomon (2004). 'Power to the People: Electric Utility Restructuring and the Commitment to Renewable Energy'. Annals of the Association of American Geographers 94 (1), 94-116.

Hirokawa KH & AB Wilson (2010). Local planning for wind power: using programmatic environmental impact review to facilitate development. Zoning and Planning Law Report 33, 1-10.

Holburn GLF (2012). Assessing and managing regulatory risk in renewable energy: Contrast between Canada and the United States. Energy Policy 45, 654-665.

Holder J (2004). Environmental Assessment: The Regulation of Decision Making. Oxford University Press Inc., New York.

Hötker H, Thomsen K-H & H Jeromin (2006). Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. http://www.batsandwind.org/pdf/impacts%20on%20biodiversity%20of%20renewable%20energy.pdf

IPCC (Intergovernmental Panel on Climate Change) (2012). Renewable Energy Sources and Climate Change Mitigation Special Report of the Intergovernmental Panel on Climate Change. http://srren.ipcc-wg3.de/report/IPCC_SRREN_Full_Report.pdf.

IWES, IWET (2013). Installierte Windleistung in Deutschland - Installierte Nennleistung [MW] aller WEA in Deutschland. http://windmonitor.iwes.fraunhofer.de/windwebdad/www_reisi_page_new.show_page?page_nr=363&lang=de

Johnson GD, Perlik MK, Erickson WP & MD Strickland (2004). Bat Activity, Composition, and Collision Mortality at a Large Wind Plant in Minnesota. Wildlife Society Bulletin 32 (4), 1278-1288.

Jordan-Korte K (2011). Government Promotion of Renewable Energy Technologies. Policy Approaches and Market Development in Germany, the United States, and Japan. Gabler Verlag, Springer Fachmedien, Wiesbaden.

Josimović B & M Pucar (2010). The strategic environmental impact assessment of electric wind energy plants: Case study 'Bavanište' (Serbia). Renewable Energy 35 (7), 1509–1519.

Kaldellis JK, Kapsali M, Kaldelli E & E Katsanou (2013). Comparing recent views of public attitude on wind energy, photovoltaic and small hydro applications. Renewable Energy 52, 197-208.

Karkkainen BC (2008). NEPA and the curious evolution of environmental impact assessment in the United States. In: Holder, J & D McGillivray (eds.). Taking Stock of Environmental Assessment. Law, Policy and Practice. Routledge, Taylor & Francis, UK, 45-63.

Köller J, Köppel J & W Peters (eds.) (2006). Offshore Wind Energy - Research on Environmental Impacts, Springer Verlag, Heidelberg.

Koontz TM (in press). Direct Democracy via Agency Collaboration with Stakeholders. UVP-report.

Köppel J & Z Hagen (2010). Strategien zur naturverträglichen Biomassebereitstellung auf Landkreisebene (Bsp. Ostprignitz-Ruppin, Chiemgau). in: Reich M & S Rüter (eds.). Energiepflanzenanbau und

Naturschutz. Cuvillier Verlag: Institut f. Umweltplanung, Leibniz-Universität Hannover: Göttingen. 67–76.
Köppel J (2011). Einführung in das Schwerpunktthema: Born in the USA (Editorial: Born in the USA). uvp-report 25 (4), 190-191.
Köppel J, Geißler G, Helfrich J & J Reisert (2012). A snapshot of Germany's EIA approach in light of the United States archetype. Journal of Environmental Assessment Policy and Management 14 (4), 1250022-1 – 1250022-21.
Köppel J, Peters W & W Wende (2004). Eingriffsregelung, Umweltverträglichkeitsprüfung, FFH-Verträglichkeitsprüfung. Stuttgart: Ulmer.
Krämer L (2008). The development of environmental assessments at the level of the European Union. In: Holder, J & D McGillivray (eds.). Taking Stock of Environmental Assessment. Law, Policy and Practice. Routledge, Taylor & Francis, UK, 131-148.
Laird FN & C Stefes (2009). The diverging paths of German and United States policies for renewable energy: Sources of difference. Energy Policy 37, 2619-2629.
Langniss O & R Wiser (2003). The renewables portfolio standard in Texas: an early assessment. Energy Policy 31, 527–535.
Lauber V (2004). REFIT and RPS: options for a harmonized community framework. Energy Policy 32, 1405-1414.
Lee N (1995). Environmental assessment in the European Union: a tenth anniversary. Project Appraisal, 10 (2), 77-90.
Lehmann P, Creutzig F, Ehlers M-H, Friedrichs N, Heuson C, Hirth L & R Pietzcker (2012). Carbon Lock-Out: Advancing Renewable Energy Policy in Europe. Energies 5, 323-354.
Leitner P (2009). The Promise and Peril of Solar Power. The Wildlife Professional 3, 48–53.
Leung DYC & Y Yang (2012). Wind energy development and its environmental impact: A review. Renewable and Sustainable Energy Reviews 16 (1), 1031-1039.
Lovich JE & JR Ennen (2011). Wildlife Conservation and Solar Energy Development in the Desert Southwest, United States. BioScience 61 (12), 982-992.
Lüthi S & R Wüstenhagen (2012). The price of policy risk – Empirical insights from choice experiments with European photovoltaic project developers. Energy Economics 34, 1001-1011.
Lüthi S & T Prässler (2011). Analyzing policy support instruments and regulatory risk factors for wind energy deployment – A developers' perspective. Energy Policy 39, 4876-4892.
Lüthi S (2010). Effective deployment of photovoltaics in the Mediterranean countries: Balancing policy risk and return. Solar Energy 84, 1059-1071.
Ma Z, Becker DR & MA Kilgore. (2009). Characterising the landscape of state environmental review policies and procedures in the United States: a national assessment. Journal of Environmental Planning and Management 52 (8), 1035-1051.
Maloney P (2008). Solar Projects Draw New Opposition. The New York Times, 24 September, p. SPG2.
Masser I (1984). Cross national comparative planning studies. Town Planning Review 55 (2), 137–149.
McLaren Loring J (2007). Wind energy planning in England, Wales and Denmark: Factors influencing project success. Energy Policy 35, 2648-2660.
Menz FC & S Vachon (2006). The effectiveness of different policy regimes for promoting wind power: Experiences from the states. Energy Policy 34, 1786–1796.
Meyerhoff J, Ohl C & V Hartje (2010). Landscape externalities from onshore wind power. Energy Policy 38 (1), 82–92.
Möller B (2006). Changing wind-power landscapes: regional assessment of visual impact on land use and population in Northern Jutland, Denmark. Applied Energy 83, 477-494.
Nadaï A & D van der Horst (2010). Wind power planning, landscapes and publics. Energy Policy 27, 181–184.
Nadaï A (2007). "Planning", "siting" and the local acceptance of wind power: Some lessons from the French case. Energy Policy 35, 2715–2726.
Negro SO, Alkemade F & MP Hekkert (2012). Why does renewable energy diffuse so slowly? A review of innovation system problems. Renewable and Sustainable Energy Reviews 16, 3836-3846.
Noonan AS (1991). Just Water over the Dam-A Look at the Endangered Species Act and the Impact of Hydroelectric Facilities on Anadromous Fish Runs of the Northwest. Idaho Raw Review 28, 781-790.
NREL (2009). Ivanpah Solar Electric Generating Station http://www.nrel.gov/csp/solarpaces/project_detail.cfm/projectID=62
NREL (2012). Wind Powering America. Installed Wind Capacity. http://www.windpoweringamerica.gov/wind_installed_capacity.asp.

NWCC (National Wind Coordinating Collaborative) (2010). Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions. https://www.nationalwind.org/assets/publications/Birds_and_Bats_Fact_Sheet_.pdf

Ohlhorst D, Bruns E, Schön S & J Köppel (2008). Windenergieboom in Deutschland: eine Erfolgsstory. in: Bechberger M, Mez L & A Sohre (eds.) Windenergie im Ländervergleich: Steuerungsimpulse, Akteure und technische Entwicklungen in Deutschland, Dänemark, Spanien und Großbritannien. Peter Lang Publishing, Frankfurt am Main, 5–60.

Oud E (2002). The evolving context for hydropower development. Energy Policy 30 (14), 1215-1223.

Pasqualetti MJ (2001). Wind Energy Landscapes: Society and Technology in the California Desert. Society and Natural Resources 14, 689–699.

Portman ME (2009). Involving the public in the impact assessment of offshore renewable energy facilities. Marine Policy 33, 332-338.

Portman ME, Duff JA, Köppel J, Reisert J & ME Higgins (2009). Offshore wind energy development in the exclusive economic zone: Legal and policy supports and impediments in Germany and the US. Energy Policy 37, 3596–3607.

Pruett CL, Patten MA & DH Wolfe (2009). It's Not Easy Being Green: Wind Energy and a Declining Grassland Bird. BioScience 59 (3), 257–262.

Rabe BG (2006). Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards. PEW Center on Global Climate Change, Arlington, VA, U.S.

Rahm D (ed.) (2006). Sustainable Energy and States. Essays on Politics, Markets and Leadership. Jefferson, NC and London: MacFarland & Company.

Reisert J (2012). The Effectiveness of Participatory Environmental Planning. The Case of Water Planning in the US State of Washington and in the German State of Lower Saxony.

REN21 (2012). Renewables 2012. Global Status Report. http://www.map.ren21.net/GSR/GSR2012_low.pdf

Rivinoja P, McKinnell S & H Lundquist (2001). Hindrances to upstream migration of atlantic salmon (Salmo salar) in a northern Swedish river caused by a hydroelectric power-station. Regulated Rivers: Research & Management 17 (2): 101–115.

Salter T (2011). NEPA and Renewable Energy: Realizing the Most Environmental Benefit in the Quickest Time. Environs Environmental Law and Policy Journal University of California Davis 34 (2), 173–187.

Schreurs MA (2012). Global Environmental Problems, US Unilateralism, and Japanese, Canadian and European Responses. Rikkyo-hogaku 86, 250-273.

Schultze C & J Köppel (2007). Gebietskulissen für den Energiepflanzenanbau. Naturschutz und Landschaftsplanung, 39 (9): 269–272.

Seawright J & J Gerring (2008). Case Selection Techniques in Case Study Research. Political Research Quarterly 61 (2), 294-308.

Smallwood KS & B Karas (2009). Avian and Bat Fatality Rates at Old-Generation and Repowered Wind Turbines in California. The Journal of Wildlife Management 73 (7), 1062–1071.

Smallwood KS, Rugge L & ML Morrison (2009). Influence of Behavior on Bird Mortality in Wind Energy Developments. The Journal of Wildlife Management 73 (7), 1082–1098.

Spengle EC (2011). A Shift in the Wind: The Siting of Wind Power Projects on Public Lands in the Obama Era. Indiana Law Journal 86 (3), 1185-1217.

Sullivan P, Logan J, Bird L & W Short (2009). Comparative Analysis of Three Proposed Federal Renewable Electricity Standards. Technical Report NREL/TP-6A2-45877. http://pop.statesadvancingfuelcells.org/assets/Uploads/LBNL-Comp-Analysis-RES-2009.pdf

Thaler J (2012). Fiddling as the world floods and burns: How climate change urgently requires a paradigm shift in the permitting of renewable energy projects. Environmental Law 42, 1101-1156.

The World Bank Group (2013a). Population, total. http://data.worldbank.org/indicator/SP.POP.TOTL.

The World Bank Group (2013b). Electric power consumption (kWh per capita). http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC.

Therivel R (2012). Strategic Environmental Assessment in Action. Routledge.

Toke D, Breuker S & M Wolsink (2008). Wind power deployment outcomes: How can we account for the differences?. Renewable & Sustainable Energy Reviews 12 (4), 1129–1147.

Torres-Sibille A, Cloquell-Ballester V-A, Cloquell-Ballester V-A & MAA Ramírez (2009a). Aesthetic impact assessment of solar power plants: An objective and a subjective approach. Renewable & Sustainable Energy Reviews 13 (5), 986-999.

Torres-Sibille A, Cloquell-Ballester V-A, Cloquell-Ballester V-A & R Darton (2009b). Development and validation of a multicriteria indicator for the assessment of objective aesthetic impact of wind farms Renewable & Sustainable Energy Reviews 13 (1), 40-66.

Tsoutsos T, Frantzeskaki N & V Gekas (2005). Environmental impacts from the solar energy technologies. Energy Policy 33, 289–296.

Tsoutsous TD & YA Stamboulis (2005). The sustainable diffusion of renewable energy technologies as an example of an innovation-focused policy. Technovation 25, 753-761.

Turney D & V Fthenakis (2011). Environmental impacts from the installation and operation of large-scale solar power plants. Renewable and Sustainable Energy Reviews 15, 3261-3270.

Union of Concerned Scientists (2010). A Better Climate Bill: Raising Efficiency and Renewable Electricity Standards. http://www.ucsusa.org/clean_energy/solutions/big_picture_solutions/a-better-climate-bill.html

Unruh GC (2000). Understanding carbon lock-in. Energy Policy 28 (12), 817–830.

US Energy Information Administration (n.y.). Total Non-Hydro Renewable Electricity Net Generation (Billion Kilowatthours). http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=6&pid=34&aid=12&cid=regions&syid=2007&eyid=2011&unit=BKWH.

Valentine SV (2010). Canada's constitutional separation of (wind) power. Energy Policy 38, 1918–1930.

Wald ML (2012). Developers of Wind Farms Run a Race Against the Calendar. The New York Times December 27, 2012.

Walker G (1995). Renewable energy and the public. Land Use Policy 12 (1), 49-59.

Walker G (2011). The role for "community" in carbon governance. Wiley Interdisciplinary Reviews: Climate Change 2 (5), 777-782.

Walker W (2000). Entrapment in large technology systems: institutional commitment and power relations. Research Policy 29 (7-8), 833–846.

Walz R (2007). The role of regulation for sustainable infrastructure innovations: the case of wind energy. International Journal of Public Policy 2 (1/2), 57-88.

Wilson EJ & JC Stephens (2009). Wind Deployment in the United States: States, Resources, Policy, and Discourse. Environmental Science and Technology 43 (24), 9063–9070.

Wiser R, Bolinger M & G Barbose (2007). Using the Federal Production Tax Credit to Build a Durable Market for Wind Power in the United States. The Electricity Journal 20, 77–88.

Wolman HL (1985). National-Urban Relations in Foreign Federal Systems. Lessons for the United States. in: Committee on National Urban Policy, National Research Council (eds.). Urban Policy in a Changing Federal System: Proceedings of a Symposium, 91-126.

Wolsink M (2007). Wind power implementation: The nature of public attitudes: Equity and fairness instead of 'backyard motives', Renewable & Sustainable Energy Review 11, 1188–1207.

Wolsink M (2010). Near-shore wind power - Protected seascapes, environmentalists' attitudes, and the technocratic planning perspective, Land Use Policy 27, 195-203.

Wood C (2003). Environmental impact assessment: a comparative review. 2nd ed. Essex: Pearson Education Limited.

Woody T (2010). It's Green Against Green In Mojave Desert Solar Battle. Yale Environment 360, Yale School of Forestry & Environmental Studies. http://e360.yale.edu/content/feature.msp?id=2236.

Wüstenhagen R, Wolsink M & MJ Bürer (2007). Social acceptance of renewable energy innovation: An introduction to the concept. Energy Policy 35, 2683–2691.

Yin RK (2009). Case study research. Thousand Oaks, Calif.: Sage.

Yonk RM, Simmons RT & BC Steed (2012). Green vs. Green. The Political, Legal and Administrative Pitfalls Facing Green Energy Production. Routledge, New York, London.

Zoellner J, Schweizer-Ries P & C Wemheuer (2008). Public acceptance of renewable energies: Results from case studies in Germany. Energy Policy 36, 4136-4141.

Chapter II
Environmental Assessment in the US and Germany[12]

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A SNAPSHOT OF GERMANY'S EIA APPROACH IN LIGHT OF THE UNITED STATES ARCHETYPE

JOHANN KÖPPEL*, GESA GEIßLER, JENNIFER HELFRICH
and JESSICA REISERT

Technische Universität Berlin, Germany
johann.koeppel@tu-berlin.de

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November 2010 marked the 25th anniversary of the EU Environmental Impact Assessment Directive and the 20th anniversary of its implementation in Germany via the Environmental Impact Assessment Act (EIAA) in 1990. Reflecting back to the original role model for these pieces of legisiation, the 1969 US National Environmental Policy Act (NEPA) can bring some interesting differences to light. Four decades of experience from the more mature US EIA system may hold some important lessons for Germany's younger EIAA. While an outright comparison is impossible at this present time, this article aims to contribute a comparative perspective to show the current status of the original US model, NEPA, and the differences in development and practice to Germany's younger EIAA.

Keywords: US NEPA (National Environmental Policy Act); German EIA (Environmental Impact Assessment) Act; coverage of ElA systems; accessibility of EIA Documents; timeliness of participation; EIA policy outreach.

Introduction

While the European Environmental Impact Assessment (EIA) Directive has just celebrated its 25th anniversary, US environmental review processes, of both federal and state levels, have been in operation for more than 40 years. The National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) have their origins in the late 1960s rise of environmentalism in the US, triggered by the Cuyahoga River fire and the 1969 Santa Barbara oil

*Corresponding author.

spill. In a 1997 NEPA effectiveness study, the US Council on Environmental Quality concluded that the NEPA model "brought the public into agency decision-making process like no other statute" (CEQ, 1997). Since then environmental review processes have spread worldwide. Germany's Environmental Impact Assessment Act (EIAA) was enacted in 1990, some 20 years later. The German EIA process, while younger, has the advantage of broader support, whereas US environmental policy suffered from the neglect of a conservative government. This perspective gives rise to our contribution for the 25th anniversary JEAPM issue: How is NEPA's EIA faring in its native US realm, and in what ways does it differ from Germany's EIA system and practice?

As we will describe, the two systems have comparable procedures (Fig. 1) and goals. However, the structure of procedures and methods for pursuing their shared

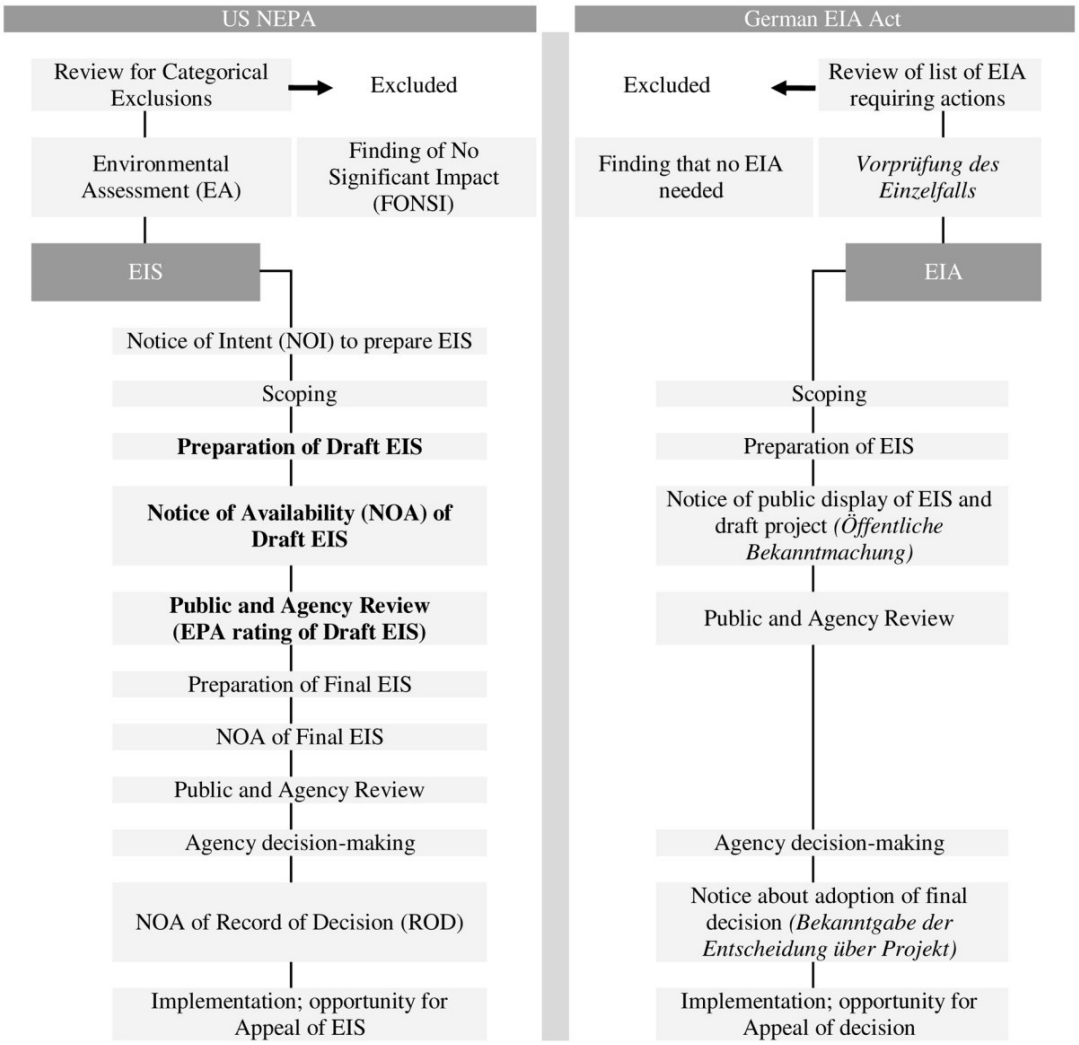

Fig. 1. Process of EIA according to US NEPA and German EIA Act (NEPA information based on Bass *et al.*, 2001).

goals are very different. Analytical comparison of German and US EIAs holds value for both, and is highlighted as an area of transnational interest by the German EIA Association's recent special-edition report on the subject (UVP, 2011). This comparison asks what lessons the two systems can learn from each other, particularly in light of the US' two decades longer experience. While there is overarching comparative research on EIA systems (e.g., Glasson *et al.*, 2005) including the US NEPA and several European EIS systems (e.g., Wood, 2003), the findings are not directly transferable to Germany as European member states have a certain amount of discretion in implementing the European EIA Directive. Most comparative research involves the United Kingdom or the Netherlands as examples of European EIA systems, Germany has been analysed only rarely. One comparison with other EU countries by Barker and Wood (1999) however, found German EIA reports to be of comparably high quality. Similarly, recent papers in international journals analysing the US are nearly as lacking as German ones (an exception for Germany is from 10 years ago — Wende, 2002). A recent study by Führ *et al.* (2009) on the performance of the EIA Act in Germany is only available to a German speaking audience. The EIA system pursuant to the US NEPA has been elaborated on in several publications (e.g., Bass *et al.*, 2001; Eccleston, 2008) providing practical advice for practitioners. The effectiveness of the NEPA implementation has been evaluated in 1997 by the Council of Environmental Quality (CEQ) and by the NEPA Task Force in 2003, the latter focusing selectively on important topics identified in the previous 1997 study. In this paper, the abbreviation EIA is used as a general term for the entire assessment process in both countries.

Methodology

The analysis of both cases focuses mainly on the review of studies and articles on EIA in both countries and, to a lesser extent, builds upon analysis of regulations, guidance and other primary sources. We further draw on recent research stays in the US but have to restrain from illustrating the main findings aside from a few exemplary cases on the timeliness of participation processes in the US. The comparative criteria used follow the sets employed by Fuller (1999) and Wood (1999). In reviewing methods for creating and controlling quality in EIAs, Fuller described a variety of principles for effective EIA design and practice. Wood created a criteria for evaluating eight EIA systems (including the US but not Germany) to identify possible improvements. Both note that there is no ultimate standard, and that the effectiveness of EIAs is not necessarily quantifiable. Furthermore, we attempt to integrate the results of the NEPA and the German EIA

effectiveness evaluations mentioned earlier (CEQ, 1997; The NEPA Task Force, 2003; Luther, 2007; Führ *et al.*, 2009). Unfortunately, the obvious importance of US state-level EIA cannot be easily summarised for a compact overview, apart from a rare scrutinising of the EIA state landscape by Ma *et al.* (2009). Thus, we do not aim to provide a comprehensive framework but to highlight some major differences between the systems — while omitting obvious similarities.

The evaluations mentioned above all pointed to weaknesses in areas that are similar to those identified by Fuller (1999) and Wood (1999) as important for effective, high-quality EIAs. In combination, these quality and effectiveness metrics serve as comparative criteria based not only in previous research, but also on the principles behind EIA systems, and form the basis of our focus for comparison. For the EIA legal provisions and administration, our focus lies in the coverage of the EIA systems, the responsible or competent authorities, as well as the intent and use of EIA. As far as the procedural EIA framework is concerned, we look at aspects of the screening and scoping process, a selection of EIA document ratings and, finally, we highlight our findings on the accessibility of EIA information and the participation process. Unfortunately, there are no evaluations, either for Germany or the US, of EIA's actual contributions to environmental protection, as an outcome of the EIA process. There are also few systematic evaluations of EIAs contribution to the output (incorporation of environmental concerns in decision-making and permit documents); Wende (2002) and Von Kampen and Mengel (2009) found an EIA impact in Germany in the incorporation of mitigation measures into permit conditions (output). However, these few studies are a limited basis for a comparative analysis which we therefore exclude in this paper.

Results

Comparison of legal provisions and EIA administration

Coverage of the EIA systems

There is a pivotal US dichotomy with, on the one hand, the important state-level EIA regulations of some US states and, on the other hand, the federal NEPA environmental review process. The federal process applies to the actions of more than 200 federal agencies, including the US Forest Service, Federal Highway Administration, Army Corps of Engineers, and the Bureau of Land Management to mention only a few, and is the role model for all subsequent international EIA regulations. In the United States, NEPA covers only federal actions, and coverage of non-federal actions greatly depends on whether US states have enacted their own EIA legislation — 15 of which have done so (Ma *et al.*, 2009). This

dichotomy creates more complications in the US than are seen in Germany. For example, a wind farm developer on private lands in Washington (WA) or California (CA) would be subject to a mandatory environmental review process under SEPA (State Environmental Policy Act, WA) or CEQA (CA). Whereas in Oregon, our wind farm proponent would not have to, unless he was proposing to develop on federal lands which would, as in all states, trigger a NEPA review. For a German wind farm developer the federal EIAA would apply regardless of the location of the proposed project, whether supplemental state legislation is available or not. Although some projects (such as quarrying, local roads, or the reallocation of agricultural land) that fall outside of EIAA's federal jurisdiction might be subject to state level provisions if they are listed in the state's EIA statutes. However, state EIA provisions all refer to the federal (EIAA) provisions regarding the specific requirements of the EIA process. All German EIAs, whether conducted by federal EIAA requirements or by state legislative requirement, differ based on the type of project, and due to sectoral statutes, a point we address in more detail in the comparison of EIA documents.

Gunther (2011, p. 208) recently summarised this US federal-state dichotomy in a nutshell: "Within the United States, permitting a project is based on three primary factors: the location of the project, the source of project funding, and the facility size or capacity. All projects that have the potential to affect the human environment, and are on lands managed by the federal government, receive federal funding, and/or require a federal permit, must comply with the NEPA."

Since its enactment, the United States NEPA applies to projects, plans, programs, and policies. In Germany, on the other hand, the EIA system initially covered projects only; it was not until 2005 that its scope was broadened to specific plans and a few programs. The 2005 change came with German federal implementation of the EU Strategic Environmental Assessment (SEA) Directive (Sheate *et al.*, 2005) and was realised by an amendment to the EIAA. Unlike the US, however, the German SEA system still does not evaluate policies, leaving public involvement and structured documentation of environmental impacts out of strategic high-level decision making. This paper however, looks only at EIA and its processes; evaluation of SEA implementation is an area for future research.

Responsible, or competent, authority for EIA

In the United States, more than 200 federal agencies are responsible for project proposals, implementing the NEPA environmental review process as both a proponent and its responsible EIA authority — the statutory "rub" of NEPA, as Nie (2011) has put it. The fact that the federal agency gets to define the problem and

holds responsibility for the environmental review process at the same time is puzzling, at least at first glance (although it also applies for the SEA in Germany). For example, a decade ago, the then responsible Minerals Management Service released an early-stage EA (Environmental Assessment) for the deep-water drillings in the Gulf of Mexico[a] stating that no full EIS (Environmental Impact Statement) was necessary — today, after the catastrophic events at the Deep Water Horizon oil platform in 2010, this agency's assignments have not only been reshaped but reorganised as the current Board of Ocean Management. Unsurprisingly, Davis (2006) recommends that, in order to address this conflict of interest, the EPA should have at least "concurrent or dual authority with other federal agencies regarding implementation of actions affecting the environment pursuant to NEPA" (2006, p. 38). He suggests an "enhanced role for the EPA and the other agencies that have authority to protect our natural resources, including the FWS [US Fish and Wildlife Service], NPS [US National Park Service], and others" (2006, p. 40).

In Germany, state, local, and only sometimes federal, agencies, depending on the projects, are responsible for the general permitting process of a project. For public projects, e.g., roads, it is generally the case that a higher level agency than the one proposing the project itself will be the responsible EIA agency. Overall, Germany has a comparatively decentralised system as far as project approvals and its EIA responsibilities are concerned. For instance, a valuable "separation of powers" between the responsible authority and the proponent applies to railway infrastructure projects and EIAs. In other cases, planning and permission are done by the same authority.

Intent and use of EIA

The language of the 1969 NEPA calls for the use of "all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans" (Title 1, Sec. 101). NEPA created the US Council on Environmental Quality (CEQ), whose regulations then defined the intent the US EIA process and content of the final EISs. The process and the EIS produced are intended to act as information and planning tools for both the decision makers and the public by

[a] U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region (2000). Gulf of Mexico, Deepwater Operations and Activities, Environmental Assessment. OCS EIS/EA, MMS 2000–2001Available at: http://www.gomr.boemre.gov/PDFs/2000/2000–2001.pdf

providing "full and fair discussion of significant environmental impacts" as well as "reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment" (§1502.1). EISs are required to rigorously explore all reasonable alternatives, including the projected impacts of a "No Action" alternative. EISs are also mandated to include descriptions and analyses of resource conservation potentials and impact mitigation measures.

These regulations specify that EISs should be more than simply informative documentation; rather, they should help guide decision making. However, although the exploration of alternatives and impacts is compulsory, there is no comprehensive requirement to avoid or minimise negative effects. NEPA and the CEQ had no provisions for either enforcing environmentally friendly choices, or requiring that impacts and mitigation efforts be monitored post implementation, although some state-level regulations, notably CEQA, do require monitoring post project approval (CEQ, 1997). Agencies generally do not collect long-term data on ecological effects of projects, leaving a paucity of research on the reality of environmental impact due to, or avoided by, the US EIA process (CEQ, 1997). However, this is sure to change in the near future with the January 2011 release of CEQ's final guidance to federal agencies on the appropriate use of mitigation and monitoring in the NEPA process. This document brings the implementation of NEPA EIA closer to California's CEQA provisions by requiring a more rigorous evaluation and monitoring of mitigation. Mitigation measures are now considered binding commitments in NEPA documents and monitoring efforts are to be identified in agency decision documents, which are available to the public (CEQ, 2011).

The legal structure of Germany's EIA process is defined in plainer language than that of NEPA, but carries largely similar intent. The EIAA requires description of "measures which will be taken to avoid, reduce or, as far as possible, compensate for any significant adverse environmental impacts of the project, and the substitute measures in the case of priority encroachments on nature and landscape for which no compensation is possible," as well as an explanation of other alternatives that were explored but not chosen (Art. 6.3.2). The clear intent of the EIA, as in the US version, is to improve project decision making processes by including careful environmental analysis. The EIAA carries no binding requirement for authorities to choose the least environmentally harmful route, stating only that the EIA should be "taken into account when deciding on the admissibility of the project with regard to effective preventive environmental protection," (Art. 12). Monitoring is not required, or even really addressed as relevant to EIA (only the case in SEAs). Unlike NEPA, the EIAA does not specifically stipulate why environmental protection is to be considered. However, Germany took a step beyond even NEPA's flowery articulation of the importance of environmental

protection when, in November of 1994, environmental protection was defined as a federal objective in the German constitution (UBA, 2010). The wording of this objective requires decision makers to give environmental considerations greater weight within the spectrum of other social concerns (UBA, 2010).

Comparison of procedural framework

The process of EIA in Germany and the US is similar in many aspects as Fig. 1 shows. However, a considerable difference exists regarding the preparation and review of the environmental impact study/statement (EIS). In the US, a draft version of the EIS is prepared on the basis of the results of the scoping process and is published for public and agency review enabling comments on this preliminary version of the document. The comments are considered in the development of the final EIS which again becomes publicly available before a final decision on the proposed action is made. In Germany the preparation and publication of a draft EIS is not mandatory, and only a final document is prepared for public review. Thus, the US framework contains more interim procedural milestones for public involvement. The following sections further discuss differences in the screening and content of the environmental review documents.

Screening and scoping process, role of EAs in the US

The first step in the EIS process, according to both the US NEPA and the German EIA Act, is the determination of whether a proposed action requires an environmental impact assessment or not (screening). In both cases the determination depends on whether significant negative environmental impacts can be expected. In Fig. 1 the steps above the EIA/EIS represent the screening process. Jones (1999) provides types of screening approaches — Germany uses a mix of lists (Annex 1 EIAA), thresholds (Annex 1 EIAA) and criteria with initial environmental evaluation (*Vorprüfung des Einzelfalls*, Annex 2 EIAA) whereas the US uses a mix of lists (categorical exclusions are set by the federal agencies) and initial environmental evaluation (Environmental Assessment). In Germany, the result of the screening only has to be published if the *Vorprüfung des Einzelfalls* resulted in the finding of no significant impacts and thus no EIA will be developed, however this is only a brief notice and no documentation of the assessment conducted is required (nothing comparable to an Environmental Assessment), consequently no comparable document to the US "Notice of Intent" to prepare an EIS (Fig. 1) exists in Germany.

In the Unites States *initial environmental evaluation*, or EAs, play an important role not mirrored in the German process. Unless a project meets the requirements

for a Categorical Exclusion, an EA must be conducted by the project proponent. The EA serves to "briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" (40 CFR §1508.9). If no EIS is necessary, then an EA and issuance of a FONSI serve as NEPA compliance, if an EIS is required then the EA helps facilitate preparation. Increasingly, EAs include examination of alternatives and mitigation options as a route towards the less costly "Mitigated FONSI" where the environmental impact is reduced enough to avoid the necessity of a full-blown EIS (CEQ, 1997).

The number of EAs developed is much higher in the US than the number of full EISs (CEQ, 1997). The number of final EAs and EISs per year in the Department of Energy is a good example, where EAs outnumber EISs by far for the past 11 years (Fig. 2).

The inclusion of public involvement in, and comments on, EAs is decided by individual agencies, with agencies such as the Department of Energy, Department of the Army, and U.S. Forest Service soliciting public comments while others did not (CEQ, 1997). There has been a debate whether such "little" EIAs might outdo the usage of full EIAs (CEQ, 1997), namely full Environmental Impact Studies (EIS) required by the NEPA review process. Some stakeholders, both public and private, worry that non-public EAs are conducted in order to avoid the comprehensive public and stakeholder participation required in EISs. Indeed, the preparation of EAs without public involvement (Blaug, 1993) was cited as the largest source of NEPA controversy and legal challenges (CEQ, 1997). Thus, EAs could constitute a blessing and a curse.

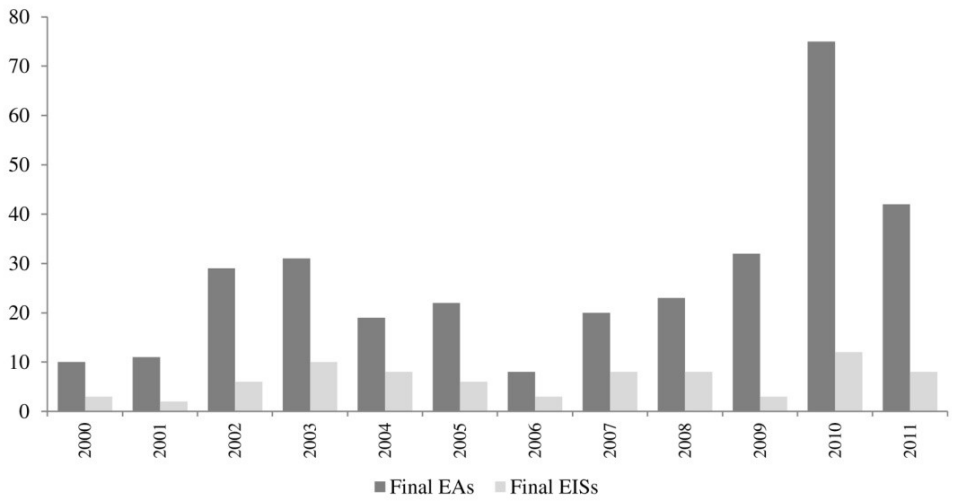

Fig. 2. Number of EAs and EISs prepared by the Department of Energy between 2000 and 2011 (data: DOE Office of NEPA Policy and Compliance, 2011).

This basic challenge was discussed broadly and much of what had been criticised or needed to be addressed for further efforts and improvement has since been remarkably optimised. A well-crafted, comprehensive, but still efficient EA can provide a tool for timely and participatory preparation of decision-making before everything is settled and pre-determined, thereby preventing premature, top-down decisions (cf. CEQ, 1997; The NEPA Task Force, 2003). We have found such good governance approaches, showing a high quality of initial environmental evaluation in the US. For example, with the Department of Energy (DOE) Monarch Warren County Wind Turbine Project in Illinois which was subject to NEPA review. During the screening process and EA development, public participation was almost comparable to the later EIS development process. In addition to a public scoping that provided stakeholders and interested parties with the opportunity for comment, there was a 30-days public review soliciting comments of the draft EA. The scoping letter, the draft and final EA, and the letter of Finding of no Significant Impact (FONSI) were all made available online at the websites of the DOE Golden Field Office and the DOE headquarters. The notices for public scoping and the draft EA review were also published online, and in the local newspaper. Additionally, postcards were sent out to identified stakeholders for announcement of the review period. The Department of Energy's public involvement practice for EAs provides a good example worth considering for German early EIA milestones.

For Germany, Führ *et al.* (2009) found similar tendencies, with initial environmental evaluations (*Vorprüfung*) resulting in no EIS outnumbering the EISs that are prepared. The study did not analyse country-wide numbers but only certain regions, as the decisions to not develop an EIS are difficult to access. However, Führ *et al.* (2009) assume similar numbers for Germany in general meaning that approximately 80–90% of the initial evaluations (*Vorprüfungen*) result in the finding of no significant impacts and no EIS is prepared. These analyses demonstrate a high relevance for initial environmental evaluations in Germany, a relevance which is not sufficiently acknowledged in practice. Führ *et al.* (2009) point to needs for improvement, specifically disclosing the results of the *Vorprüfung* including the main reasons leading to the decision. The lack of access to documentation of the reasoning behind decisions against the preparation of EIS makes it difficult to assess the quality of *Vorprüfungen.* In contrast, the US's "little" EIA, the EA, must be publicly accessible, whether or not the public is allowed to comment. As a publicly visible environmental impact analysis, which must be released before a decision can be made about a full EIS, the EA gives the US screening process more weight than the *Vorprüfungen* has in Germany. German law has no similar requirements for publishing decisions made during

screening, since the reasons for whether or not to conduct an EIA do not have to be made public. In this instance, it could be worthwhile to consider the US experience, where Environmental Assessments provide for a much more transparent, public, and thorough screening process than does the German model.

The NEPA statute does not specify the scoping process, but the CEQ Regulations for Implementing NEPA provide details for stakeholder involvement in the scoping process: "affected Federal, State, and local agencies, any affected Indian tribe, the proponent of the action, and other interested persons" are required to be invited (Sec. 1501.7(a)). Similar far-reaching, practical implications are not currently found in Germany. We will examine the scoping process in more detail later, when discussing public involvement.

EIA documents

The German EIAA differs from NEPA and US state EIA regulations in that the EIAA does not necessarily require a single, specific EIS document. The EIAA calls for documents with content and scope defined by existing "statutory provisions which are authoritative for the decision on the admissibility of the project" (UVPG, 2001). The Act requires a summary of documents and items that must be included in such documents, whether or not prior statutory provisions exist. By concentrating on procedural regulations, the EIAA leaves much of the content of EISs to sectoral statute. One of the results of this approach is that EIAA is satisfied by "documents according to Article 6" (Art. 6), which in this paper we refer to as an EIS, although it is not necessarily a single EIS document like that of the US. Comparing the content of EISs in Germany and the US, it is obvious that the NEPA documents cover a much wider range of possible impacts than the German ones. NEPA EISs discuss, in addition to environmental effects, both socioeconomic aspects and environmental justice concerns (Bass, 1998), two major differences from the German practice. German assessments are limited to the effects on flora, fauna, biodiversity, abiotic resources (water, air, climate, and soil), humans and human health, landscape and cultural assets (EIA Act §2 No 1). However, recently, the discussion about the consideration of environmental justice effects in environmental impact assessments is growing in Germany (e.g., UBA, 2011, 2008). Thus, the experiences from the US could be a valuable contribution.

This likewise applies to the issue of climate change considerations in impact assessments. Whereas in the US several states and the federal CEQ have issued draft and final guidance for the incorporation of greenhouse gas emissions in NEPA and SEPA reviews (Slotterback, 2011), in Germany few comparable

efforts are currently underway to address the challenge of climate change in EIAs. As this is expected to change, Germany would be well advised to make use of the, by then proven, greenhouse gas calculation tools, thresholds for significant impacts, and mitigation measures of US NEPA and SEPA assessments (Geißler *et al.*, 2011).

As part of the agency review process for the draft EIS, the US Environmental Protection Agency (EPA) is required to rate the adequacy of the information provided in the draft statement and the environmental impact of the proposed action. This rating is conducted by the 10 EPA Regional Offices throughout the US. A separate rating scale has been developed for both aspects: the information adequacy is rated on a 3-point scale of adequate, insufficient, or inadequate, the evaluation of the environmental impacts can range from lack of objection (LO), environmental concerns (EC), environmental objections (EO) to environmentally unsatisfactory (EU).[b] The EPA conducted ratings are forwarded, along with additional comments, to the agency preparing the EIS and are also made publicly available through the EPA online database. The online availability of EPA comments on the final EIS makes it possible to check the extent to which the initial comments have been considered in developing the final EIS, as well as whether any concerns remain; see, for example, the comments on the final EIS of the Ivanpah Solar Project in California.[c]

Although Tzoumis and Finegold (2000) and Tzoumis (2007) recommend several improvements to the EPA rating system, such as a database allowing easy identification of the best rated documents in order to use them as best-practice examples, this system can be seen as a model for EIS ratings elsewhere. In Germany no comparable system exists. Führ *et al.* (2009) recommend establishing an external referee (*Behördengutachter*) who should, among other things, be responsible for ensuring the quality of the EIA documents, possibly using a standardised rating of EISs similar to the US EPA system. At the same time, Tzoumis and Finegold (2000) and Tzoumis (2007) analysed the EPA ratings of draft EISs over time from 1970 to 1997 and 1998 to 2004. They found that the ratings did not improve over time which contradicted their hypothesis that agencies might learn from previous EISs and would produce better documents the more experience they have (Tzoumis and Finegold, 2000; Tzoumis, 2007).

[b] http://www.epa.gov/compliance/nepa/comments/ratings.html#rating

[c] http://yosemite.epa.gov/oeca/webeis.nsf/%28PDFView%29/20100292/$file/20100292.PDF?OpenElement, on draft EIS:http://yosemite.epa.gov/oeca/webeis.nsf/%28PDFView%29/20090386/$file/20090386.PDF?OpenElement

Accessibility and readability of EIA documents, public participation

In the United States, online availability of NEPA records is required since the enactment of the *Electronic* Freedom of Information Act of March 31, 1997 (5 U.S.C. 552[a][2]). Amending the basic act, it requires online availability of most federal agency records. Although EISs, EAs, public notices and other documents prepared under NEPA are not explicitly mentioned, these documents clearly fall under the requirement (Bass *et al.*, 2001). A state level example of regulation which safeguards the accessibility of EIA documents is the "EIS on the Web"[d] requirement of New York State's SEQR environmental review regulations. Additionally, the high demand for communicative and *readable* EIA documents (for example, Ryan *et al.*, 2011) is both made clear and fuelled by the active engagement of civil society (stakeholders, public, interest groups).

Germany still lacks both the US invitations for public involvement from the very beginning, as well as the US standard for information policies and respective web tools (Kaufmann, 2011). Indeed, even the German version of these requirements (*Umweltinformationsgesetz*), induced by the Aarhus Convention, seems to be undermined regularly (e.g., authorities claim for intellectual property rights of consultants for documents etc.). The results of an empirical study on access to environmental information in Germany support this apparent lack of enforcement: only in 60% of the studied cases were answers to posed questions provided at all — although such answers were sometimes dissatisfactory. In fact, only 40% of the cases documented a timely and satisfactory reply (Zschiesche and Sperfeld, 2011).

The most notable differences in public participation of EIA procedures are both the considerably earlier involvement and the better opportunities for the general public in the US. Public participation is a defining hallmark of NEPA and one of the Act's most enduring legacies (CEQ, 1997; Nie, 2011). Thus, the recently confirmed lack of an early enough participation process in Germany (Führ *et al.*, 2009) is one of the most stunning legislative and practical differences between the US mother and German child.

Essential aspects of the investigation are determined during the scoping, influencing the overall quality of the EIA (cf. Führ *et al.*, 2009) and making it necessary that all groups of actors, including environmental organizations, are involved. EIS and further documents (Art. 6 EIAA) are the basis for the informing of the public and determine the quality of the participation process. Delayed participation often means that the project is already determined or has become too

[d] http://www.dec.ny.gov/permits/6197.html

specified by the time the public becomes involved. In Germany, however, only the developer and the responsible agency, or competent authority, are required to be involved in the scoping process (Art. 5 EIAA). Other affected agencies, independent experts and third parties may be consulted. Only environmental groups, but not the general public, are meant to participate in the scoping; the scoping documents are mostly not available for public review and comment. The affected (and not the general) public has the first opportunity to participate only after the EIS documents (Art. 6) have been prepared. Even though the EU EIA directive broadened in 2003 the term "affected public" to "public with an interest" (because of the public participation directive), Germany has yet to effectively implement these provisions (cf. Führ *et al.*, 2009).

In contrast, Slotterback (2008, 2009) analysed the practices and effects of stakeholder involvement in scoping processes of US transportation agencies, based on a survey of 46 states. She found that, in general, a wide range of stakeholders was included: in over 90% of the states, federal, state, regional, and local agencies, property owners, organized groups, elected officials, and the general public are engaged. Both agencies and the public seem to have an effect on the content and the outcomes of the scoping while agencies appear to have the strongest effect on selecting alternatives. Agencies are also influential in identifying key impacts and which data to address, as well as in proposing additional stakeholders. In the US, the public availability of EAs is a requirement of 40 C.F.R. §1506.6 (CEQ Implementation Regulations for NEPA; CEQ, 1978). Some recent examples of timely public participation in EA development include the Monarch Warren County Wind Turbine Project described before as well as the West Alsea Landscape Management Project (cf. ELI, 2010).[e] The Lake Charles Carbon Capture and Sequestration Project serves as one example, of many, for high-quality public involvement practice in the case of mandatorily disclosed Draft (full) Environmental Impact Studies (EIS).

[e] Project of the Forest Service in the Oregon Coast Range/Alsea River watershed/Siuslaw National Forest to provide timber to local businesses and to restore ecological conditions. Endangered species present are the northern spotted owl and marbled murrelet. A year before the scoping process, FS asked for public input (information, field tours, meetings) and shared data (detailed maps), incorporating concerns and suggestions both prior to scoping as well as in the draft EA. The public provided alternatives and improvements to the design, e.g., building no new roads, local knowledge about historic meadow locations, forest management (thinning). The process resulted in trust between the FS and the public, support for the project, and fewer negative environmental impacts.

Conclusions

Our criteria are drawn from previous reviews or evaluations of EIA systems which have highlighted the length and quality of scoping (or initial EA) as well as the level of public information and input as metrics for the efficiency and effectiveness of EIA processes. These evaluations end with recommendations for improving EIA processes by broadening coverage, increasing the length and quality of scoping or initial EA, the level and quality of public participation, the diversity of stakeholders involved, and the quality, clarity, and accessibility of documentation (CEQ, 1997; The NEPA Task Force, 2003; Luther, 2007; Führ *et al.*, 2009; Fuller, 1999; Wood, 1999). These recommendations are made on the basis that, if these changes are incorporated, then an EIA process will not only be more cost and time effective, but also require decision-makers to take more environmental concerns into account than would be possible if these "action areas" were left unchanged. Taking these as points of comparison, it becomes clear that the two countries can learn from each other. Table 1 below gives a summary of our comparison for each criterion. The US EIA process, while far from perfect, holds lessons for Germany when it comes to quality and inclusion in procedure, review, and documentation.

First, the statutory US federal-state dichotomy is evident, with the federal NEPA environmental review process on the one hand and significant state level EIA legislation on the other. As for the coverage of the EIA system, the German EIA Act provides a more homogenous EIA application and applies to every

Table 1. Comparative summary of German and US EIA processes.

EIA Criteria	US	Germany
	Legal Provisions and Administration	
Coverage of the Systems	Federal lands and actions of federal agencies. Projects, plans, programs, and policies.	All relevant projects regardless of location or proponent, Projects, and since 2005 specific plans and a few programs. Does not cover policies.
Responsible or Competent Authorities	More than 200 federal agencies act as the responsible EIA authority and often simultaneously as the proponent.	State, local, and sometimes federal agencies. For public projects, generally a higher level agency than the proponent. Some valuable "separation of powers" between authority and proponent, but not always.

Table 1. (*Continued*)

EIA Criteria	US	Germany
Intent and Use	Help guide environmentally conscious decision making. Exploring alternatives and impacts is compulsory, but no comprehensive requirement to avoid negative effects or monitor. As of 2011: mitigation and monitoring are required.	Help guide enviromentally conscious decision making. Exploring alternatives and impacts is compulsory, but no reguirement to avoid negative effects, monitoring is neither required nor significantly mentioned 2010: environmental protection valued in federal constitution.
	Procedural EIA Framework (see Fig. 1)	
Screening and Scoping Process	Unless a Categorical Exclusion project, an EA determines need for an EIS. If not needed, a FONSI is issued. More EAs than EISs. Mitigated FONSI reduces impacts and avoids full EIS. Public participation by agency, but often encouraged. Thorough documentation that is publicly available.	Result of screening published only if *Vorprüfung des Einzelfalls* finds no significant impacts. Decisions against EIS preparation outnumber actual EISs. No requirement for documentation of the assessment. No general public involvement.
EIA Documents	Specific, structured document covering environmental impacts (like Germany). Includes socioeconomic aspects and environmental justice concerns. Various efforts to incorporate green house gas emissions. Adequacy of documents is rated.	No single specific EIS document. Content set by sectoral statute, EIAA is satisfied by "documents according to Article 6"covering environmental impacts. Does not currently include socioeconomic or environmental justice. Few efforts to incorporate green house gas emissions. No rating system.
Accessibility and Readability of Documents	Documentation is easily accessed online. There is a high demand for, and thus attempt to make, understandable and readable documents.	Documentation not easily accessible, must be requested.
Participation	Wide participation is encouraged, early involvement, good opportunities.	Participation is selective, happens late in the process, and is not widely solicited.

relevant project no matter its location, whereas in the United States, location is everything, and a wind farm proponent in Texas, for example, may not have to conduct either a federal or a state EIA.

In terms of comparing the procedural environmental review processes of both countries' EIA policies, the early steps are pivotal. First is the predominant role of Environmental Assessments, or "little EISs". US NEPA Environmental Assessments not only far outnumber full EISs, but also provide a more comprehensive environmental review than does the German screening and scoping approach. In the US, EAs are considered a valuable tool for safeguarding public involvement while simultaneously streamlining the process (CEQ, 1997). This stands in stark contrast to the often opaque and merely check-box-like quality of German screening and scoping processes. As for EIA documents in general, Germany has no quality assurance system that is comparable to the rating approach of the US EPA.

As Nie (2008) has put it, the constitutional multilevel fragmentation of the US democracy (see also Van Horn *et al.*, 2001) and lively debates and discourses on projects, plans and policies seem often to encourage frustration and intractability. However, the German perspective on public involvement sometimes misses comparable democratic processes in environmental decision-making. Germany needs to engage more quickly in this field and, in so doing would be well advised to make use of some transatlantic experiences — most notably the open-mindedness of the US early participation processes. In summary, US practice provides considerably more opportunity for involvement, starting much earlier in the process, than does the German EIS (cf. Portman *et al.*, 2009). As previously mentioned, the length and participatory quality of the US process provides for timely and democratic decision-making before everything is settled and pre-determined, thereby preventing premature top-down decisions. The German EIS process could learn from this, and could also consider evaluating policies, like the US, in order to bring public involvement and structured documentation of environmental effects into high-level decision making. The newly enacted law to improve public participation and standardisation of plan approval procedures (*Gesetz zur Verbesserung der Öffentlichkeitsbeteiligung und Vereinheitlichung von Planfeststellungsverfahren*) that also applies to EIA processes gives a bit of hope regarding early participation in Germany. However, the early participation procedure is not obligatory and regulations on organisation and form of early participation are missing as well.

It is obvious that the availability of, access to, and reporting on EIA documents is more effectively organized in the United States, on both the federal and state level. The accessibility of EIS documents and comments is still quite limited in Germany whereas much effort has been made in the US to provide readable and

user-friendly EIA documents. It remains to be seen whether the debate on federal E-Governance legislation (Schütte, 2011) might trigger better availability of and access to EIA documents in Germany.

The differences highlighted in this paper point towards areas for further research. For instance, the question of common challenges faced by the two countries, such as how to better streamline multilevel environmental review processes and parallel environmental permission procedures. How, for example, to streamline endangered species regulations with environmental impact assessments? Another point of interest would be a comparison of the two SEA systems to if the more mature US SEA system (PEIS) could provide valuable recommendations for Germany's SEA implementation.

More pertinent to the topics covered in this paper, and of great interest for both processes, is an evaluation of the comparative effectiveness of actual environmental protection resulting from the two different levels of public participation. Is greater participation better for the environment, do reviews with more public involvement create more environmentally friendly projects? Much more remains to be said and further comparative research would be lucrative.

The lack of long-term monitoring noted here and in other evaluations (CEQ, 1997) has created a literature reviewing EIA systems which tends to focus on EIA outputs, such as the quality of final documents or the considerations of a final decision. Research that identifies the level of actual, long-term environmental protection achieved by these systems focuses on case-specific circumstances that would be difficult to apply to national levels for an accurate international comparison. More research is needed before accurate comparisons and evaluations can be made concerning what Fuller (1999) calls the "ultimate quality indicator": real improvement in environmental protection.

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References

Barker, A and C Wood (1999). An evaluation of EIA system performance in eight EU countries. *Environmental Impact Assessment Review*, 19(4), 387–404.

Bass, RE (1998). Evaluating environmental justice under the National Environmental Policy Act. *Environmental Impact Assessment Review*, 18(1), 83–92.

Bass, RE, AI Herson and KM Bogdan (2001). *The NEPA Book. A Step-By-Step Guide on How to Comply with the National Environmental Policy Act*. 2nd edn. Point Arena, CA: Solano Press Books.

Bear, D (2003). Some modest suggestions for improving implementation of the National Environmental Policy Act. *Natural Resources Journal*, 43, 931–960.

Blaug, EA (1993). Use of the environmental assessment by federal agencies in NEPA implementation. *The Environmental Professional*, 15, 57–65.

CEQ (Council of Environmental Qualtiy) (2011). Memorandum for heads of federal departments and agencies. Appropriate use of mitigation and monitoring and clarifying the appropriate use of mitigated findings of no significant impact. Available at http://ceq.hss.doe.gov/current_developments/docs/Mitigation_and_Monitoring_Guidance_14Jan2011.pdf, last accessed 20 January 2012.

CEQ (Council of Environmental Quality) (1997). The National Environmental Policy Act. A study of its effectiveness after twenty-five years. Available at http://ceq.hss.doe.gov/nepa/nepa25fn.pdf, last accessed 18 January 2012.

CEQ (Council of Environmental Quality) (1978). Regulations for implementing the procedural provisions of the National Environmental Policy Act (40 CFR Parts 1500–1508). Available at http://ceq.hss.doe.gov/ceq_regulations/Council_on_Environmental_Quality_Regulations.pdf, last accessed 11 August 2011.

Davis, WB (2006). The fox is guarding the henhouse: enhancing the role of the EPA in FONSI determinations pursuant to NEPA. *Akron Law Review*, 39, 35–72.

DOE (Department of Energy) Office of NEPA Policy and Compliance (2011). NEPA documents. Available at http://www.doe.gov/nepa/doe-nepa-documents, last accessed 2 August 2011.

Eccleston, CH (2000). *Environmental Impact Statements. A Comprehensive Guide to Project and Strategic Planning*. New York: John Wiley & Sons.

Eccleston, CH (2008). *NEPA and Environmental Planning. Tools, Techniques, and Approaches for Practitioners*. Boca Raton: CRC Press.

ELI (Environmental Law Institute) (2010). NEPA success stories: celebrating 40 years of transparency and open government. Washington, D.C.

Führ, M, K Bizer, J Dopfer, S Schlagbauer, N Bedke, F Belzer, M Harteisen, K Kleihauer, A Mengel, S von Kampen, D Kober, M Bächle, N Löffler, A Schopf and C Wolter (2009). Evaluation des UVPG des Bundes – Auswirkungen des UVPG auf den Vollzug des Umweltrechts und die Durchführung von Zulassungsverfahren für Industrieanlagen und Infrastrukturmaßnahmen. *UBA-Texte* 03/09. Available at http://www.umweltdaten.de/publikationen/fpdf-l/3738.pdf, last accessed 2 August 2011.

Fuller, K (1999). Quality and quality control in environmental impact assessment. In *Handbook of Environmental Impact Assessment*, J Petts (ed.), Vol. 2, pp. 35–70. Oxford: Blackwell.

Geißler, G, J Köppel and LF Odparlik (2011). Addressing greenhouse gas emissions in environmental impact assessments — The discursive making of guidance in the United States. *UVP-Report*, 25(4), 215–221.

Glasson, J, R Therivel and A Chadwick (2005). *Introduction to Environmental Impact Assessment*. 3rd edn. London: Routledge.

Gunther, P (2011). Permitting renewable energy in the United States with Examples from the Western U. S. *UVP-Report*, 25(4), 208–211.

Jones, CE (1999). Screening, scoping and consideration of alternatives. In *Handbook of Environmental Impact Assessment*, J Petts (ed.), Vol. 1, pp. 201–228. London: Blackwell Science.

Kaufmann, PT (2011). Webbasierte Daten- und Kommunikationssysteme in der Umweltprüfung — Good Practice. Und wo steht Deutschland? Unpublished bachelor thesis, Technische Universität Berlin, Environmental Assessment and Planning Research Group.

Luther, L (2007). The National Environmental Policy Act: Streamlining NEPA. CRS Report for Congress. Available at http://www.nationalaglawcenter.org/assets/crs/RL33267.pdf, last accessed 11 August, 2011.

Ma, Z, DR Becker and MA Kilgore (2009). Characterising the landscape of state environmental review policies and procedures in the United States: a national assessment. *Journal of Environmental Planning and Management*, 52(8), 1035–1051.

NEPA. National Environmental Policy Act of 1969, §102, 42 U.S.C. §4321 (2012).

Nie, M (2008). *The Governance of Western Public Lands: Mapping its Present and Future*. University Press of Kansas.

Nie, M (2011). NEPA, Interest Groups, and Federal Lands Management. *UVP-Report*, 25(4), 198–201.

Portman ME, JA Duff, J Köppel, J Reisert and ME Higgins (2009). Offshore wind energy development in the exclusive economic zone: Legal and policy supports and impediments in Germany and the US. *Energy Policy*, 37, 3596–3607.

Ryan, CM, DOB Brody and AI Lunde (2011). NEPA documents at the US Forest Service: A blessing and a curse? *UVP-Report*, 25(4), 192–197.

Schütte, P (2011). Mehr Demokratie versus Verfahrensbeschleunigung? *Zeitschrift für Umweltrecht*, 22(4), 169–170.

Sheate, W, H Byron, S Dagg, and L Cooper (2005). The relationship between the EIA and SEA Directives. Final report to the European Commission. Available at http://ec.europa.eu/environment/eia/pdf/final_report_0508.pdf, last accessed 26 January, 2012.

Slotterback, SC (2008). Stakeholder involvement in NEPA scoping processes: evaluating practices and effects in transportation agencies. *Journal of Environmental Planning and Management*, 51(5), 663–678.

Slotterback, SC (2009). Scoping implementation in National Environmental Policy Act process in US transportation agencies. *Transportation Research*, Part D, 14, 83–90.

Slotterback, SC (2011). Addressing climate change in state and local environmental impact analysis. *Journal of Environmental Planning and Management*, 54(6), 749–767.

The NEPA Task Force (2003). Report to the Council of Environmental Quality: modernizing NEPA implementation. Available at http://ceq.hss.doe.gov/ntf/report/final-report.pdf, last accessed 2 August 2011.

Tzoumis, K and L Finegold (2000). Looking at the quality of draft environmental impact statements over time in the United States: Have ratings improved? *Environmental Impact Assessment Review*, 20, 557–578.

Tzoumis, K (2007). Comparing the quality of draft environmental impact statements by agencies in the United States since 1998 to 2004. *Environmental Impact Assessment Review*, 27, 26–40.

UBA (Umweltbundesamt) (2011). II. Themenheft Umweltgerechtigkeit. Available at http://www.umweltbundesamt.de/umid/archiv/umid0211.pdf, last accessed 2 August 2011.

UBA (Umweltbundesamt) (2010). Environmental law/associational claims. Environmental protection as a state objective. Available at http://www.umweltbundesamt.de/umwel-trecht-e/environmental-protection-as-a-state-objective.htm, last accessed 20 January 2012.

UBA (Umweltbundesamt) (2008). Umweltgerechtigkeit — Umwelt, Gesundheit und soziale Lage. Available at http://www.umweltbundesamt.de/umid/archiv/umid0208.pdf, last accessed 2 August 2011.

UVP (Gesellschaft für die Prüfung der Umweltverträglichkeit) (2011). Born in the USA. *UVP-Report*, 25(4).

Van Horn CE, DC Baumer and WT Gormley (2001). *Politics and Public Policy*. 3rd edn. Washington DC: CQ Press.

Von Kampen, S and A Mengel (2009). Evaluation des UVPG — wesentliche Analyseergebnisse und Empfehlungen. *UVP-Report*, 23(1+2), 30–34.

Wende, W (2002). Evaluation of the effectiveness and quality of environmental impact assessment in the Federal Republic of Germany. *Impact Assessment and Project Appraisal*, 20(2), 93–99.

Wood, C (2003). *Environmental Impact Assessment: A Comparative Review*. 2nd edn. Essex: Pearson Education Limited.

Wood, C (1999). Comparative evaluation of environmental impact assessment systems. In *Handbook of Environmental Impact Assessment*, J Petts (ed.), vol. 2, pp. 10–34. Oxford: Blackwell.

Zschiesche, M and F Sperfeld (2011). Zur Praxis des neuen Umweltinformationsrechts in der Bundesrepublik Deutschland. *Zeitschrift für Umweltrecht*, 22(2), 71–78.

Chapter III
Impact Mitigation and Compensation in the US and Germany[13]

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Upside down – Weiterentwicklung von US-amerikanischen Konzepten zur naturhaushaltlichen Kompensation

Wetland Mitigation und Conservation Banking*

Von Gesa Geissler und Johann Köppel

Abstracts

Vor dem Hintergrund der auch in Deutschland zunehmend genutzten Poollösungen (Flächenpools, Ökokonten) zur Erfüllung von Kompensationsverpflichtungen nach Eingriffen stellt der vorliegende Artikel die Weiterentwicklung von Ansätzen zur Kompensation in den USA vor. Wir beleuchten dabei einerseits jüngere Trends bei den ‚Wetland Mitigation Banks' und zeigen dabei Neuerungen im Verhältnis von Vorhabensträger-Verantworteter und durch Dritte realisierter Kompensationsleistungen auf. Andererseits wird die seit einigen Jahren in den USA etablierte Praxis der ‚Conservation Banks' zur Folgenbewältigung beim Vollzug des speziellen Artenschutzes vorgestellt und deren innovativer Einsatz bei der Etablierung Erneuerbarer Energien an einem kalifornischen Beispiel aufgezeigt.

Der Beitrag liefert durch den Blick über den Atlantik letztlich auch Diskussionsbeiträge für die Weiterentwicklung entsprechender europäischer und deutscher Folgenbewältigungsansätze.

"Upside down" – Further Development of US-American Concepts for the Compensation of Ecosystem Impacts. Wetland Mitigation and Conservation Banking

In order to fulfill compensation requirements for unavoidable impacts to ecosystem functions mitigation banks (compensation pools) are used more and more. Against this background the paper presents the evolution of respective approaches in the USA. On the one hand it focuses on the recent trends of Wetland Mitigation Banks and points to innovations as far as permittee-responsible and third-party compensatory mitigation is concerned. On the other hand the study introduces the US practice of Conservation Banks which are an established means to implement endangered species protection and offsets. The study highlights the innovative use of conservation banks in the field of renewable energy deployment using an example from California. With the view across the Atlantic, the article provides stimulus for the discourse on the future development of compensation approaches in Europe and Germany, too.

1 Einführung

Vor zehn Jahren berichteten wir in *Naturschutz und Landschaftsplanung* vor dem Hintergrund der deutschen Eingriffsregelung über die US-amerikanischen ‚Wetland Mitigation Banks' (Butzke et al. 2002). Bis heute stellen diese Vorläufer der auch in Deutschland zunehmend implementierten Kompensationsflächenpools (Böhme et al. 2005, Wende et al. 2005) einen beachtenswerten Weg der Kompensation von Landschaftshaushaltsfunktionen nach Eingriffen dar. Im Kern stehen dabei in den USA zwar die betreffenden Regelungen gemäß des ‚Clean Water Acts', aber die Bedeutung für die biologische Vielfalt (‚Biodiversity Offsets') sind weithin bekannt und besprochen (Darbi et al. 2010). Während in den vergangenen zehn Jahren hierzulande mit der Novelle des Bundesnaturschutzgesetzes 2009 gewisse Änderungen im zugrundeliegenden Rechtskonstrukt bei gleichzeitiger Aufrechterhaltung der Folgenbewältigungsstrategie vorgenommen wurden (vgl. z.B. Michler & Möller 2010), kam es in den USA ebenfalls zu einer Weiterentwicklung des betreffenden Instrumentariums – wenn auch mit ganz unterschiedlichen Vorzeichen (Gardner 2011, Wilkinson 2009).

Darüber wollen wir im Folgenden zum einen berichten und zum anderen einen Blick auf eine kaum weniger aktuelle Strategie kooperativen Naturschutzes werfen, die der zunehmenden Diversifizierung kompensatorischer Programme nach verschiedenen Rechtsnormen Rechnung trägt: US-amerikanische ‚Conservation Banks' als Folgenbewältigungsansatz beim Vollzug des speziellen Artenschutzes gemäß den föderalen und bundesstaatlichen US ‚Endangered Species Acts'. Dabei werden wir im Besonderen auf die frühzeitige Anwendung solcher Ansätze im Zuge der Entwicklung Erneuerbarer Energien in Kalifornien aufmerksam machen (‚Desert Renewable Energy Conservation Plan'). Methodisch stützen wir uns auf teilweise verfügbare Evaluationen, rechtliche und unterrechtliche Regelungen, wissenschaftliche Publikationen sowie ausgewählte Fallbeispiele, auf die wir im Zuge von Vor-Ort-Aufenthalten im amerikanischen Westen sowie bei Recherchen zu Lehrveranstaltungen im Masterprogramm Environmental Planning an der TU Berlin aufmerksam wurden.

In der Folge rufen wir zunächst die Funktionsweise des Wetland Mitigation Bankings in Erinnerung und kennzeichnen den empirischen Sachstand und Überlegungen zur weiteren Ausgestaltung dieses Instrumentariums; sodann gilt das Augenmerk sogenannten ‚In-Lieu-Fee'-Regelungen, die unseren Ersatzzahlungen (vgl. § 15 Abs. 6 BNatSchG) nahe kommen. Letztere haben in jüngerer Zeit in den USA

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einen bemerkenswert höheren Stellenwert erreicht, begleitet durch qualitätssichernde Anforderungen, die den bereits etablierten Mitigation Banks nicht nachstehen sollen. Die Ausführungen im Abschnitt 2.4 zur neu präferierten Folgenbewältigungsstrategie im Spektrum von bevorzugten Pool- und Ersatzgeldlösungen bis hin zu nachrangigen durch den Vorhabensträger geleisteten Einzelkompensationsmaßnahmen zeigen sodann das ganze Ausmaß der jüngeren Entwicklungen in den USA. Einen systematischen Vergleich mit der Entwicklung ähnlicher Ansätze in Deutschland streben wir dabei nicht an.

2 Kompensation nach dem US Clean Water Act

2.1 Überblick

Wie bereits bei BUTZKE et al. (2002) beschrieben, erfordert der 1972 in den USA verabschiedete ‚Clean Water Act' für Eingriffe in Feuchtgebiete oder Gewässer eine behördliche Genehmigung des US Army Corps of Engineers. Diese verlangt vom Vorhabensträger Vermeidung, Verminderung sowie Kompensation für die Auswirkungen des geplanten Eingriffes. Dabei wird eine mit der deutschen Eingriffsregelung vergleichbare Entscheidungskaskade verfolgt (vgl. Abb. 1). Erst wenn Eingriffe nicht vollständig vermeidbar oder verminderbar sind, sind die verbleibenden Auswirkungen durch weitergehende Maßnahmen zu kompensieren (‚compensatory mitigation').

Für die Umsetzung des letzten Schrittes der Kaskade sind seit 1990 mit der Verabschiedung eines ‚Mitigation Memorandum of Agreement' neben ‚on-site'- (also am Ort des Eingriffes) auch ‚off-site'-Maßnahmen (also räumlich entkoppelte Maßnahmen) möglich. Diese ‚off-site'-Kompensation kann einerseits durch den Vorhabensträger realisiert werden (‚permitee-responsible') oder durch eine andere Instanz (‚third-party'). Hierzu zählen die im Folgenden näher betrachteten ‚Wetland Mitigation Banks' (Kompensationspools mit echter Maßnahmenbevorratung, vgl. BÖHME et al. 2005) sowie ‚In-Lieu-Fee Programme' (gespeist durch Ersatzzahlungen).

2.2 Wetland Mitigation Banks (Kompensationspools)

Eine Wetland Mitigation Bank verkauft ‚credits' für zuvor erbrachte Kompensationsleistungen an Vorhabensträger, deren entsprechende Verpflichtungen so übernommen werden: "Mitigation bank means a site, or suite of sites, where resources (e.g., wetlands, streams, riparian areas) are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for impacts ... In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor." (DoD & EPA 2008). Die ersten Wetland Mitigation Banks entstanden in den USA in den späten 1980er bzw. frühen 1990er Jahren, bevor mit der Verabschiedung des ersten national gültigen Leitfadens 1995 (Army Corps of Engineers' 1995 Banking Guideline) diese Form der Kompensation offiziell anerkannt und einheitliche Standards dafür gesetzt wurden. Seitdem haben Wetland Mitigation Banks in den USA einen starken Zuwachs erfahren. In einer Studie des Environmental Law Institutes (ELI) von 2006 werden für das Jahr 2005 insgesamt 330 aktive Banken, 75, die alle Maßnahmen bereits verkauft haben, sowie 169 im Genehmigungsverfahren gezählt; 1992 waren es erst 46 aktive Banken und 64 im Genehmigungsprozess (ELI 2006). Die Entwicklung der Wetland

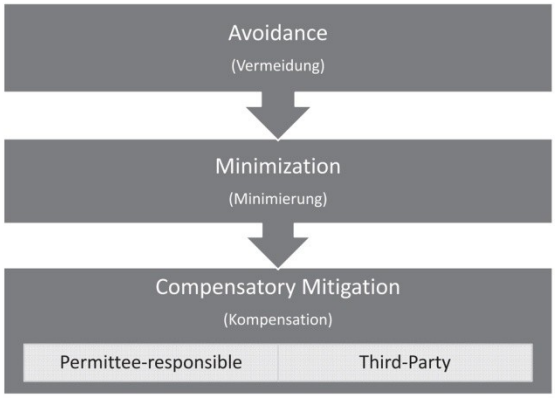

Abb. 1: Entscheidungskaskade des US Wetland Mitigation.

Textbox 1. Fallbeispiel City of Eugene (Oregon): Mitigation Bank Program (West Eugene Wetlands); redaktionell bearbeitet

'The City of Eugene's Wetlands Mitigation Bank is operated by the Parks and Open Space Division within the City's Public Works Department. Its goals are to fund and implement wetland mitigation projects, carry out the West Eugene Wetlands Plan, and serve other community needs in cooperation with the City's wetland partners. Following a logical and integrated plan of wetland restoration, the Bank manages a program that maintains a viable, contiguous wetland system within the southern Willamette Valley.

The Bank is a key instrument in achieving two major goals:

- Provide mitigation credits to private and public entities for development impacts located within the Bank's service area.
- Develop and implement restoration and enhancement plans for local wetland communities.

The result is a wetland system that provides significant benefits to the community, including:

- Enhanced air and water quality through natural filtration and treatment.
- Flood control through increased water storage and floodplain capacity.
- A diverse array of native plants, animals, and habitats interconnected by a system of wetland and riparian areas.
- Public access to large open spaces near the urban center.
- Educational, recreational, and research opportunities in and along the wetlands and stream corridors.

State and federal laws require compensatory mitigation for the loss of all wetlands, regardless of value. Plan policies call for creation of a mitigation bank to help fund restoration and enhancement in conjunction with a program to protect valuable wetlands. The performance standards and procedural requirements for operating the Bank are described in the Mitigation Bank Instrument and Memorandum of Agreement, developed in accordance with state and federal wetland mitigation bank requirements. Bank sites are located within a connected system of existing wetlands that are managed by the Rivers to Ridges Partnership.

The Bank produces an annual report which details the performance of each of the mitigation sites. The report contains monitoring information about vegetation, hydrology, soils, and wildlife. A summary of the Bank's financial transactions is also found in the annual report ...'

www.eugene-or.gov/portal/server.pt?open=512&objID=667&PageID=1495&cached=true&mode=2&userID=2

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Abb. 2: Wetland Mitigation Maßnahme am Campus der University of Washington, Seattle (Köppel 2006).

Mitigation Banks wird z.B. bei Robertson (2009, 2006, 2004) sowie Hough und Robertson (2009) ausführlich dargelegt.

2.3 In-Lieu Fees (Ersatzzahlungen)

In-lieu-Fees entsprechen grundsätzlich unseren naturschutzrechtlichen Ersatzzahlungen: "In-lieu fee program means a program involving the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements ... permits. Similar to a mitigation bank, an in-lieu fee program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor." (DoD & EPA 2008). Im Jahr 2005 gab es 58 aktive In-lieu-Fee-Programme in den USA sowie sieben, die sich noch im Genehmigungsprozess befanden (ELI 2006a).

Die Form der Kompensation durch In-lieu Fees wurde erstmals in dem 1995 erlassenen nationalen Leitfaden zu Wetland Mitigation Banks (Army Corps of Engineers' 1995 Banking Guideline) behandelt. Darin wird anerkannt, dass in bestimmten Situationen Ersatzzahlungen die angemessene Form der Kompensation sein können. Allerdings wurde empfohlen, in diesen Fällen Sicherheiten einzufordern, die den Erfolg und die zügige Umsetzung der durch die In-lieu Fees finanzierten Maßnahmen gewährleisten. Dieses sollte in Form einer offiziellen Vereinbarung zwischen dem Betreiber des In-lieu-Fee-Programms und der Genehmigungsbehörde (US Army Corps of Engineers) erfolgen.

Den bereits hier deutlich gewordenen Bedenken hinsichtlich des Erfolges von In-lieu-Fee-Programmen sollte 2000 durch die Verabschiedung eines speziellen nationalen Leitfadens begegnet werden (2000 In-Lieu Fee Guidance). Dennoch belegten mehrere zwischen 2000 und 2006 durchgeführte Studien, dass in der Praxis Defizite bei der Umsetzung der Kompensationsmaßnahmen durch In-lieu-Fee-Programme bestehen und deren Beitrag zum Ziel ‚no net loss' von Feuchtgebieten und Gewässern und deren Funktionen zweifelhaft war (u. a. NRC 2001, ELI 2006b).

2.4 Neue Vorgaben für die Kompensation nach US Clean Water Act

Ausgelöst durch die beschriebenen Defizite von In-lieu-Fee-Programmen, insbesondere den häufig großen zeitlichen Verzug zwischen Eingang der Zahlungen und der Realisierung von Maßnahmen sowie die mangelhafte administrative Organisation der Programme, wurde im Jahr 2008 vom US Army Corps of Engineers und der Nationalen Umweltbehörde (Environmental Protection Agency) die ‚Compensatory Mitigation Rule' (im folgenden ‚Federal Rule') verabschiedet (DoD & EPA 2008). Diese bindende Regelung war durch eine Forderung nach gleichen Standards und Kriterien für alle Formen des ‚Compensatory Mitigation' (also Kompensationspools und Ersatzzahlungen), welche in einem Gesetz von 2004 enthalten war, notwendig geworden.

Die neuen Regelungen schaffen einen einheitlichen Genehmigungs- bzw. Zertifizierungsprozess für Wetland Mitigation Banks und In-lieu-Fee-Programme und schließen die Praxis so genannter ‚ad hoc in-lieu fee payments' aus (Wilkinson 2009). Bei diesen gingen Ersatzzahlungen nicht an zuvor genehmigte In-lieu-Fee-Programme, sondern spontan an Dritte, die damit Maßnahmen umsetzen wollten. Die geforderten Inhalte der einzureichenden Unterlagen zur Genehmigung von Wetland Mitigation Banks sowie In-lieu-Fee-Programmen, dem Programmentwurf (‚Prospectus') und dem abschließenden Genehmigungsdokument (‚Instrument') umfassen u.a. geklärte Eigentumsverhältnisse und Qualifikationsnachweise des Pool-Betreibers, den Nachweis der standörtlichen Eignung der Poolflächen zum Erreichen der Entwicklungsziele, wie die ‚Credits' bestimmt werden und ihre Preise und Abbuchungsmechanismen, die Pflege- und Entwicklungspläne und die heranzuziehenden Monitoring-Indikatoren sowie finanzielle Sicherungsmechanismen (DoD & EPA 2008).

Nicht zuletzt erfolgte mit der Verabschiedung der Federal Rule in den USA eine bemerkenswerte Abkehr von den in Deutschland trotz aller Flexibilisierungsansätze (Deiwick 2002) bis heute aufrecht erhaltenen Kompensations-Paradigmen. Die US Federal Rule behält zwar eine Präferenz für (gleichartige) in-kind-Kompensation bei Eingriffen in als Wetlands klassifizierte Ökosysteme bei, ersetzt aber sowohl die (eingriffsnahe) on-site-Präferenz als auch die vorhabensträgerfixierte Folgenbewältigungsstrategie durch eine neue fünfstufige Präferenz-Hierarchie (§ 332.3(b) Federal Rule). Motiviert ist dieses vor allem durch die begründete Annahme einer qualitativ besseren und gesicherteren Kompensation im Falle von nicht den Vorhabensträgern überlassenen Pool- und Ersatzgeldlösungen (ELI 2006a, 2006b, NRC 2001). Die fünfstufige Folgenbewältigungshierarchie (oder „Entscheidungskaskade", Köppel et al. 1998, 2004) weist nunmehr die folgende Priorisierung auf:

1. Die Inanspruchnahme von (bereits geschaffenen) Credits von Wetland Mitigation Banks stellt die erste Präferenz dar, um Eingriffe gemäß der Federal Rule zu kompensieren. Es handelt sich um ein Abbuchen vorgezogen umgesetzter, anerkannter (zertifizierter) und qualitätsgesicherter Kompensationsmaßnahmen, die in der Regel von privaten Poolbetreiben geleistet wurden. Ein Vorhabensträger erwirbt entsprechend seinen jeweiligen Kompensationsverpflichtungen ‚Credits' im Gegenwert bereits durchgeführter passender Kompensationsmaßnahmen bei einem Poolbetreiber. Letzterer übernimmt auch die Verantwortung für den Erfolg dieser Maßnahmen. Die Maßnahmen finden stets ‚off-site' statt, aber noch im definierten ‚Service'-Bereich des jeweiligen Pools innerhalb eines zugehörigen Wassereinzugsgebiets.

2. Die Abbuchung von ‚Credits' aus einem aus Ersatzgeld gespeisten In-lieu-Fee-Programm erhält durch die neue Federal Rule einen hohen Stellenwert und folgt sogleich in der Präferenzhierarchie. Ermöglicht und gestärkt wurde das durch die oben aufgeführten Qualitätssicherungsstandards. So können z.B. nicht beliebig Ersatzgelder bevorratet werden, vielmehr sorgt eine entsprechende Deckelung dafür, dass die faktische Maßnahmenumsetzung rechtzeitig aufgenommen wird. Die In-lieu-Fee-Programme können von öffentlichen Trägern oder Nichtregierungsorganisationen (NGOs) betrieben werden. Verantwortlich für den Maßnahmenerfolg ist wie bei den Wetland Mitigation Banks der Empfänger der Ersatzzahlungen und nicht der Vorhabensträger. Die Maßnahmen finden ebenfalls ‚off-site' statt, im Gegensatz zu Maßnahmen in den Mitigation Banks jedoch meist erst nach dem genehmigten Eingriffsfall.

3. Erst wenn beide vorgenannten Lösungen nicht verfügbar sind, kommt es gemäß der Federal Rule überhaupt erst zur Erwägung direkt durch den Vorhabensträger verantworteter Maßnahmen. Bei dem dann zuerst empfohlenen ‚Watershed Approach' sind Maßnahmen adressiert, die in Deutschland etwa in einem überörtlichen Konzept der Landschaftsplanung oder Maßnahmenprogrammen gemäß der WRRL (EU-Wasserrahmenrichtlinie) vorbereitet sein können.

4. Bietet sich schließlich auch Option 3 nicht an, folgen in der Präferenzhierarchie der Federal Rule ‚on-site/in-kind' und vom Vorhabensträger direkt verantwortete Kompensationsmaßnahmen, also die eingriffsnahe und gleichartige Folgenbewältigungsstrategie. Erst an vorletzter Stelle der US-amerikanischen Entscheidungskaskade wird demnach der Vorzug räumlich und zeitlich entkoppelter Maßnahmenumsetzung zugunsten von klassischen Einzelmaßnahmen im Sinne von Ausgleichsmaßnahmen nach deutschem Naturschutzrecht aufgegeben.

5. Als letzte Option sollen Ersatzmaßnahmen im deutschen Sinne zum Einsatz kommen, d.h. vom Vorhabensträger direkt verantwortete ‚off-site/out-of-kind'-Kompensationsmaßnahmen. Auch in diesem Fall erfolgt die Umsetzung der Maßnahme nach der Vorhabensgenehmigung und die Verantwortung für den Maßnahmenerfolg verbleibt beim Vorhabensträger.

So wird insgesamt also unterstrichen, dass gleichartige Maßnahmen auf gesichertem Umsetzungsstand im Sinne eines auch räumlich entkoppelten ‚No-net-loss'-Ansatzes Priorität genießen. Letzten Endes schieben sich dabei (vorgezogene Maßnahmen-) Pools (durch ‚Third Parties') und (auch erst nachlaufend realisierte) Ersatzzahlungs-Lösungen (durch die öffentliche Hand oder zugelassene NGOs) sowohl vor Ausgleichs- als auch Ersatzmaßnahmen im Sinne des BNatSchG. Begründet wird das in erster Linie durch eine sowohl flexiblere wie risikoärmere Kompensation (ELI 2006a, 2006b; NRC 2001), die gleichzeitig auch zu weniger Verzögerungen in Genehmigungsprozessen führt.

Textbox 2. Fallbeispiel King County Mitigation Reserves Program In-Lieu Fee Program Instrument
redaktionell bearbeitet

"The King County Mitigation Reserves Program (MRP) is a King County-sponsored in-lieu fee mitigation program. The proposed program structure and processes for completing mitigation projects are based largely upon guidance outlined in a federal rule issued in April 2008 by the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (EPA) [33 CFR Part 332 and 40 CFR Part 230] (the federal rule). The King County Mitigation Reserves Program seeks to address historic inadequacies associated with compensatory mitigation by creating a comprehensive, equitable and consistent in-lieu fee program that includes all elements and phases necessary to ensure mitigation success among small and large projects, including: rigorous baseline conditions analysis; thorough assessment of impacts; seamless and transparent fee transaction processes; ecologically-based site selection criteria that address critical watershed needs; professional project design and implementation; and long-term commitment to adaptive management, maintenance, monitoring and stewardship to ensure no net loss of functions."
http://your.kingcounty.gov/dnrp/library/water-and-land/mitigation-reserves/2011-in-lieu-fee-instrument/in-lieu-fee-program-instrument-10-2011.pdf

3 Conservation Banks nach US Endangered Species Act (Kompensationspools im US-Artenschutz)

3.1 Rechtlicher Rahmen

Die Anforderungen an den speziellen Artenschutz in den USA sind auf föderaler Ebene im Endangered Species Act (ESA) von 1973 geregelt, einem wirkungsvollen Instrument des amerikanischen Naturschutzes; Nye (2009) bezeichnet die betreffenden Regelungen gar als ‚pit bull' der amerikanischen Umweltgesetzgebung. Neben dem nationalen Gesetz, das durch den US Fish and Wildlife Service (US FWS) umgesetzt wird, haben fast alle Bundesstaaten der USA zusätzliche eigene State Endangered Species Acts erlassen, die neben dem Bundesgesetz stehen. Allein durch das nationale Gesetz sind 1 372 Arten (Stand März 2011) als ‚endangered' (gefährdet) oder ‚threatened' (bedroht) gelistet und unterliegen damit den Regelungen des ESA (US FWS 2011a); den Gesetzen der Bundesstaaten unterliegen weitere Arten.

Die amerikanischen Artenschutzgesetze entsprechen im Wesentlichen unseren deutschen bzw. europäischen Regelungen: „The ESA makes it unlawful for a person to take a listed animal without a permit. Take is defined as ‚to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct.' Through regulations, the term 'harm' is defined as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." (US FWS 2011a). Artenschutzrechtliche Befreiungen (incidental take permits) bedürfen einer entsprechenden Prüfung durch den US Fish and Wildlife Service, einschließlich eines ‚Habitat Conservation Plan', in dem ähnlich unserer artenschutzrechtlichen Prüfung neben den negativen Auswirkungen des Vorhabens, die entsprechenden Vermeidungs-

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und ggf. Ausgleichsmaßnahmen einschließlich ihrer Finanzierung darzulegen sind (vgl. z.B. Mead 2008).**

3.2 Conservation Banks nach dem Vorbild der Wetland Mitigation Banks

Die Wurzeln und das Vorbild für Poollösungen von Maßnahmen für USA-weit geschützte Arten gemäß ESA liegen explizit beim Wetland Mitigation Banking (Bonnie 1999, Mead 2008). In den frühen 1990er Jahren begann der US Fish and Wildlife Service zusammen mit anderen Bundesbehörden und dem Staat Kalifornien mit der Genehmigung erster Kompensationsbanken für geschützte Arten (Mead 2008, US FWS 2011). Während für die Kompensation nach dem Clean Water Act ab 1995 die ‚Federal Guidance for the Establishment, Use, and Operation of Mitigation Banks' zur Verfügung stand, erließ Kalifornien – wie so oft Vorreiter in der amerikanischen Umweltpolitik – im gleichen Jahr eine Richtlinie zur Schaffung einer zweiten Generation von Mitigation Banks, den Conservation Banks. Mit diesen sollten, als Kompensation für Eingriffe, explizit bestehende Lebensräume geschützt und entwickelt werden.

Erst 2003 folgte dann basierend auf dem Kalifornischen Leitfaden eine nationale Richtlinie des US FWS (‚Guidance for the establishment, use, and operation of conservation banks'), die bundesweit gültige Vorgaben machte. Auf dieser Basis wurden bis Januar 2011 mehr als 120 Conservation Banks vom USFWS genehmigt und etabliert, die meisten davon in Kalifornien (US FWS 2011). Die Vorgaben für die Entwicklung von Conservation Banks ähneln sehr denen des Wetland Mitigation Bankings. Um eine Conservation Bank zu eröffnen, muss der Eigentümer ein so genanntes 'Conservation Bank Agreement' (CBA) mit dem US Fish and Wildlife Service eingehen. Diese rechtlich bindende Vereinbarung beinhaltet vergleichbare Informationen wie ein ‚Wetland banking instrument', darunter in jedem Fall einen Management Plan, und

Abb. 3: Windpark in der kalifornischen Mojave Wüste (Geissler 2010).

auch ein Interagency Review Team ist an dem Genehmigungsprozess für die Bank beteiligt.

Ein Beispiel ist die Zayante Sandhills Conservation Bank (ZSCB) an der kalifornischen Küste mit dem Ziel, die dortigen Lebensräume teilweise nur im Santa Cruz County vorkommender Pflanzen- und Tiergemeinschaften zu schützen und weiter zu entwickeln ('enhance'). Verbunden ist die Conservation Bank mit dem Habitat Conservation Plan (HCP) für die Gemeinde Scotts Valley, welcher eine artenschutzrechtliche Lösung für Auswirkungen insbesondere auf den Mount Hermon June Beetle durch zukünftige Entwicklung neuer Wohngebiete gewährleistet. Dieser HCP empfiehlt für die Kompensation der erwarteten Auswirkungen den Kauf von Credits der Zayante Sandhills Conservation Bank (US FWS et al. 2011).

3.3 Desert Renewable Energy Conservation Plan (DRECP)

Die besondere Rolle Kaliforniens ergab sich auch angesichts einer hohen Anzahl national und bundesstaatlich geschützter Arten in diesem Bundesstaat und einer gleichzeitig starken Entwicklung der Wirtschaft und der Städte in den frühen 1990er Jahren. In diesem Zusammenhang wurde 1991 der Ansatz der ‚Natural Community Conservation Plans' (NCCP) geschaffen – mit dem Ziel, den Artenschutz mit der wirtschaftlichen und sozialen Entwicklung im Staat zu vereinen. Diese NCCPs stellen die kalifornische Version eines großräumigen Habitat Conservation Planes dar, welcher auf regionaler Ebene zukünftig zu erwartende Auswirkungen auf geschützte Arten und die dafür nötigen Vermeidungs- und Kompensationsmaßnahmen pro-aktiv darstellt (Mead 2008). In diesen NCCPs wird in vielen Fällen auf Conservation Banks als Mittel zur Bereitstellung der Kompensation zurückgegriffen.

Herausgegriffen sei hier der ‚Desert Renewable Energy Conservation Plan' (DRECP), mit dem der damalige kalifornische Gouverneur Schwarzenegger zusammen mit US-Innenminister Salazar (zuständig für im Bundesbesitz befindliche Flächen im Westen der USA) 2008 eine wegweisende Strategie auf den Weg gebracht hat. Ganz bewusst so angesprochene ‚Twin Goals' sollen erzielt werden, um in der Mojave- und der Colorado-Wüste einerseits den ambitionierten Ausbau Erneuerbarer Energien voranzubringen (insbesondere Freiflächen-Solarthermie- und -Photovoltaik-Kraftwerke), gleichzeitig aber von vornherein den Schutz gefährdeter oder bedrohter Arten zu gewährleisten: „The DRECP, when completed, is expected to further these objectives [renewable energy deployment] and provide binding, long-term endangered species permit assurances while facilitating the review and approval of renewable energy projects in the Mojave and Colorado deserts in California" (CEC 2012).

Durch die Erstellung des langfristig angelegten DRECP sollen die Voraussetzungen für die erforderlichen artenschutzrechtliche Befreiungen (‚Incidental Take Permits') nach Bundes- und Landesrecht geschaffen werden. Letzten Endes hofft man so, größere Naturschutzwerte zu erreichen als in einem herkömmlichen Projekt-für-Projekt- und Art-für-Art-(Genehmigungs-)Prozess. Der DRECP legt auf regionaler Ebene einerseits Gebiete für den ambitionierten Ausbau Erneuerbarer Energien und andererseits Kompen-

** 'Section 10 of the ESA provides relief to landowners including private citizens, corporations, Tribes, States, and counties who want to develop property inhabited by listed species. Landowners can receive a permit to take such species incidental to otherwise legal activities, provided they have developed an approved habitat conservation plan (HCP). HCPs include an assessment of the likely impacts on the species from the proposed action, the steps that the permit holder will take to minimize and mitigate the impacts, and the funding available to carry out the steps.' (US FWS 2011a).

sationsräume für den Artenschutz fest. Der anspruchsvolle und sehr partizipativ angelegte Planungsprozess wird in einem eigens erstellten Leitfaden (DFG et al. 2010) beschrieben.

Da die Entwicklung des DRECP aber zu langsam für die schon in der Genehmigung befindlichen Projekte ist und auch kein Moratorium über Jahre gewollt war, wurde 2010 per Gesetz (SB X8 34) eine ‚Interim Mitigation Strategy' beschlossen. Diese soll den Projekten zugutekommen, die Anträge auf auslaufende staatliche Förderung stellen wollen und daher noch vor Ablauf des Jahres 2011 eine Genehmigung benötigten. Diese Interim Mitigation Strategy (DFG 2010) bietet zwei Möglichkeiten zur Kompensation unvermeidbarer Auswirkungen auf geschützte und bedrohte Arten:

▶ ‚advanced mitigation' – dafür soll eine ‚Land Bank' (Flächenpool) erstellt werden, so dass für die Kompensationsanforderungen durch die Behörden im Vorfeld Flächen identifiziert und gekauft werden, auf denen die Vorhabensträger dann Maßnahmen durchführen können;

▶ eine ‚In-Lieu Fee'-Option – dabei werden die Behörden mit Geldern der Vorhabensträger die Kompensation durchführen. Für diese Option wurden in der Interim Mitigation Strategy fachliche Vorgaben gemacht und so genannte IMS ‚Mitigation Target Areas' im Sinne einer betreffenden Flächenkulisse identifiziert.

4 Schlussfolgerungen

Im Kontext der andauernden Diskussionen zur Weiterentwicklung der Eingriffsregelung (vgl. u.a. den Koalitionsvertrag zwischen CDU, CSU und FDP, DEGENHART 2011) wie auch der fortschreitenden Erfahrungen mit der Umsetzung der artenschutzrechtlichen Vorgaben der EU in der Praxis erscheint ein Blick über den Tellerrand und eine Auseinandersetzung mit den Erfahrungen in Ländern mit ähnlichen Regelungen wichtig und aufschlussreich.

Die jüngeren Entwicklungen des US-amerikanischen Wetland-Mitigation-Konzepts durch die ‚Federal Rule' von 2008 stellen die in Deutschland gültige Entscheidungskaskade zur Wahl von naturschutzrechtlichen Kompensationsmaßnahmen quasi auf den Kopf. Getragen von der Überzeugung einer qualitätsvolleren und risikoärmeren Kompensation in der Hand von ‚Third Parties' und kontrolliert durch kooperativ handelnde, behördenübergreifend organisierte Review-Teams wird seitdem nicht nur Kompensationspools, sondern auch Ersatzzahlungslösungen ein Vorrang vor Einzelfall-Kompensation in Vorhabensträger-Verantwortung eingeräumt. Die dabei an den Tag tretende Orientierung an den seit Beginn der 1990er Jahre etablierten Wetland Mitigation Banks zeigt das gewachsene Vertrauen in qualitätsgesicherte Poollösungen; übertragen auf die Regelungen zur deutschen Eingriffsregelung gemäß BNatSchG würde das bedeuten, die Mittelverwendung von Ersatzzahlungen an ambitionierte Standards für die Entwicklung von Kompensationspools zu binden.

Die artenschutzrechtliche Folgenbewältigung und planerische Vorbereitung betreffender Poollösungen (‚Conservation Banks' wie beim DRECP) wiederum bietet gerade für den offenbar so schwierigen Ausgleich ‚Green against Green' (WOODY 2010) zwischen Klimaschutz durch Erneuerbare Energien einerseits und dem Schutz der Biodiversität andererseits wertvolle Anregungen im Hinblick auf kooperative Planungs- und Genehmigungsprozesse.

Fazit für die Praxis

- Beim US Wetland Mitigation werden Kompensation durch Pools (Wetland Mitigation Banks) und Ersatzgeldprogramme (In-lieu fee programs) präferiert vor durch Vorhabensträger verantworteten Maßnahmen und durch bundesweit geltende einheitliche Standards reguliert.
- Poolansätze werden in den USA auch im Bereich des Artenschutzes als so genannte „Conservation Banks" bereits seit Jahren genutzt.
- Die US-amerikanischen Beispiele der Nutzung von Kompensationspools und Ersatzgeldern insbesondere auch bei der Realisierung der Energiewende zur Harmonisierung von Biodiversitäts- und Klimaschutz sind einen Blick über den Tellerrand bzw. den Atlantik wert!

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Literatur

BENDOR, T., RIGGSBEE, J.A. (2011): Regulatory and ecological risk under federal requirements for compensatory wetland and stream mitigation. Environmental Science & Policy 14 (6), 639-649.

BNatSchG (Bundesnaturschutzgesetz) vom 29. Juli 2009 (BGBl. I S. 2542), zuletzt geändert durch Artikel 5 des Gesetzes vom 6.Februar 2012 (BGBl. I S. 148).

BÖHME, C., BRUNS, E., BUNZEL, A., HERBERG, A., KÖPPEL, J. (2005): Flächen- und Maßnahmenpools in Deutschland.

BONNIE, R. (1999): Endangered species mitigation banking: promoting recovery through habitat conservation planning under the Endangered Species Act. The Science of the Total Environment 240, 11-19.

BUTZKE, A., HARTJE, V., KÖPPEL, J., MEYERHOFF, J. (2002): Wetland Mitigation and Mitigation Banks in den USA. Die amerikanische Eingriffsregel für Feuchtgebiete. Naturschutz und Landschaftsplanung 34 (5), 139-144.

CEC (California Energy Commission, 2012): The Desert Renewable Energy Conservation Plan (DRECP). www.drecp.org/about/index.html (Abruf am 10.01.2012).

DARBI, M., OHLENBURG, H., HERBERG, A., WENDE, W. (2010): Impact mitigation and biodiversity offsets – compensation approaches from around the world. A study on the application of Article 14 of the CBD (Convention on Biological Diversity). Naturschutz und Biologische Vielfalt 101.

DEGENHART, C. (2011): Regelungsmöglichkeiten des Bundes zur Gleichstellung von Ersatzgeld und Naturalkompensation im Rahmen der naturschutzrechtlichen Eingriffsregelung – verfassungsrechtliche Rahmenbedingungen. Expertise für das BfN. www.bfn.de/fileadmin/MDB/images/themen/recht/Gutachten-Prof-Degenhart.pdf (Abruf am 10.01.2012).

DEIWICK, B. (2002): Entwicklungstendenzen der Eingriffsregelung. Landschaftsentwicklung und Umweltforschung 120, TU Berlin.

DFG (California Department of Fish and Game, 2010): Interim Mitigation Strategy As Required by SB X8 34. www.energy.ca.gov/2010publications/DRECP-1000-2010-006/DRECP-1000-2010-006-F.PDF (Abruf am 10.01.2012).

DoD & EPA (Department of Defense & Environmental Protection Agency, 2008): Compensatory Mitigation for Losses of Aquatic Resources; Final Rule. www.epa.gov/owow/wetlands/pdf/wetlands_mitigation_final_rule_4_10_08.pdf (Abruf am 10.01.2012).

DFG et al. (California Department of Fish and Game, California Energy Commission, United States Bureau of Land Management, and United States Fish and Wildlife Service, 2010): Planning Agreement for the Desert Renewable Energy Plan. www.nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=29285 (Abruf am 10.01.2012).

ELI (Environmental Law Institute, 2006a): 2005 Status Report on Compensatory Mitigation in the United States. http://water.epa.gov/lawsregs/guidance/wetlands/upload/2006_06_01_wetlands_ELIMitigation2005.pdf (Abruf am 10.01.2012).

– (2006b): The Status and Character of In-Lieu-Fee Mitigation in the United States. www.epa.gov/owow/wetlands/pdf/ELI_ILF_Study06.pdf (Abruf am 10.01.2012).

– (2009): In-Lieu Fee Mitigation: Model Instrument Language and Resources. www.policy-

Naturschutz und Landschaftsplanung 44 (12), 2012, 364-370, ISSN 0940-6808 Verlag Eugen Ulmer KG, Stuttgart

archive.org/handle/10207/bitstreams/22072.pdf (Abruf am 10.01.2012).
Gardner, R.C. (2011): Lawyers, Swamps, and Money. U.S. Wetland Law, Policy, and Politics. Island Press: Washington, Covelo, London.
Hough, P., Robertson, M. (2009): Mitigation under Section 404 of the Clean Water Act: where it comes from, what it means. Wetlands Ecology and Management 17, 15-33.
Köppel, J., Feickert, U., Spandau, L., Strasser, H. (1998): Praxis der Eingriffsregelung – Schadenersatz an Natur und Landschaft? Eugen Ulmer, Stuttgart.
–, Peters, W., Wende, W. (2004): Eingriffsregelung, Umweltverträglichkeitsprüfung, FFH-Verträglichkeitsprüfung. Eugen Ulmer, Stuttgart.
Mead, D.L. (2008): History and Theory: The Origin and Evolution of Conservation Banking. In: Carroll, N., Fox, J., Bayon, R., eds., Conservation & Biodiversity Banking, A Guide to Setting up and Running Biodiversity Credit Trading Systems, Earthscan. London, Sterlin, VA, 9-31.
Michler, H-P., Möller, F. (2010): Änderungen der Eingriffsregelung durch das BNatSchG 2010. Natur und Recht 33, 81-90.
National Research Council (NRC, 2001): Compensating for wetland losses under the Clean Water Act. National Academy Press, Washington.
Robertson, M. (2004): The neoliberalization of ecosystem services: wetland mitigation banking and problems in environmental governance. Geoforum 35, 361-373.
– (2009): The work of wetland credit markets: two cases in entrepreneurial wetland banking. Wetlands Ecol. Manage. 17, 35–51.
US FWS (US Fish and Wildlife Service, 2003): Guidance for the Establishment, Use, and Operation of Conservation Banks. http://moderncms.ecosystemmarketplace.com/repository/moderncms_documents/Federal%20Guidance%20on%20Conservation%20Banking%202003.pdf (Abruf am 13.01.2012).
– (2011a): ESA Basics. More Than 30 Years of Conserving Endangered Species. www.fws.gov/endangered/esa-library/pdf/ESA_basics.pdf (Abruf am 13.01.2012).
– (2011b): Conservation Banking. Incentives for Stewardship. www.fws.gov/endangered/esa-library/pdf/conservation_banking.pdf (Abruf am 13.01.2012).
US FWS et al. (US Fish and Wildlife Service, Santa Cruz County, City of Scotts Valley, 2011): Interim-Programmatic Habitat Conservation Plan for the Endangered Mount Hermon June Beetle and Ben Lomond Spineflower. www.fws.gov/ventura/endangered/habitat_conservation_planning/hcp/docs/MHJB-ZBGH_IPHCP/IPHCP_FINAL.pdf (Abruf am 13.01.2012).
Wende, W., Herberg, A., Herzberg, A. (2005): Mitigation banking and compensation pools: improving the effectiveness of impact mitigation regulation in project planning procedures. Impact Assessment and Project Appraisal 23 (2), 101-111.
Wilkinson, J. (2009): In-lieu fee mitigation: coming into compliance with the new Compensatory Mitigation Rule. Wetlands. Ecol. Manage. 17, 53-70.
Woody, T. (2010): It's Green Against Green In Mojave Desert Solar Battle. http://e360.yale.edu/feature/its_green_against_green_in_mojave_desert_solar_battle/2236/ (Abruf am 13.01.2012).

Anschriften der Verfasserin/des Verfassers: Dipl.-Ing. Gesa Geißler, Prof. Dr. Johann Köppel, Technische Universität Berlin, Fakultät VI Planen Bauen Umwelt, Fachgebiet für Umweltprüfung und Umweltplanung, Sekr. EB 5, Straße des 17. Juni 145, D-10623 Berlin, E-Mail gesa.geissler@tu-berlin.de bzw. johann.koeppel@tu-berlin.de.

TERMINE

Auenökologie

„Hochwasser- und Artenschutz, Schutz und Renaturierung europäischer Auengebiete" lauten die Themen der 2. Jenaer Auentagung am 08. und 09. März 2013 in Jena (Thüringen).

Informationen: Arbeitsgruppe Artenschutz Thüringen e.V., Thymianweg 25, 07745 Jena, Fax (03641) 605625, E-Mail ag-artenschutz@freenet.de, Internet www.ag-artenschutz.de.

Grün am Gebäude

Am 12. Dezember 2012 veranstaltet die Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau (FLL) in Frankfurt eine Fachtagung „Übergangsbereiche zwischen Freiflächen und Gebäuden – Vorstellung des neuen Regelwerks".

Informationen: FLL, Colmantstraße 32, 53115 Bonn, Telefon (0228) 965010-0, Fax -20, E-Mail j.rohrbach@fll.de, Internet www.fll.de.

Bauleiter

Die 17. bdla-Bauleitergespräche am 11. und 12. Januar 2013 in Potsdam beinhalten Diskussionen zu Bautechnik und Baumanagement in der Freiraumplanung ebenso wie Fragen des Architekten- und Vergaberechts sowie Exkursionen zum Flughafen Berlin Brandenburg und zum Westpark am Gleisdreieck in Berlin.

Informationen: Bund Deutscher Landschaftsarchitekten, Köpenicker Straße 48/49, 10179 Berlin, Telefon (030) 278715-0, Fax -55, E-Mail info@bdla.de, Internet www.bdla.de.

Difu-Programm

Das Deutsche Institut für Urbanistik (Difu) verweist auf sein neues Jahresprogramm 2013 „Difu-Fortbildung: Praxis – Wissen – Erfahrungsaustausch".

Informationen: Deutsches Institut für Urbanistik, Zimmerstraße 13-15, 10969 Berlin, Internet www.difu.de.

Toepfer Akademie

28.01. bis 01.02.2013: Grundlagenschulung ArcGIS 10
31.01. und 01.02.2013: Projektmanagement im Umweltbereich
07.02.2013: Entschlammung von Gewässern
09. und 10.02.2013: Podcast-Schulung Landschaftsreporter
13. und 14.02.2013: Bodenkundliche Baubegleitung
19.02.2013: Vertiefungsschulung für landwirtschaftliche Berater
21. und 22.02.2013: Landwirtschaft, Erhaltung von Ökosystemen und Ökosystemdienstleistungen
22.02.2013: Nachhaltigkeit konkret kommunizieren
27.02.2013: In und von der Landschaft leben

Informationen: Alfred Toepfer Akademie für Naturschutz (NNA), Hof Möhr, 29640 Schneverdingen-Heber, Telefon (05199) 989-0, Fax -46, E-Mail nna@nna.niedersachsen.de, Internet www.nna.de.

Hochwasser

Die Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall (DWA) und die Fachgemeinschaft Hydrologische Wissenschaften (FgHW) laden zum FgHW-Seminar „Ermittlung von Hochwasserwahrscheinlichkeiten" am 06. Februar 2013 in Bochum ein.

Informationen: Sabine Smolka, Ruhr-Universität-Bochum (RUB), Universitätsstraße 150, 44801 Bochum, Telefon (0234) 3224693, E-Mail sabine.smolka@rub.de, Internet www.hydrology.ruhr-uni-bochum.de.

Chapter IV
Environmental Assessment in Wind Energy Diffusion in the US and Germany[14]

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Wind energy and environmental assessments – A hard look at two forerunners' approaches: Germany and the United States

Gesa Geißler [a,*], Johann Köppel [a], Pamela Gunther [b]

[a] Environmental Assessment and Planning Research Group, Technische Universität Berlin, Secretariat EB 5, Straße des 17. Juni 145, 10623 Berlin, Germany
[b] Amec Environment & Infrastructure, 4445 Lougheed Highway, Suite 600, Burnaby, V5C 0E4 B.C., Canada

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ABSTRACT

Wind energy development is booming worldwide with Germany and the United States being forerunners in installed capacity. Based on a review of relevant laws and regulations, policy, siting, and permitting documents, academic literature, and expert interviews, the paper compares the permit and environmental impact assessment (IA) policies and regulations pertaining to wind energy projects in both countries. The focus is on the potential of IAs in supporting an environmentally conscious development of wind power generation. This includes the analysis of IA regulations on the project level, strategic level impact assessment and planning processes, opportunities for public involvement and transparency of processes, and the clarity and predictability of the IA provisions. The findings suggest certain variations between both countries' permit and IA processes for wind energy projects and further research needs, inter alia on the actual effects of strategic assessment of wind development on subsequent permitting.

1. Introduction

Germany is a leader in Europe on shifting to renewable sources of energy [1–3]. This has been underlined by the recently announced 'Energiewende' on renouncing nuclear power generation to shift to renewable energy sources with wind energy as the preferred focus [4].[1] In the United States, industry and government have also been supportive of opportunities to develop renewable energy production with large growth rates of wind energy recently [7–9].[2] Renewable energy generation and, in particular wind energy, is regarded as an important contribution to the establishment of a low carbon energy system to reduce dependence on finite fossil fuels [12]. However, development of renewable energy generation facilities, including wind energy, is not entirely environmentally benign. In particular, social and ecological conflicts might occur [13]: Wind farms can impact land- and seascapes [14–16] and cause light and noise emissions [17,18] that may induce conflicts with neighbors and the tourism industry. Studies also suggest impacts of wind turbines on birds and bats [19–21] where a conflict between climate change mitigation and biodiversity conservation goals emerges [22,23]. In order to achieve a balanced development of energy, these possible conflicts should be considered and mitigated to the extent possible. This includes, for example, the selection of suitable sites for wind development and/or the design of wind farms to minimize negative impacts on environment and society while also providing societal benefits. Regulatory mechanisms, such as impact assessments (IA)[3] (that provide an in-depth study of likely impacts of proposed actions significantly affecting the environment), consultations with the public and agencies, and consideration of environmental impacts in the final decision-making provide for these functions. Both Germany and the United States have IA mechanisms in place that are summarized in Table 1 below. The general process and the content of these assessments are similar but certain variations exist as outlined by Köppel et al. [27].

The objective of this paper is to analyze and compare the IA regulations and processes in Germany and the United States and their potential in supporting an environmentally conscious development

* Corresponding author. Tel.: +49 30 314 73335; fax: +49 30 314 24831.
E-mail addresses: gesa.geissler@tu-berlin.de (G. Geißler), johann.koeppel@tu-berlin.de (J. Köppel), pam.gunther@amec.com (P. Gunther).

[1] Renewable energy sources' share in electricity generation in mid-2012 was 25% [5]. Wind energy supplied the largest share of the electricity generated from renewable energies (9.2%) with 29.3 GW of installed wind power capacity in mid-2012 [5]. Nearly all of the 22,515 installed wind turbines are located on land [6].

[2] In 2011, the share of electricity from renewable energies was 12.73% and wind provided about 2.9% of the total U.S. electricity demand [10]. This capacity of 49.8 GW has been provided by the over 43,000 turbines that were installed in the United States until mid-2012, all of these onshore [11].

[3] IA (Impact Assessment) will be used throughout the paper as general term for German SEA and EIA as well as for U.S. NEPA (EIS and PEIS) and state environmental impact review. For general introductions to IA refer to [24–26].

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Table 1
Policy setting of environmental impact assessment in Germany and the United States.

Setting	Germany	United States
Federal level		
Regulation	Environmental impact assessment act (EIA Act)	National environmental policy act (NEPA)
Strategic level procedure	Strategic environmental assessment (SEA)	NEPA programmatic environmental review
Documentation in case of full review	Environmental report	Programmatic environmental impact statement (PEIS)
Project level procedure	Environmental impact assessment (EIA)	NEPA project environmental review
Documentation in Case of Full Review	Environmental impact study (EIS)	Environmental impact statement (EIS)
Applicability	Projects and plans listed in Annex I & III EIA Act (including state and private actions)	Federal actions incl. actions receiving some federal funding
State level		
Regulation	EIA Act and state EIA Acts	State environmental policy acts (SEPAs) in 16 states[a]
Strategic Level Procedure	Equal to federal activities (above)	Depends on state regulation, varies amongst 16 states
Documentation in Case of Full Review		
Project Level Procedure		
Documentation in Case of Full Review		
Applicability	Equal to federal activities (above) and further projects, plans, and programs identified in state EIA Acts	Depends on state regulation, in general state actions in some cases, as well as local and private activities covered

[a] Another 20 states have environmental review regulations applying to certain project types or parts of the state varying to large extends [24].

of wind power generation. Considering climate change, renewable energies address a globalised public good (less carbon dioxide) but can result in environmental impacts as well (impacts on landscapes and wildlife etc.), as Nadai and van der Horst [28] claimed, for example. It is even more than "securing low carbon energy at acceptable environmental costs", as one of our reviewers addressed this challenge as well or the question, "what kind of greenness" (Nadai and van der Horst [28]) we want: from its very beginnings, public participation has been a constituting pillar of environmental assessments which entails at the same time fair access to information and involvement opportunities during wind energy permit decision-making. All stakeholders involved, last but not least the proponents as well, can expect transparent, well-structured and effective permission requiring process (i.e., respective good governance approaches). The latter implies that the tiering requirement from SEA/PEIS to EIA/EIS must facilitate that, on the project and local level, no dead end siting and the appropriate conduct of review processes occurs. Overall, we expect IA to thoroughly support the consideration of environmental and social concerns in decision-making on the one hand, and providing for transparent and inclusive processes in a manner that is, on the other hand, not imposing needless red tape on wind developers or neglecting climate benefits. Thus, our analysis focused on the following questions:

1. Does a comprehensive analysis of environmental consequences of wind farm projects and consideration of those in permitting processes take place? – Wind farms might have detrimental effect (e.g., on the avifauna if placed in unsuitable locations [cf. Altamont Pass, California]) which can be avoided or minimized by choosing less sensitive locations or by changing design, size or micro-siting of wind farms. The analysis of the likely environmental impacts of wind power projects provides for the information necessary to change the initial project and minimize negative impacts on the environment to allow implementation of the precautionary principle.
2. Does strategic level impact assessment (SEA & PEIS), considering environmental concerns early in planning for wind energy policies and site selection processes, take place? – Strategic level assessments in contrast to project level IA focus on the consideration of cumulative effects, which in the case of wind power development might occur due to the decentralized and rapid development in recent years. Additionally SEAs and PEISs contribute to the implementation of the precautionary principle by providing for a broader assessment of alternatives and helping develop the project level IA process. If environmental concerns are considered in SEAs and PEISs and the strategic site selection process, then sensitive sites can be ruled out [29–32].
3. Is transparent access to information and public involvement opportunities during IA and wind energy permit decision-making guaranteed? - Public involvement provides for several functions in IAs, first the public may inform the IA process with their specific knowledge leading to better quality of the assessment. Second, public participation in the process might lead to a better informed citizenry and, in some cases, to more acceptance of the final decision [33–40].
4. Are requirements and responsibilities for permission and IA processes in wind energy development clear and predictable? – Planning and permitting processes should balance the need for renewable energy generation with ecologic and social interests. For investors in wind energy projects, a certain degree of planning certainty regarding the process of obtaining a permit as well as the outcome of the process is necessary [41,42]. This includes the requirements for IA of proposals and their likely impacts.

For this analysis, a comparative policy and regulations analysis was conducted. The research is based on a review of relevant laws and regulations; policy, siting, and permitting documents; academic literature; and exploratory interviews. These interviews were conducted as in-depth semi-structured interviews in 2010 in the United States with representatives involved in renewable energy development from local, state, and federal agencies; industry; non-governmental organizations; and citizen groups. The interviewees were asked questions about the practice of wind power permission procedures, environmental review, and their perception of policies that supported and hindered factors for wind energy development. The information was also used to structure and focus further research.

Regarding German policies and permit requirements, the authors were able to also draw on own earlier work (predominantly Bruns et al. [3,43]). The information on supporting and hindering factors in German wind power development gathered through interviews and document analysis in these studies provided a basis for this article and was complemented regarding more recent developments.

With this paper we add to the ongoing discourse on the implementation of renewable energy policies and respective transatlantic comparisons that were conducted recently (for example Laird and Stefes [44], Bohn and Lant [45], Menz and Vachon [46], and Portman et al. [47]).

The paper is structured as follows. Sections 2 and 3 introduce the situation of environmental impact assessment in wind energy planning and permitting in Germany and the United States. Following we compare both countries (Section 4) and close in Section 5 with overall conclusions highlighting the main findings and identifying areas of further research.

2. Impact assessment in wind energy planning and permitting in Germany

2.1. Wind energy permission and impact assessment regime

Onshore[4] wind turbines in Germany are uniformly regulated by the Federal Pollution Control Act (*BImSchG*), which is implemented by state agencies (cf. Fig. 1). This permission process applies to all wind energy turbines taller than 50 m regardless of their location or the landownership or whether the investor is a private or public entity, and is carried out as a simplified permit (*vereinfachtes Verfahren*) without public involvement unless an EIA is required. The permit for a wind farm according to the Pollution Control Act concentrates all other necessary permits and approvals. This includes for example environmental regulations such as the IA requirements.

The EIA of wind farms is federally regulated in the EIA Act and requires an obligatory EIA for large projects with 20 turbines or more and a conditional EIA depending on the results of an initial screening process for projects with 3–19 turbines (cf. Fig. 1). Besides the environmental review as according to the EIA Act, requirements of the German Impact Mitigation Regulation (*Eingriffsregelung*)[5] and the EU Habitats Directive (Council Directive 92/43/EEC of 21 May 1992) and Birds Directive (Council Directive 79/409/EEC of 2 April 1979) must be considered. The latter two laws regulate the protection of habitats of common European interest constituting the network NATURA 2000, as well as the protection of certain species listed in the directives (species of Annex IV Habitats Directive and Article 1 Birds Directive).

2.2. Wind energy planning and strategic environmental assessment

In addition to the project level consideration of wind energy, the regional planning regime is concerned with spatial implications of this development [3,43]. A change of the planning regulations in 1998 introduced a new zoning category within the regional planning system which is referred to as "suitable area" (*Eignungsgebiet*) and by which wind energy use can be concentrated in certain areas. Once such specifically appointed suitable areas are designated in the spatial developments plans (regional or local comprehensive plans), in general no other sites can be claimed and requested for wind farm development [49]. These suitable areas are identified by a restriction analysis comparable to the following sequence: (1) mapping all categorical no-go areas (e.g. nature conservation areas, areas with high sensitivity of landscape scenery, forests, residential and industrial areas etc.) and buffer zones, (2) analysing wind potential of remaining sites, and (3) designating the remaining areas.

The criteria for no-go areas and buffer zones in detail differ from state to state in Germany but are comparable to the example above. Most states have enacted rules guiding these restriction analyses which must be followed by regional planning agencies.

The aforementioned spatial development plans must undergo an SEA, notwithstanding a subsequent EIA in the subsequent project approval process. However, the strategic IA for the wind energy suitable areas in practice is very limited, as during the designation process most environmentally sensitive or potentially conflicting areas have already categorically been ruled out (cf. restriction analysis above) and the environmental assessment mainly reiterates or refers to this process.

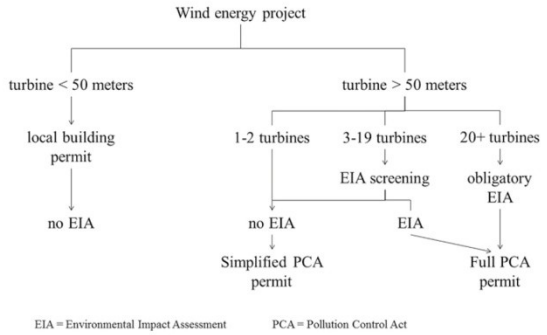

Fig. 1. Permission regime and IA for wind energy projects in Germany.

2.3. Public involvement in wind energy planning and permitting

During all EIAs and SEAs public participation is required to occur. This requirement is legally defined in the EIA Act and at least the opportunity for consultation and comment on the proposed project or plan and the accompanying environmental study must be granted. In practice, most projects and plans do not go beyond these formal requirements; thus the public becomes involved when the plan or project is in an advanced stage. For projects that do not require an EIA, or where the initial screening results in the finding that no full EIA is necessary (cf. Fig. 1), public participation is not formally required and thus rarely occurs.

3. Impact assessment in wind energy planning and permitting in the United States

3.1. Wind energy permitting and impact assessment regime

The approval procedures for wind farms differ widely among U.S. states. Permitting procedures for wind farms depend on the location of the wind farm and the type of land owner (cf. Fig. 2). Projects on federal lands[6] in general require right-of-way (ROW) or lease permits by the federal land management field office where the site would be located, whereas for projects located on state or private lands, state and/or locally regulated permission programs may apply. In California and nine other states,[7] local jurisdictions issue permits for wind farms (conditional use permits), while in West Virginia, a state agency (Public Service Commission), has sole authority to regulate wind projects. In Texas and six other states,[8] onshore wind energy projects require no permit at all (cf. Table 2). In other states, permission authority is split between state and local level depending on the size of the projects. For example, in Oregon large wind farms (>35 MW) are evaluated by the state

[4] We will omit offshore wind power here referring to Portman et al. [47] for respective U.S.–German comparisons.

[5] For further information on the German Impact Mitigation Regulation refer to Rundcrantz and Skärbäck [48].

[6] The Bureau of Land Management (BLM) alone manages 20.6 million acres (ca. 83,365 km^2) of land with favorable wind potential primarily located in the 12 Western states [66].

[7] Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Michigan, and Pennsylvania.

[8] Idaho, Mississippi, Missouri, Montana, Oklahoma, and South Carolina.

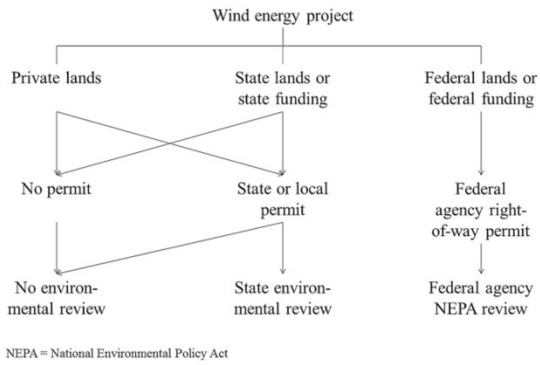

Fig. 2. Permission regime and IA for wind projects in the United States.

Energy Facility Siting Council, and smaller wind farms, in contrast, are evaluated by cities or counties. In total, 25 states have split responsibility for wind power siting between state and local government levels. The threshold for larger wind power projects, where permission authority may be delegated to state agencies, varies among states, from 5 MW in Ohio to 100 MW in Wisconsin. The wind energy permits by federal and state authorities do not include all other possible necessary permits, meaning that, in most cases, additional applications are needed. This is the case for most local, state, and federal level permission regimes unless there exists an explicit "one-stop-shopping" approach for wind power projects such as occurs, for example, in Washington or Oregon.

In the United States, the regulations for IAs vary from state to state and are dependent on the lead agency. While NEPA applies to all projects that require federal actions, for example, federal permits, which are required for projects realized on federal lands or lands with certain characteristics (e.g. presence of jurisdictional wetlands[9]) or with federal funding; projects on state or private lands are regulated according to state regulations (cf. Fig. 2). These differ from no state mandated EIS (e.g. in Texas), to a full environmental impact analysis similar to the NEPA process (e.g. California). The following Table 2 provides an overview of the respective state regulations. Besides NEPA or SEPA assessments, other federal regulations (such as the federal Endangered Species Act and state endangered species acts) exist in all states, except for five U.S. states [50]. In addition, the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act are relevant for most wind power projects as they prohibit harming and harassing these bird species. Mitigation measures may be necessary for incidental take of listed or protected species [51].

3.2. Wind energy planning and programmatic environmental impact statement

In addition to project level IA, some efforts for strategic level assessments of wind farms have occurred. In 2005, a Wind Programmatic Environmental Impact Statement (PEIS) was completed by the Bureau of Land Management (BLM), which assessed the impacts of a proposed comprehensive Wind Energy Development Program for wind energy projects on BLM lands. The PEIS established policies, best management practices, and minimum requirements for mitigation. Furthermore, the PEIS provided the framework for amending BLM resource management plans in 11 western U.S. states and identified suitable/unsuitable wind energy sites. Suitable sites are those economically viable where no conflicts with existing designations occur (e.g. wilderness designation). These sites may be restricted on a site-specific basis when a right-of-way application may be accepted or denied [53]. Similar PEISs are currently under development in Hawaii and the Great Plains.

On the local level, single examples exist, such as an early pioneering approach in Klickitat County, Washington that included the development of a PEIS for an amendment of the land use plan enabling wind power development [32]. However, as land use

Table 2
Wind energy development, IA regulations, wind permitting authority and renewable energy policies on state level.

State[a]	Installed wind capacity at the end of 2010 (MW) [52]	State environmental review regulations applicable to wind power projects[b]	Permitting authority for wind power projects
Alaska (AK)	9	No regulation	split
Arizona (AZ)	128	Non-SEPA regulations	split
Arkansas (AR)	0	No regulation	split
California (CA)	3177	SEPA	local
Colorado (CO)	1299	Non-SEPA regulations	split
Hawaii (HI)	63	SEPA	local
Idaho (ID)	353	No regulation	unregulated
Illinois (IL)	2046	Non-SEPA regulations	local
Indiana (IN)	1339	No regulation	local
Iowa (IA)	3675	No regulation	split
Kansas (KS)	1074	No regulation	local
Maine (ME)	266	Non-SEPA regulations	split
Maryland (MD)	70	Non-SEPA regulations	split
Massachusetts (MA)	18	SEPA (state)	split
Michigan (MI)	164	No regulation	local
Minnesota (MN)	2192	SEPA	split
Missouri (MO)	457	No regulation	unregulated
Montana (MT)	386	No regulation	unregulated
Nebraska (NE)	213	No regulation	split
Nevada (NV)	0	No regulation	split
New Hampshire (NH)	26	Non-SEPA regulations	split
New Mexico (NM)	700	No regulation	split
New York (NY)	1275	SEPA	split
North Carolina (NC)	0	SEPA (state)	split
North Dakota (ND)	1424	No regulation	split
Ohio (OH)	11	Non-SEPA regulations	split
Oklahoma (OK)	1482	No regulation	unregulated
Oregon (OR)	2104	Non-SEPA regulations	split
Pennsylvania (PA)	748	No regulation	local
South Dakota (SD)	709	SEPA (state)	split
Texas (TX)	10,085	No regulation	unregulated
Utah (UT)	223	No regulation	unregulated
Vermont (VT)	6	Non-SEPA regulations	state
Virginia (VA)	0	Non-SEPA regulations	split
Washington (WA)	2104	SEPA	split
West Virginia (WV)	431	Non-SEPA regulations	state
Wisconsin (WI)	469	SEPA (state)	split
Wyoming (WY)	1412	Non-SEPA regulations	split

[a] states with no or very little technical potential for producing wind energy have been omitted (Alabama, Connecticut, Delaware, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Jersey, Rhode Island, South Carolina, Tennessee).

[b] the states have been categorized as: SEPA – states having an environmental review process modeled after NEPA, which applies to permits that are needed for wind power projects; SEPA (state) – states having an environmental review process modeled after NEPA, which only applies to state permits for wind power projects; non-SEPA-regulations – states having regulations in place requiring consideration of environmental concerns in permitting of wind farms but are less formalized and comprehensive than SEPAs (mandatory requirement to provide pre-construction avian, bird, wildlife studies, requirement to receive certificate of environmental compatibility and/or inclusion of environmental issues in permit, requirement of formal consultation with state natural resource or environmental department), and no regulations - states requiring no consideration of environmental concerns for wind power projects at all including voluntary approaches.

[9] For the alteration of jurisdictional wetlands a permit from the US Army Corps of Engineers is required which is a federal action and triggers a NEPA environmental review.

planning is a task of the local level (cities and counties) and only four states have SEPAs applicable to local actions (California, Hawaii, New York, Washington), PEISs comparable to the one in Klickitat will remain limited.

3.3. Public involvement in wind energy planning and permitting

In the case of NEPA or SEPAs, public involvement in planning and siting of wind farms is almost guaranteed. The public is regarded as anyone interested in the proposal including individuals, non-governmental organizations etc. As the states differ in their legislation for wind development, the extent of public participation differs and some states exist, such as Texas, where there is no requirement to inform adjacent land owners about proposed wind energy projects, regardless of their size and impact.

4. Comparative analysis and discussion

In the following, we discuss the German and U.S. approaches on wind energy permitting and impact assessment procedures with regard to their potential contribution to balanced and environmentally compatible wind power development. Table 3 provides for a summary of the four criteria analyzed in detail.

4.1. Comprehensive analysis of environmental consequences of wind farm projects

In Germany, the EIA regulations assure that, for all wind energy projects likely having significant environmental impacts, these impacts will be identified, evaluated, and considered in the decision-making process. Although smaller wind farms with less than 20 turbines do not outright have to undergo an EIA, the requirement to screen whether significant impacts could occur ensures that those projects with significant impacts will still include an analysis of the impacts.

In the United States the situation is different. First, there is no positive list of wind power projects regularly requiring a full environmental review under NEPA or state regulations and screening will always need to be carried out to determine the need for a full EIS. Furthermore, for wind power projects not requiring any type of federal action (e.g. permit), the assessment of the environmental consequences depends on the state regulations which results in the possibility that, in many cases, no impact assessment will occur (cf. Table 2). Thus, for the United States, it is not ensured by the regulations that, in the decision making on wind projects, significant environmental impacts will in all cases be identified and considered.

The potential of the EIS process in supporting a sustainable development of wind energy is, thus, quite limited in many parts of the United States compared to Germany. However, further research would be valuable in analyzing the practice of wind power development in those states lacking formalized IA regulations in order to see whether due to other, non-regulatory requirements, environmental concerns are still considered. If, for example, financial institutions or other investors base their decision upon proof of environmental conscientious planning, then development of wind projects and consideration of environmental impacts could still occur without being formally regulated, which has been alluded by one interview partner in the United States.

4.2. Strategic level consideration of environmental concerns in wind energy plan, program, policy making

The benefits that strategic level planning and impact assessment can provide have been in limited use for wind power development in Germany and the United States. Both countries require strategic level impact assessment of plans and programs and, in the United States, policies fall under NEPA and some states IA requirements. However, application and relevance of PEISs to wind development in the United States is limited to federal policies, such as the BLM Wind PEIS for federal lands in the western United States and a few local wind power planning efforts depending on the state and local IA and land use planning regulations. In many states without any IA regulations (cf. Table 2) but with high levels of wind energy development (such as Texas or Iowa), no strategic assessment of environmental consequences of wind power development takes place and cumulative effects from this development are not considered. Stemmer [54] coming to similar conclusions recommends a state level siting process for wind power improving the consideration of impacts beyond the immediate wind power development site, thus considering cumulative effects.

Table 3
Summary of comparison of German and U.S. impact assessment regulations for wind energy.

Germany	USA
1. Comprehensive analysis of environmental consequences of wind farm projects	
• for all wind farms ≥20 turbines full impact assessment	• for all projects with federal permits screening & depending on results full assessment or not
• for all wind farms with 3–19 turbines screening & depending on results full assessment or not	• for all other projects state regulations vary: –17 have no EIA regulations –5 have NEPA-like standards, –4 have NEPA-like standards for state permits –12 have non-NEPA-like regulations (less formalized)
2. Strategic level consideration of environmental concerns in wind energy plan, program, policy making	
• all federal, state, regional and local land-use plans undergo SEA	• all federal plans, programs, policies undergo PEIS
• no policy level SEA (energy concept, funding schemes)	• state & local plans, programs, policies undergo strategic impact assessment depending on state regulations (only 4 states with SEPAs applicable to local land use plans)
3. Public involvement during wind energy permit and IA	
• for all wind farms ≥20 turbines mandatory public consultations	• for all projects with federal permits if screening leads to full impact assessment public consultations
• for all wind farms with 3–19 turbines public consultations if screening leads to full EIA	• for all other projects public involvement depending on state regulations
• no public involvement in screening & scoping	• public involvement in most cases already in screening & scoping
4. Clear and predictable requirements and responsibilities in permission and IA process	
• uniform EIA regulations in the whole country (process, content)	• various & differing impact assessment regulations (states, federal), sometime applying parallel
• for all wind farms ≥ 3 turbines streamlined one-stop shop permit	• for all projects with federal permits various processes, no concentrated permit
• for whole country strategic (regional) level designation of suitable/unsuitable wind areas	• for federal lands and few states strategic level designation of suitable/unsuitable wind areas

In Germany, the formal potency of the SEA is important and, comparable to the EIA, uniformly required by the federal EIA Act and applies to all local, regional, and state land use plans. In particular, regional plans have had a large impact on the development of wind farms as being required by federal regulations to designate certain suitable areas for wind energy while excluding others [49]. The relevance of the SEA for regional plans in practice, however, is comparably low as during the process of designating the suitable wind sites, most environmental concerns and potentially conflicting areas are already excluded for wind use. As a result, the SEAs in general only refer to the subsequent project approval process for more detailed analyses. However, the SEAs still offer some benefits to the subsequent project level as the EIA can tier off the earlier inventories and assessments.

As a SEA in Germany is only required for binding plans and programs but not for policies (renewable), energy policies such as the federal Energy Concept of September 2010 [55] have not been assessed for their impacts on environmental resources to date, which is a deficit as the highest tier of decision making is not subject to the impact assessment system.

4.3. Providing public involvement opportunities during permission and IA

In Germany, all states must apply IA regulations and allow for public participation in wind power siting cases when significant impacts are likely and an IA must be conducted (Table 3). In the United States, only those seven states having SEPA approaches, as well as projects under the federal NEPA, benefit from these formalized requirements for public involvement and disclosure of impact studies. In contrast, in U.S. states without any permitting regime and required consideration of environmental issues (e.g. Texas), no venue for citizens to become involved or even informed exists. Swofford and Slattery [56] state for the case of Texas that more public participation in wind energy planning will likely be needed in the future with local opposition already growing [57]. In the majority of U.S. states, the requirement for public involvement depends on the specific (local) permit regulations and varies considerably. A need for improvement of public participation mechanisms in these states without NEPA-like processes has been stated before by Ma et al. [24] who analyzed state environmental review regulations, and as well by Stemmer [54].

The opportunity for early involvement on a strategic level in Germany is underachieved as on the highest decision making tier (policies, concepts), no SEA and public involvement is required and, in SEAs for regional plans, little efforts are made to actively involve the public. As a result, participation levels are generally low. As strategic level IA and planning for wind power in the United States occurs only in few places, overall similar to Germany, the specific benefits associated with public involvement in SEAs as providing opportunity for social and institutional learning or the exchange of knowledge amongst stakeholders as pointed out by Eales and Sheate [58] cannot be realized in most situations.

The scope of public participation approaches in the United States is, in general, remarkably broader than in the German EIA/SEA processes and, in general, involvement starts significantly earlier in the process. The tradition of public participation in German planning and project permitting does not go far beyond formal consultation on ready-made plans, which was stated by Agterbosch and Breukers (2008) for the German state of North Rhine-Westphalia [59]. With proposed legislation introducing rules that agencies shall promote the use of early public participation even before the formal permitting process starts, the German legislator in early 2012 tried to react to accelerating criticism of the current practice of public involvement (draft Gesetz zur Verbesserung der Öffentlichkeitsbeteiligung und Vereinheitlichung von Planfeststellungsverfahren of February 2012). However, the adoption of the regulations is not scheduled yet, and the rules would only promote early involvement on a voluntary basis but would not impose any mandatory steps.

In the United States, the broad public involvement opportunities, in cases where SEPAs or NEPA apply, provide for early hearings at the beginning of the EIS process allowing for comments from any interested person or organization on the scope of the assessments. Public involvement is continued throughout the process with proposal review, comment phases, and additional hearings. These opportunities are well designed to take into consideration community concerns and issues. However, they are, in some situations, also prone to misuse by individuals and corporate interests trying to delay and hamper the realization of renewable energy projects. Reports on attempts from a labor union in California to use the EIS process to pressure developers to sign contracts with the union are examples for abuse of these involvement opportunities [60,61].

4.4. Clear and predictable requirements for permission and IA processes

In Germany, the permission process and the EIA are regulated by federal acts that apply uniformly in all regions. Developers, thus, can predict the process and the requirements that will be required. However, the legal regulations do not provide for clear guidance regarding the substantial requirements, such as thresholds, models or methods of assessment (Table 3). This is, as well, not provided in non-regulatory guidelines so far. As one measure to facilitate timely wind permitting, since 2011 a specific working group with members of the federal level environmental ministry and all state ministries (Bund-Länder-Initiative Windenergie) is working on the identification and solution of wind power permitting hurdles including the harmonization of varying standards for wind power projects in the German states [62].

The requirements for permissions and the consideration of environmental concerns a wind developer must comply within the United States vary considerably among states and often even between local jurisdictions within a state. In most cases, ownership and natural state of the land on which the wind farm is planned are important to determine whether NEPA applies or not, and SEPAs can require EISs for governmental (state and local) actions that includes permits for wind energy projects but large variations among states exist and, of the 16 states having a SEPA, only in five states do these regulations apply to wind power projects (cf. Table 2).

The situation in the United States might resemble the case of Spain where Iglesias et al. [42] found large variations among regions in treatment of wind power permits. They thus recommend increasing homogeneity of authorization procedures for wind projects among regions to reduce costs for investors and support wind energy deployment.

Several authors pointed to the importance of reliable information on the regulatory authority for the realization of wind power projects and highlighted the benefits of “one-stop” permit processes with one responsible agency and a concentrated permit encompassing all required approvals (Portman et al. [47], Feiock and Stream [63], Bohn and Lant [45], Dhanju and Firestone [64], TRC [65]). With the German Pollution Control Act permit for wind farms, such an all-encompassing regulatory process that concentrates all necessary permits and the EIA into one process without compromising environmental standards is given. In contrast, only few U.S. states provide for such streamlined permission processes. The federal level permitting also requires a variety of individual

permits. Furthermore, the permitting authority varies considerably amongst the U.S. states with many states delegating authority to the local level. Stemmer [54] compared the benefits and drawbacks of U.S. local, state, and federal wind siting authority and concluded that the local level is least suitable for guaranteeing appropriate wind power permission success as staff is, in general, less trained and professionalized and has fewer resources and experience than on state the level.

One further relevant aspect of wind power development that can impact the success of and time required for permitting is the choice of the site for the wind power project. A proposal on a site bearing sensitive or valuable environmental features will have more difficulties in securing a permit than a proposal on a less sensitive site. Therefore, the information on generally suitable and unsuitable sites can improve the site selection process of wind developers and ease project permitting.

The strategic level designation of wind power sites in regional land use plans, considering their environmental impacts already on the strategic level, can have such a guiding role for developers. Thus, the German practice of regional level wind power planning, combined with SEAs, can provide valuable benefits for the balancing of developing low carbon energy options through wind farms and the avoidance of environmental impacts of core sensitive environmental features. In the United States, such strategic planning and environmental impact assessment only occurs in few places and, thus, is less apt in providing guidance for wind power sites selection.

5. Conclusions

The regulatory assessment of the German and the U.S. impact assessment and permitting system revealed certain differences with regard to the potential of supporting a balanced and environmentally compatible development of wind power generation. Both countries provide for processes intended to promote consideration of environmental interests in decision making for wind power.

The comparison revealed that the regulatory conditions on IA and wind power permitting in Germany are likely better prepared in providing the means to develop low carbon energy options in an environmentally benign approach. This is, in particular, achieved by the systematically tiered approach with strategic level planning and subsequent project approval for wind power projects. The U.S. system shows great variation among the federal and the state levels and among the states with comparable situations to Germany in some few places. However, in many regions, there is little guidance regarding regulatory provisions on EIA and SEA. Overall, this leads to the conclusion that, in comparison, the U.S. regulations are less prepared for balancing carbon reduction activities with overall environmental conservation.

However, our comparative regulatory assessment left out the question of the practical implementation of EIA/EIS and SEA/PEIS in wind power cases for both the United States and Germany. The analysis of how the IA process in practice is used to manage the balance of achieving conflicting environmental goals (low carbon energy generation and environmental conservation) and whether the IA outcomes actually influences decision-making and leads to a more balanced decision would be in particular informative. Such efforts should include monitoring the effects of strategic level impact assessment approaches and their effectiveness in supporting wind power development by providing guidance for the project level. Furthermore, as outlined before, the analysis of voluntary and not formally regulated environmental assessment approaches should be addressed as well. Further research in this field is warranted.

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References

[1] Ohlhorst D, Bruns E, Schön S, Köppel J. Windenergieboom in Deutschland: Eine Erfolgsstory. In: Bechberger M, Mez L, Sohre A, editors. Windenergie im Ländervergleich: Steuerungsimpulse, Akteure und technische Entwicklungen in Deutschland, Dänemark, Spanien und Großbritannien. Frankfurt am Main: Peter Lang Publishing; 2008. p. 5–60.
[2] Büsgen U, Dürrschmidt W. The expansion of electricity generation from renewable energies in Germany - a review based on the renewable energy sources act progress report 2007 and the new German feed-in legislation. Energ Policy 2009;37:2536–45.
[3] Bruns E, Ohlhorst D, Wenzel B, Köppel J. Renewable energies in Germany's electricity market. A biography of the innovation process. Heidelberg: Springer Verlag; 2010.
[4] Merkel A. Der Weg zur Energie der Zukunft. Regierungserklärung von Bundeskanzlerin Angela Merkel zur Energiepolitik am 09.06.2011. http://www.bundesregierung.de/Content/DE/Regierungserklaerung/2011/2011-06-09-merkel-energie-zukunft.html; 2011 [accessed 6 12 2011].
[5] BDEW (Bundesverband der Energie- und Wasserwirtschaft e.V.), Erneuerbare Energien liefern mehr als ein Viertel des Stroms. http://www.bdew.de/internet.nsf/id/20120726-pi-erneuerbare-energien-liefern-mehr-als-ein-viertel-des-stroms-de; 2012 [accessed 8 08 2012].
[6] Fraunhofer IWES. Windmonitor. Installierte Windleistung in Deutschland. http://windmonitor.iwes.fraunhofer.de/windwebdad/www_reisi_page_new.show_page?page_nr=363&lang=de; 2012 [accessed 1 08 2012].
[7] Espey S. Renewables portfolio standard: a means for trade with electricity from renewable energy sources? Energ Policy 2001;29:557–66.
[8] Rabe BG. Race to the Top: the Expanding role of U.S. State renewable portfolio standards. Arlington, VA, U.S: PEW Center on Global Climate Change; 2006.
[9] Rahm D. Renewable energy in Texas: the role of the renewables portfolio standard. In: Rahm D, editor. Sustainable energy and states. Essays on politics, markets and leadership. North Carolina and London: MacFarland & Company, Jefferson; 2006.
[10] REN21. Renewables 2012. Global status report. http://www.map.ren21.net/GSR/GSR2012_low.pdf; 2012 [accessed 8 08 2012].
[11] The wind power. wind energy data for USA. http://www.thewindpower.net/country-datasheet-zones-4-usa.php; 2012 [accessed 8 08 2012].
[12] Dincer I. Renewable energy and sustainable development: a crucial review. Renew Sust Energ Rev 2000;4:157–75.
[13] Bagliani M, Dansero E, Puttilli M. Territory and energy sustainability: the challenge of renewable energy sources. J Environ Plann Man 2010;53:457–72.
[14] Bishop ID. Determination of thresholds of visual impact: the case of wind turbines. Environ Plan B-Planning Des 2002;29:707–18.
[15] Krause CL. Our visual landscape: managing the landscape under special consideration of visual aspects. Landscape Urban Plan 2001;54:239–54.
[16] Möller B. Changing wind-power landscapes: regional assessment of visual impact on land use and population in Northern Jutland, Denmark. Appl Energ 2006;83:477–94.
[17] Hau E. Wind turbines. Fundamentals, technology, application, economics. Heidelberg: Springer Verlag; 2006.
[18] Rogers AL, Manwell JF, Wright S. Wind turbine acoustic noise - A white paper. Renewable energy research laboratory. University of Massachusetts at Amherst http://www.ceere.org/rerl/publications/whitepapers/Wind_Turbine_Acoustic_Noise_Rev2006.pdf; 2006 [accessed 6 12 2011]
[19] Bright J, Langston R, Bullman R, Evans R, Gardener S, Pearce-Higgins J. Map of bird sensitivities to wind farms in Scotland: a tool to aid planning and conservation. Biol Conserv 2008;141:2342–56.
[20] Hötker H., Thomsen K-H., Jeromin H., Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. http://www.batsandwind.org/pdf/impacts%20on%20biodiversity%20of%20renewable%20energy.pdf; 2006 [accessed 6 12 2011].
[21] Johnson GD, Perlik MK, Erickson WP, Strickland MD. Bat activity, composition, and collision mortality at a large wind plant in Minnesota. Wildl Soc Bull 2004;32:1278–88.
[22] Köller J, Köppel J, Peters W, editors. Offshore wind energy - Research on environmental impacts. Heidelberg: Springer Verlag; 2006.
[23] Mautz R. Konflikte um die offshore-windkraftnutzung - eine neue Konstellation der gesellschaftlichen Auseinandersetzung um Ökologie. In: Feindt PH, Saretzki T, editors. Umwelt- und Technikkonflikte. Wiesbaden: VS Verlag für Sozialwissenschaften; 2010. p. 181–97.
[24] Ma Z, Becker DR, Kilgore MA. Characterising the landscape of state environmental review policies and procedures in the United States: a national assessment. J Environ Plann Man 2009;52(8):1035–51.

[25] Wood C. Environmental impact assessment: a comparative review. 2nd ed. Essex: Pearson Education Limited; 2003.
[26] Köppel J, Peters W, Wende W. Eingriffsregelung, Umweltverträglichkeitsprüfung, FFH-Verträglichkeitsprüfung. Stuttgart: Ulmer; 2004.
[27] Köppel J., Geißler G., Helfrich J., Reisert J. A snapshot of Germany's EIA approach in light of the United States archetype. J Environ Assess Policy Manage (in press).
[28] Nadai A, van der Horst D. Wind power planning, landscapes and publics. Editorial. Land Use Policy 2010;27:181–4.
[29] Jay S. Planners to the rescue: spatial planning facilitating the development of offshore wind energy. Mar Pollut Bull 2010;60:493–9.
[30] Jay S. Strategic environmental assessment for energy production. Energ Policy 2010;38:3489–97.
[31] Bérubé GG, Cusson C. The environmental legal and regulatory frameworks. Assessing fairness and efficiency. Energ Policy 2002;30:1291–8.
[32] Hirokawa KH, Wilson AB. Local planning for wind power: using programmatic environmental impact review to facilitate development. Zoning Plan Law Rep 2010;33:1–10.
[33] Agterbosch S, Meertens RM, Vermeulen WJV. The relative importance of social and institutional conditions in the planning of wind power projects. Renew Sust Energ Rev 2009;13:393–405.
[34] Breukers S, Wolsink M. Wind power implementation in changing institutional landscapes: an international comparison. Energ Policy 2007;35:2737–50.
[35] Firestone J, Kempton W. Public opinion about large offshore wind power: underlying factors. Energ Policy 2007;35:1584–98.
[36] Gross C. Community perspectives of wind energy in Australia: the application of a justice and community fairness framework to increase social acceptance. Energ Policy 2007;35:2727–36.
[37] Wolsink M. Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'. Renew Sust Energ Rev 2007; 11:1188–207.
[38] Haggett C. Understanding public responses to offshore wind power. Energ Policy 2011;39:503–10.
[39] Wolsink M. Near-shore wind power - protected seascapes, environmentalists' attitudes, and the technocratic planning perspective. Land Use Policy 2010; 27:195–203.
[40] Firestone J, Kempton W, Krueger A. Public acceptance of offshore wind power projects in the USA. Wind Energ 2009;12:183–202.
[41] Lüthi S, Prässler T. Analyzing policy support instruments and regulatory risk factors for wind energy deployment - a developers' perspective. Energ Policy 2011;39:4876–92.
[42] Iglesias G, del Río P, Dopico JÁ. Policy analysis of authorisation procedures for wind energy deployment in Spain. Energ Policy 2011;39:4067–76.
[43] Bruns E, Ohlhorst D, Schön S, Köppel J. Die Innovationsbiographie der Windenergie. Berlin: Lit Verlag; 2008.
[44] Laird FN, Stefes C. The diverging paths of German and United States policies for renewable energy: sources of difference. Energ Policy 2009;37:2619–29.
[45] Bohn C, Lant C. Welcoming the wind? Determinants of wind power development among U.S. States. Prof Geogr 2009;61(1):87–100.
[46] Menz FC, Vachon S. The effectiveness of different policy regimes for promoting wind power: experiences from the states. Energ Policy 2006;34:1786–96.
[47] Portman ME, Duff JA, Köppel J, Reisert J, Higgins ME. Offshore wind energy development in the exclusive economic zone: legal and policy supports and impediments in Germany and the US. Energ Policy 2009;37:3596–607.
[48] Rundcrantz K, Skärbäck E. Environmental compensation in planning: a review of five different countries with major emphasis on the German system. Eur Environ 2003;13:204–26.
[49] Ohl C, Eichhorn M. The mismatch between regional spatial planning for wind power development in Germany and national eligibility criteria for feed-in tariffs - A case study in West Saxony. Land Use Policy 2010;27:243–54.
[50] George S, Snape WJ. State endangered species acts. In: Baur DC, Irvin WR, editors. Endangered species act: law, policy, and perspective. Chicago: American Bar Association Section of Environment Energy and Resources; 2010. p. 344–59.
[51] McKinsey JA. Regulating avian impacts under the migratory bird treaty act and other laws: the wind industry collides with one of its own, the environmental protection movement. Energy Law J 2007;28:71–92.
[52] AWEA (American Wind Energy Association), U.S. wind industry annual market report – year ending 2009. http://www2.grist.org/pdf/AWEA.pdf; 2010 [accessed 6 12 2011].
[53] BLM (Bureau of Land Management), Record of decision: implementation of a wind energy development program and associated land use plan Amendments. http://windeis.anl.gov/documents/docs/WindPEISROD.pdf; 2005 [accessed 6 12 2010].
[54] Stemmer O. Clearing the air: a comparison of regulatory frameworks for siting wind farms. George Wash J Energy Environ Law 2011;3(1):85–97.
[55] BMWI & BMU (Bundesministerium für Wirtschaft und Technologie & Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit), Energiekonzept für eine umweltschonende, zuverlässige und bezahlbare Energieversorgung. http://www.bmu.de/files/pdfs/allgemein/application/pdf/energiekonzept_bundesregierung.pdf; 2010 [accessed 6 12 2011].
[56] Swofford J, Slattery M. Public attitudes of wind energy in Texas: local communities in close proximity to wind farms and their effect on decision-making. Energ Policy 2010;38:2508–19.
[57] Graham TL, Hudak PF. Potential hazards of wind energy for rare, threatened, and endangered birds and bats in Texas. Int J Environ Res 2011;5(4): 917–22.
[58] Eales RP, Sheate WR. Effectiveness of policy level environmental and sustainability assessment: challenges and lessons from recent practice. J Environ Assess Policy Manage 2011;13(1):39–65.
[59] Agterbosch S, Breukers S. Socio-political embedding of onshore wind power in the Netherlands and North Rhine–Westphalia. Technol Anal Strateg 2008;20: 633–48.
[60] Lifsher M. Labor coalition's tactics on renewable energy projects are criticized. Los Angeles Times February 2011;5.
[61] Woody T. A move to put the union label on solar power plants. The New York Times June 2009;19.
[62] BMU (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit), deBund-Länder-Initiative Windenergie (BLWE), http://www.erneuerbare-energien.de/erneuerbare_energien/windenergie/blwe/doc/47936.php; 2012 [accessed 2 07 2012].
[63] Feiock RC, Stream C. Environmental protection versus economic development: a false trade-off? Public Admin Rev 2001;61:313–21.
[64] Dhanju A, Firestone J. Access system framework for regulating offshore wind power in state waters. Coast Manage 2009;37:441–78.
[65] TRC (Noble & Wickersham LLP, Megdal & Associates), Renewable energy siting study. Prepared for executive office of energy & environmental affairs, Boston, MA. http://www.mass.gov/eea/docs/doer/renewables/wind/wind-siting-study-04-15-09.pdf; 2009 [accessed 6 12 2011].
[66] BLM (Bureau of Land Management) 2009. Renewable Energy and the BLM: Wind. http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy.Par.58306.File.dat/09factsheetmap_Wind.pdf [accessed 28 September 2012].

Chapter V
Strategic Environmental Assessment in Renewable Energy Diffusion in the US and Germany[15]

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STRATEGIC ENVIRONMENTAL ASSESSMENTS FOR RENEWABLE ENERGY DEVELOPMENT — COMPARING THE UNITED STATES AND GERMANY

GESA GEIßLER

Environmental Assessment and Planning Research Group
Technische Universität Berlin
Sekr. EB 5 Straße des 17. Juni 145 10623 Berlin, Germany
gesa.geissler@tu-berlin.de

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Germany and the United States are amongst the leading countries regarding installed renewable energy capacity and are steadily adding new facilities. As balancing the strive for a low carbon energy supply with other environmental interests, such as biodiversity conservation, becomes more prevalent with increasing numbers of wind, solar, biomass, geothermal, and hydro-power facilities, the call for a strategic-level consideration of environmental impacts (SEA) becomes louder. The paper compares the practice of SEAs for renewable energy plans, programmes, and policies in terms of discussion of alternatives, consideration of cumulative effects, and public involvement. A case study analysis compares SEAs from Germany and the United States and evaluates their performance.

Results indicate large differences between both countries, with Germany performing less well on average. Therefore, a strong need for improvement becomes obvious. A general conclusion is that both countries need to become more open to strategic assessment of environmental impacts from renewable energy policies, strategies, and legislation (policy SEA), in order to allow for meaningful assessment of alternatives and achieve an environmentally sound low carbon future.

Keywords: Strategic environmental assessment; programmatic environmental impact statement; renewable energy development.

Introduction

Worldwide, Germany and the United States of America are amongst the leading five countries regarding installed renewable energy capacity (REN21, 2012). Germany reached a share of more than 25% of renewable electricity generation in mid-2012 (BDEW, 2012), while in the US almost 13% of the electricity was produced from renewable sources (EIA, 2012). Both nations are steadily expanding their renewable energy basis and building new facilities to meet their renewable energy goals (REN21, 2012). With the rapid growth of large-scale solar, wind, geothermal, and biomass energy generation facilities, the environmental consequences of this development come to the fore in both countries (Blood, 2010; Defenders of Wildlife *et al.*, 2009; Maloney, 2008; Woody, 2010). Decentralised energy generation such as wind farms or solar plants, although beneficial for climate protection, can result in unavoidable impacts on other natural resources (Bagliani *et al.*, 2010; Chiabrando *et al.*, 2009; Johnson *et al.*, 2004; Köller *et al.*, 2006; Leitner, 2009; Tsoutsos *et al.*, 2005). As a means of consideration of environmental effects of renewable energy expansion, both the US and Germany employ impact assessments. With the increase of existing and planned renewable energy generation facilities in both countries, the call for strategic-level impact assessments becomes louder; in particular as cumulative effects of many individual projects need to be considered to ensure a sustainable development of renewables (Stemmer, 2011; Jay, 2010). Strategic Environmental Assessment (SEA) carried out for plans, programmes, and policies provides the opportunity for such cumulative impact assessment (Athanas and McCormick, 2013; Canter, 1999; Dalal-Clayton and Sadler, 2005) and furthermore allows for a broader discussion of alternative actions (Athanas and McCormick, 2013) and earlier public involvement in decision making (Eales and Sheate, 2011) than impact assessment on the project level.

SEA is defined by Dalal-Clayton and Sadler (2005) as a "process for identifying and addressing the environmental (and also, increasingly, the associated social and economic) dimensions, effects and consequences of PPP [policies, plans, and programmes, added by author] and other high-level initiatives. This process should be made, when major alternatives are open".

While the US has since the adoption of the US National Environmental Policy Act (NEPA) in 1969 long experience with impact assessments as well on the strategic level, strategic environmental assessment of plans and programmes in Germany has been codified only in 2004/2005 (Köppel *et al.*, 2012). NEPA was the first regulation requiring the assessment of environmental consequences of proposed actions, which included strategic-level actions from the beginning. Although not specifically mentioned in the statute, the "Programmatic Environmental

Impact Statement" (PEIS) became the tool for analysing the impacts of programmes, plans, and policies (Clark *et al.*, 2011). The US NEPA has subsequently been the model for other environmental assessment legislations, including the European regulations (Busch and Jörgens, 2005; Clark *et al.*, 2011).

The aim of the paper is to analyse how Germany and the US perform in assessing environmental impacts of renewable energy deployment on strategic levels. It is assumed that in particular Germany with an already high per capita renewable energy generation capacity, limited availability of space, and likely competition between land uses, might be seizing the benefits of early and strategic consideration of impacts of additional renewable energy deployment. On the other hand, the US, having its long experience with environmental assessments, might prove particularly apt in applying PEISs to renewable energy development as well. Therefore, both countries are expected to perform rather well in strategic impact assessments on renewable energy plans, programmes, and policies.

While there are a number of international publications describing and comparing different SEA systems internationally, some also considering the German and the US approaches (Thérivel, 1993; Chaker *et al.*, 2006; Jones *et al.*, 2005; Dalal-Clayton and Sadler, 2005), these, however, mainly focus on the legal regulations and less on practical experience. Furthermore, in the case of Germany, they were mostly published before or shortly after the implementation of the formal SEA system in 2005, when little to no practical experience with formal SEA in Germany existed. There has been no comprehensive study on SEA practice and effectiveness in Germany.[1] Moreover, there generally have been few international, English-speaking publications on SEA in Germany (exemptions are Weiland, 2010; Fischer, 2005; Wende *et al.*, 2004).

In the US, only few studies have been published on PEIS (Slotterback, 2009) with Sigal and Webb (1989) and Cooper (1993) providing some early overview and experience with PEIS up to the late 1980s. In the 1990s and 2000s, reports on the general efficiency of the NEPA considered the PEIS as well, however only briefly and not explicitly (CEQ, 1997b; The NEPA Task Force, 2003). Recently, Houck (2009) as well as Clark *et al.* (2011) have analysed PEIS practice in the US, pointing to certain deficits, including the limited use of strategic impact assessment by many federal agencies.

Generally SEAs for energy generation have been scant so far, as pointed out by Jay (2010) and Athanas and McCormick (2013). The analysis of SEA practice

[1] A study on the effectiveness of the EIA Act published in 2008 exclusively focused on the project-level EIA, omitting the SEA (Führ *et al.*, 2008).

related to renewable energy development has been consequently limited to few studies (e.g. Josimović and Pucar, 2010).

The paper starts with a brief description of the regulations for SEA in Germany and the US, which is followed by the elaboration of the research approach and methodology employed for the empirical analysis of renewable energy SEA and PEIS cases. Afterwards, the results of the case study analysis are presented. The following discussion of findings will lead to final conclusions and an outlook to further research needs.

Background on Strategic Level Impact Assessment Regulations

Germany

In Germany, the formal requirement to conduct SEAs was established with the implementation of the European SEA-Directive[2] in 2004 by amending the building act (*BauGB*), regulating local land use planning, and 2005 by amending the Federal Environmental Impact Assessment Act (EIA Act). The EIA Act was first adopted in 1992, establishing the system of project-level EIA in Germany and was supplemented with the regulations on SEA in its Section 3. The majority of states (*Länder*) in Germany have adopted additional state EIA Acts complementing the federal law.

In general, a SEA is required only for plans and programmes (1) developed or amended by a governmental agency or the government itself and (2) which are required by federal law. Exempted from this are budget, financial, defense, and emergency management plans and programmes. SEA of plans and programmes adopted according to state regulations is regulated by state EIA Acts but will not be detailed here.

The federal EIA Act specifies that a SEA is required for plans and programmes that are listed in its Annex III. Plans and programmes under Section 1 of this annex always require a SEA if significant environmental impacts are expected. In contrast, plans and programmes listed under Section 2 of Annex III only require a SEA if they set the frame for actions requiring a project-level EIA pursuant to the EIA Act (cf. Table 1). This will be determined during the screening.

Except for the designation of offshore wind sites in the German Exclusive Economic Zone (EEZ), no renewable energy plans or programmes and energy plans in general are listed in the EIA Act as requiring a SEA. One reason for this situation is that no formal (renewable) energy plans or programmes are developed

[2]Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment.

Table 1. Plans and programmes requiring a SEA according to the German EIA Act.

Plans & programmes always requiring a SEA
Federal transportation plans including air travel
State and regional-level land-use plans for onshore and offshore uses
Local land-use plans
Designation of wind energy areas in the Exclusive Economic Zone (EEZ)
Federal transmission development plans[a]
Flood risk management plans
Management programmes according to the EU water framework directive
Plans & programmes requiring a SEA if setting the frame for projects requiring an EIA
Local noise action plans
Local air pollution reduction plans
Local waste management concepts and plans

[a]Included only recently by amendments to the EIA Act in 2011.

by an agency in Germany. Thus the definition of actions triggering a SEA as described above is not met. Renewable energy development only indirectly through the consideration of this topic in federal, state, regional and local land-use plans falls under the requirement to assess its environmental impacts during a SEA (cf. Geißler *et al.*, 2013). As policies, strategies, concepts, and legislations as well as informal plans and programmes do not require a SEA according to the regulations, energy concepts or strategies such as the Federal Energy Concept of 2010 (*Energiekonzept 2010*) are not subject to a SEA. The same applies to renewable energy funding legislation, such as the Renewable Energy Sources Act (*Erneuerbare Energien Gesetz*).

Since the adoption of the SEA regulations in 2004/2005, several SEAs have been conducted in Germany, the majority for local land-use plans (Weiland, 2010). However, the exact number is difficult to determine because no central registry for SEAs exists. SEAs carried out on the federal level and by federal agencies are rare, only the SEAs for the land-use plans for the North Sea and Baltic Sea EEZ (including offshore wind energy designations) and SEAs for programmes under the EU structural funding programmes have been carried out so far at this level. For the federal transmission development plan a SEA is currently being conducted as the plan is just being developed for the first time.

United States

With the adoption of the NEPA in 1969, not only project-level EIA was introduced but also the strategic-level assessment of significant environmental impacts of plans, policies, and programmes. The statute requires an environmental impact evaluation

for "proposals for legislation or other major Federal actions significantly affecting the quality of the human environment" (42 USC Chapter 55, Section 4332). The Council of Environmental Quality (CEQ) regulations on NEPA clarify the term "Major Federal Actions" and detail that "actions include new and continuing activities, including projects and programmes entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies; new or revised agency rules, regulations, plans, policies, or procedures; and legislative proposals" (CFR 40 §1508.18). The term Programmatic Environmental Impact Statements (PEIS) for the assessment of environmental consequences of plans, programmes, and policies was introduced by a memorandum from the CEQ to federal agencies in 1972, which endorsed the concept of programme statements.

The practical use of PEISs is valued differently amongst authors. While some conclude that PEISs are rather widely used amongst the different federal agencies (Cooper, 1993) others such as Clark *et al.* (2011) find that PEISs are rarely used compared to project-level EISs. In general, about 500 EISs are filed each year of which about one quarter is prepared for policies, plans, and programmes and thus can be categorised as programmatic according to Bass *et al.* (2001). The US Environmental Protection Agency (EPA) determined for the time period between 1987 and 2003 that 75 PEISs have been written (CEQ Roundtable, 2003). And for the time span between January 2004 and Mai 2012, 73 finalised PEISs labeled as such could be identified through the EPA database. However, not all EISs that are programmatic in nature are labeled accordingly, thus it is quite difficult to determine the exact number of PEISs (cf. Clark *et al.*, 2011).

In the US, renewable energy plans, programmes, and policies require a PEIS if they meet the general definitions by NEPA described before. In practice, as early as 1971 the Atomic Energy Commission developed a PEIS for a Geothermal Leasing Program (Sigal and Webb, 1989), and a variety of PEISs on renewable energy topics have been conducted in the last years. Further federal actions on renewable energy development and related infrastructure have been subject to NEPA, but no PEISs were developed as the initial screening resulted in a Finding Of No Significant Impacts (FONSI), for example in the cases of a proposed rule related to biofuels development by the US Department of Agriculture.

Research Approach and Methodology

For this research a cross-national, horizontal comparative case study analysis was conducted. The research is based first on a review of relevant laws and regulations, policy documents, and academic literature. In addition, a case study analysis of several SEAs and PEISs from Germany and the US from the field of renewable

energy development has been carried out, including the respective siting and permitting documents. The case studies were identified following recommendations by Yin (2009) using a structured internet research and additional written inquiries with the agencies in charge for the development of policies, plans, and programmes on renewable energies. For the US, this included a search through the NEPA registry provided through the website of the EPA.[3] The focus was on the federal-level PEISs pursuant to NEPA. State and local-level strategic environmental assessments are not included into the case study analysis, due to their differing legal groundings. All PEISs on renewable development identified through the described approach are included in the case study analysis.[4]

In this way, eight PEISs have been analysed of which six are finalised and two in different stages of development. Two of the PEISs deal with the development of wind energy resources (Wind Energy Development Program PEIS, Great Plains PEIS) while one respectively deals with solar (Solar Energy Development PEIS), geothermal (Geothermal Leasing PEIS) and biomass (Biomass Crop Assistance Program PEIS) energy development and two with multiple renewable energies (Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf Program PEIS, Hawai'i Clean Energy PEIS). Furthermore, the Designation of Energy Corridors PEIS was included, as dealing with energy infrastructure also related to renewable energy deployment. The first PEIS that was initiated was the Wind PEIS in October 2003, while the Hawai'i Clean Energy PEIS is the most recent one. It was only started in 2012 and is still ongoing. Table 2 provides the key characteristics of the case studies.

Since no central SEA registry exists in Germany, the land-use planning agencies on federal, state, and regional level were contacted and a subset of their land-use plans was chosen for analysis. In total, six SEAs have been analysed (cf. Table 3), five of which are for non-sectoral plans under the land-use planning regulations (*Raumordnungsgesetz*). Plans or programmes specific for the energy sector, as described above, do not exist in Germany so far. However, the ongoing development process for the sectoral transmission development plan and its SEA has been included here. The land-use plan SEAs that have been considered, mainly cover designations for wind energy use (Raumordnungsplan für die deutsche ausschließliche Wirtschaftszone in der Nordsee SEA, Raumordnungsplan für die

[3] http://www.epa.gov/compliance/nepa/eisdata.html.

[4] However, programmatic NEPA reviews that were terminated with a Programmatic Environmental Assessment and did not prepare a PEIS were not included in the detailed analysis (e.g. a PEA for a US Agency for International Development (USAID) Program on rural energy in Georgia (Caucasus) or USDA's PEA for Proposed Rules Related to Biofuels Development).

Table 2. General information on US case studies.

			United States				
Wind PEIS	Hawai'i Clean Energy PEIS[a]	Great Plains Wind PEIS	Solar PEIS	Geothermal PEIS	Biomass PEIS	Outer Continental Shelf PEIS	Corridor PEIS
			Action reviewed under NEPA				
Wind Energy Development Program	Hawai'i Clean Energ PEIS	Wind energy development in Western Area Power Administration's Upper Great Plains Region	Solar Energy Development	Geothermal Leasing	Biomass Crop Assistance Program	Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf Program	Designation of Energy Corridors
			Objective of action				
— adopt policies — adopt best-management-practices — amend land use plans	develop guidance for decision making on actions for meeting the goal of achieving 70% of energy needs by 2030 through energy efficiency & renewable energy	develop and implement comprehensive region-wide management programme for wind energy project interconnections	develop — new programme guidance relevant to DOE-supported solar energy projects — new Solar Energy Program on BLM-administered lands	facilitate geothermal leasing on publicly administered land with geothermal potential	establish and administer the Establishment and Annual Payments Programme component of the Biomass Crop Assistance Programme.	establish programme for granting leases, ease- ments, and ROWs for alternative energy (wind, wave, ocean current energy capture technologies)	designate corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities

Table 2. (*Continued*)

			United States				
Wind PEIS	Hawai'i Clean Energy PEIS[a]	Great Plains Wind PEIS	Solar PEIS	Geothermal PEIS	Biomass PEIS	Outer Continental Shelf PEIS	Corridor PEIS
			PEIS time frame				
2003–2005	2012–ongoing	2008–ongoing	2008–2012	2007–2008	2008–2010	2006–2007	2005–2008
			Lead agencies				
BLM (DOI), DOE	DOE, State of Hawai'i	DOE, Fish and Wildlife Service (DOI)	BLM (DOI), DOE	BLM (DOI), USDA FS	USDA	MMS (DOI)	BLM (DOI), DOE
			Spatial scope of assessment				
BLM-administered lands in the 11 Western states[b]	Hawai'i	Iowa, Minnesota, Montana, Nebraska, North Dakota, South Dakota	BLM-administered lands in 6 South-western states[c]	BLM- and FS-administered lands in the 11 Western states and Alaska	nationwide	Marine areas within OCS in Atlantic, Gulf of Mexico & Pacific regions (Hawai'i & Alaska regions excluded)	Federal Land in 11 Western states[b]

[a]First started in 2010 as the "Hawai'i Interisland Renewable Energy Programme: Wind" but amended due to scoping comments and legislative changes in 2012 ; now having a broader scope.

[b]Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

[c]Arizona, California, Colorado, Nevada, New Mexico, Utah.

Table 3. General information on German case studies.

		Germany			
Offshore North Sea SEA	Offshore Baltic Sea SEA	SH state land-use plan SEA	RP state land-use plan SEA	Mecklenburg regional land-use plan SEA	Transmission Development Plan SEA
Action reviewed under EIA Act					
Raumordnungsplan für die deutsche ausschließliche Wirtschaftszone in der Nordsee (Land Use Plan for the German EEZ in the North Sea)	Raumordnungsplan für die deutsche ausschließliche Wirtschaftszone in der Ostsee (Land Use Plan for the German EEZ in the Baltic Sea)	Landesentwicklungsplan für Schleswig-Holstein 2010	Landesentwicklungsprogramm IV für Rheinland-Pfalz	Regionales Raumentwicklungsprogramm Mittleres Mecklenburg/Rostock	Bundesbedarfsplan Übertragungsnetzausbau
Objective of action					
— designate goals and objectives for development of the German EEZ	— designate goals and objectives for development of the German EEZ	— develop programmatic concept for future development	— develop general principles for spatial development (*Leitbilder*)	— develop comprehensive concept for sustainable development of the region	— Identification and determination of need for high-voltage transmission lines

Table 3. (*Continued*)

		Germany			
Offshore North Sea SEA	Offshore Baltic Sea SEA	SH state land-use plan SEA	RP state land-use plan SEA	Mecklenburg regional land-use plan SEA	Transmission Development Plan SEA
— designate areas for various uses (e.g. shipping, pipelines and cables, energy generation in particular wind energy, fishing, marine environment)	— designate areas for various uses (e.g. shipping, pipelines and cables, energy generation in particular wind energy, fishing, marine environment)	— designate goals and objectives for spatial development	— designate goals and objectives for spatial development	— designate goals and objectives for spatial development	— Designation of start and end nodes for transmission expansions
SEA time frame					
2005–2009	2005–2009	2007–2010	2005–2008	2004–2011	2012–ongoing
Lead agency					
BSH	BSH	Innenministerium Schleswig-Holstein	Ministerium des Inneren und für Sport Rheinland-Pfalz	Regionaler Planungsverband Mittleres Mecklenburg/ Rostock	Bundesnetzagentur (BNetzA)
Spatial scope of assessment					
German Exclusive Economic Zone in the North Sea	German Exclusive Economic Zone in the Baltic Sea	State of Schleswig-Holstein	State of Rheinland-Pfalz	Region of Middle Mecklenburg and Rostock	Nationwide

deutsche ausschließliche Wirtschaftszone in der Ostsee SEA, Regionales Raumentwicklungsprogram Mittleres Mecklenburg/Rostock SEA). The Landesentwicklungsplan für Schleswig-Holstein (S-H) 2010 and the Landesentwicklungsprogram IV für Rheinland-Pfalz (R-P) however, cover wind, solar, biomass, as well as geothermal energy generation. All SEAs considered, except for the transmission plan SEA, have been completed between 2008 and 2011. The two SEAs for the spatial development of offshore resources and the transmission plan SEA have been conducted by federal agencies, while the remaining three plans and the SEAs were carried out by state and regional level administrations. Local plans have not been included as their scope is generally so narrow that SEAs in this area resemble EIAs, and are difficult to compare.

The following analysis of the SEA/PEIS practice in the field of renewable energy development is focused on three major aspects: (1) consideration of alternatives, (2) assessment of cumulative effects, and (3) public participation. These review categories were chosen as they have been identified in previous research as being decisive aspects of SEA respectively constituting the benefits of SEA in comparison to project-level EIA (e.g. van Buuren and Nootebom, 2009; Fischer, 2002). Table 4 identifies the criteria that were used to assess the performance of the cases studies with regard to the three categories. These research criteria are based on a review of academic literature as well as guidelines in

Table 4. Review categories and criteria.

Alternatives
Number of alternatives
Consideration of no-action alternative
Type of alternatives (alternative options, option alternatives, cf. Noble, 2000)
Detail of discussion of alternatives (equal)
Method of effects analysis (qualitative, quantitative)
Cumulative effects
Identified in documents
Definition of cumulative effects (intra- and/or inter-plan effects, cf. Thérivel and Ross, 2007)
Focus of cumulative effects assessment (resource-/receptor- or plan-based, cf. Dixon and Thérivel, 2011)
Method of effects analysis (qualitative, quantitative)
Public participation
Opportunity for public review
Timing of public involvement (early, late)
Use of public hearings
Provision of access to relevant information
Active notification of citizens

Germany and the US describing relevant aspects for the development of SEAs or PEISs (e.g. Clark *et al.*, 2011; CEQ, 1997b; Copper and Sheate, 2002; Dalal-Clayton and Sadler, 2005; Dixon and Thérivel, 2011; The NEPA Task Force, 2003; Thérivel and Ross, 2007; UBA and BMU, 2010).

Results

Consideration of alternatives

In both countries the consideration of alternatives to the proposed action is required in the SEA or PEIS (§14 g EIA Act, Sec. 102(2)(E)(iii) & 102(2)(E) NEPA). It is requested to (1) develop and (2) study appropriate alternatives and in both cases the no-action alternative has to be included in the assessment.

For all PEISs analysed here, the alternatives are described and assessed in detail. All cases consider a minimum of three alternatives, one of which is the no-action-alternative which also serves as baseline for the assessment of impacts of the proposed and other alternatives (cf. Table 5). The alternatives are described as option alternatives to the proposed action. For example, the Geothermal, the Solar and the Wind PEIS consider different sets of criteria for the selection of lands which are open or closed to development, leading to different numbers of sites available for the alternatives. In all cases, a systematic comparison of the impacts of the alternatives in tables is used to justify the choice of the preferred alternative. Mainly qualitative assessments are used to compare the effects of the alternatives; only in few cases quantifications have been employed. For example, in the Solar PEIS the impacts on specific vegetation types from the three alternatives have been calculated as percentages of the total amount of these vegetation types in the planning region. In the Biomass PEIS several quantitative measures were used, for example for the assessment of greenhouse gas emissions. Thus, a clear comparison between the amounts of impact from the alternatives could be drawn.

In the German cases, the analysis only considered the part of the plans/programmes and environmental reports that dealt with renewable energy generation. Regarding the discussion of alternatives, this resulted in the finding that no consideration of alternatives to the plan/programme contents took place (therefore the German cases have been omitted in Table 5). Only explanations why no alternatives had been assessed were given. In several cases previous upstream decisions were regarded as making the assessment of alternatives impossible. For example, the criteria for wind energy site designations, which were employed in the Mittleres Mecklenburg regional land-use plan SEA to identify suitable and unsuitable wind power sites, were already set by a state-wide regulation. Thus, no

Table 5. Alternatives considered in PEISs and SEAs (the Hawai' i Clean Energy PEIS, the Great Plains Wind PEIS, and the Transmission Development Plan SEA have not been included as no documents had been published until September 2012).

	# of alternatives	No action alternative	Type of alternatives[a]	Detail of discussion	Method (qualitative, quantitative)
			United States		
Wind PEIS	3	yes	— option alternatives (concepts)	— equal for all alternatives	— qualitative
Solar PEIS	3	yes	— option alternatives (concepts)	— equal for all alternatives	— mainly qualitative (some quantitative), comparative table
Geothermal PEIS	3	yes	— option alternatives (concepts)	— equal for all alternatives	— qualitative
Biomass PEIS	3	yes	— option alternatives (concepts)	— equal for all alternatives	— qualitative & quantitative
Outer Continental Shelf PEIS	4	yes	— option alternatives (concepts)	— equal for all alternatives	— qualitative
Corridor PEIS	2[b]	yes	— option alternatives	— equal for all alternatives	— qualitative (& quantitative only for proposed action), comparative table

[a]The types of alternatives are based on Noble (2000).
[b]From initially four alternatives two were dropped from further detailed study during the PEIS process, the reasons are given in the Final PEIS.

alternatives to the suitable wind sites identified in the regional land-use plan were seen and consequently no alternative to the proposed action (designation of a certain set of suitable wind energy sites) was analysed. The criteria set employed itself however, had not been subject of a SEA previously, as the regulation constituting this set did not meet the definition of a plan or programme under the EIA Act. The no-action alternative has been described in all German cases, often called "status-quo prognosis" of the environmental resources.

The transmission development plan SEA has not been included in the analysis as the environmental report has not been published yet (September 2012).

However, from the information provided in the scoping paper it can be drawn that no discussion of alternative options for meeting the objective (planning the need for expansion of the high-voltage transmission system) will take place within the SEA either. The reasons given are that the assessment of strategic alternatives would be too resource intensive and thus not reasonable. Furthermore, it is argued that the consideration of alternative scenarios including energy generation options has taken place in upstream planning. However, these planning efforts (carried out by the transmission system operators) did not involve a SEA (similar findings made by Jay, 2010).

In summary, for the German case studies it can be said that the discussion of alternatives did not take place, and has been rather an exercise of justifying why no alternatives have been considered.

Cumulative effects assessment

NEPA itself does not talk about cumulative effects. The CEQ NEPA Implementing Regulations, however, detail that effects include direct, indirect, and cumulative effects (§1508.8). A special guideline published in 1997 by the CEQ gives direction specifically on the consideration of cumulative effects in NEPA analyses (CEQ, 1997a). Cumulative effects are defined as "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

In Germany the EIA Act as well requires a SEA to include the direct and indirect effects of a proposal (§ 2 EIA Act), but does not explicitly mention the term cumulative effects (*kumulative Auswirkungen*). The German SEA guideline, however, regards cumulative effects as being a possible subject of analysis and defines them as effects resulting from various designations in a plan or programme that could have regionally overlapping effects (UBA and BMU, 2010).

The US PEISs all contained a separate chapter dealing with cumulative impacts in a systematic way and in a detailed manner (cf. Table 6). This included the identification of other past, current and likely future actions (policies, ongoing plan or programme development in other sectors, proposed projects…) that could have cumulative effects together with the proposed plan or programme (intra- and inter-plan effects). The assessment of the cumulative effects is related to the environmental resources and takes together likely positive as well as negative cumulative effects from the developments identified before. In general, a qualitative assessment of the cumulative effects took place. In most PEISs differences in cumulative

Table 6. Consideration of cumulative effects in the case studies (the Hawai'i Clean Energy PEIS, the Great Plains Wind PEIS, and the Transmission Development Plan SEA have not been included as no documents had been published until September 2012).

	Identified in document	Definition of cumulative effects (intra-plan effects, inter-plan effects)[a]	Focus of cumulative effects assessment (resource/receptor-based, plan-based)[b]	Method of effects analysis (quantitative, qualitative)
		United States		
Wind PEIS	Yes (separate chapter)	— intra-plan & inter-plan effects	— resource/receptor	— qualitative analysis
Solar PEIS	Yes (separate chapter)	— intra-plan & inter-plan effects	— resource/receptor	— qualitative analysis (differences for alternatives highlighted)
Geothermal PEIS	Yes (separate chapter)	— intra-plan & inter-plan effects	— resource/receptor	— qualitative analysis (alternatives considered)
Biomass PEIS	Yes (separate chapter)	— intra-plan & inter-plan effects	— resource/receptor	— qualitative analysis (comparative table for alternatives)
Outer Continental Shelf PEIS	Yes (separate chapter)	— intra-plan & inter-plan effects	— resource/receptor	— qualitative analysis (alternatives considered)
Corridor PEIS	Yes (separate chapter)	— intra-plan & inter-plan effects	— resource/receptor	— qualitative analysis

Table 6. (*Continued*)

	Identified in document	Definition of cumulative effects (intra-plan effects, inter-plan effects)[a]	Focus of cumulative effects assessment (resource/receptor-based, plan-based)[b]	Method of effects analysis (quantitative, qualitative)
		Germany		
Offshore North Sea land-use plan SEA	yes (no separate chapter)	— intra-plan effects	— plan	— qualitative analysis (very general)
Offshore Baltic Sea land-use plan SEA	yes (no separate chapter)	— intra-plan effects	— plan	— qualitative analysis (very general)
SH state land-use plan SEA	yes (separate chapter)[c]	— intra-plan effects	— plan	— qualitative analysis (very brief & general)
RP state land-use plan SEA	yes (separate chapter)[d]	— intra-plan effects	— plan	— qualitative analysis (very brief & general)
Mecklenburg regional land-use plan SEA	yes (separate chapter)[d]	— intra-plan effects	— resource/receptor	— qualitative & some quantitative analysis

[a]The categories are based on Thérivel and Ross (2007).
[b]The categories are based on Dixon and Thérivel (2011).
[c]Called summarizing evaluation (*Summarische Beurteilung*).
[d]Called comprehensive plan analysis (*Gesamtplanbetrachtung*).

effects from the different alternatives considered in the plan or programme are described.

The German SEAs are all very brief on cumulative effects and justify this with the broad and little detailed nature of the contents of the plans and programmes (cf. Table 6). All land-use plan SEAs only considered cumulative effects of the proposed actions and designations of the plan (intra-plan effects). Other actions (policies, projects etc. also transboundary) likely influencing the environmental resources have not been identified and considered. As the only German case, the Mittleres Mecklenburg regional land-use plan SEA provided a resource/receptor-based assessment of cumulative effects, however, as well only considered impacts from the provisions of the plan itself and did not take into consideration other actions. The assessment was made combining qualitative descriptions and some quantitative approximations of areas that will cumulatively be affected by the designations in the regional land-use plan.

Public involvement

In the US cases, the public involvement process started with the publication of the Notice of Intent (NOI) to develop a PEIS which opened the scoping process. In all cases, this scoping was open to the general public and included several hearings for all interested in the PEIS (up to 11 for the Solar PEIS). For such scoping processes the Department of Energy (DOE), which was lead agency in 4 of the cases, determines that the public scoping process for an EIS shall allow for a minimum of 30 days for receipt of public comments (§ 1021.311), furthermore at minimum one public scoping meeting shall be held at earliest 15 days after publication of the NOI and announcement of meeting. The US case studies went all well beyond the minimum requirements for the time frame of the public scoping process, except for the Biomass PEIS which allowed for the minimum required 30 days (cf. Table 7).

The second opportunity for public involvement in the US cases is the review of the draft PEIS. For this step the DOE again regulates that a minimum of 45 days shall be available for public review and comments, including at least one public hearing. The Bureau of Land Management (BLM) requires the same period and details, but requires for land-use plans a public review period of a minimum of 90 days (BLM, 2008). These minimum requirements were met by all case studies, only the Solar PEIS (134 days) and the Outer Continental Shelf PEIS (60 days) went beyond the requirements. Finally, in the US cases another public comment phase after the publication of the final PEIS and before the issuance of the Record of Decision (ROD) was provided for, in most cases of about 30 days.

Regarding the scoping process, the German EIA Act leaves the discretion to the responsible agency whether the public or non-governmental organizations should be involved (§14f). The federal SEA guideline regards the scoping rather as a process between agencies with possible invitation of technical experts or representatives of non-governmental organisations but involvement of the general public is not mentioned (UBA and BMU, 2010). A notification of the public about the start of the development of a SEA (comparable of the NOI in US cases) is not required by the law. The SEA guideline also states that there is no necessity (UBA and BMU, 2010). Regarding the cases analysed here, only the Mittleres Mecklenburg regional land-use plan SEA provided opportunities for public comments during the scoping phase, whereas all other scoping processes were conducted without public involvement (cf. Table 7).

In Germany, the EIA Act requires that the public comment phase takes at least one month (30 days) (§14i EIA Act). Whether a hearing (*Erörterungstermin*) has to be carried out is determined in the respective regulations for the plans or programmes that are under review. The Federal Regional Planning Act (*Raumordnungsgesetz*), the basis for the development of federal, state and regional land-use plans, as well as the Energy Industry Act (*Energiewirtschaftsgesetz*) as basis for the Transmission Development Plan, do not require a hearing. The case studies analysed did all provide for the public comment phase and all went beyond the minimum time frame required, however no hearings were conducted. Subject to the public comment phase in Germany is not a draft version of the environmental report (ER) but a rather final version — it is also not labeled as being a "draft". However, if substantial changes of the ER are considered necessary, a second phase of public involvement is required.

Provision of and access to information

In all US case studies the internet was used to make the PEIS publicly available. Further information such as the transcripts of scoping meetings and hearings, the comments received, the scoping report, and additional technical information including maps was placed on websites, often exclusively designed for the PEIS process (Wind PEIS, Hawai'i Clean Energy PEIS, Solar PEIS, Outer Continental Shelf PEIS, Corridor PEIS, and Great Plains PEIS). In the Solar PEIS case the material provided online also included interactive panoramas of the proposed Solar Energy Zones to visualise the likely impacts. The websites were also used to receive online comments and to provide news about the process via newsletters (e.g. ongoing for the Solar PEIS). This accessibility of the PEISs and additional documents can be attributed to the requirement of online availability of NEPA

Table 7. Renewable energy SEAs and PEISs public involvement and provision of information.

	US								Germany					
	Wind PEIS	Hawai'i Clean Energy PEIS	Great Plains PEIS	Solar PEIS	Geo-thermal PEIS	Biomass Crop PEIS	Outer Continental Shelf PEIS	Corridor PEIS	SEA AWZ North Sea	SEA AWZ Baltic Sea	SH state land-use plan SEA	RP state land-use plan SEA	Mecklenburg regional land-use plan SEA	Transmission Development Plan SEA
Public Review (time in days)														
Scoping	60	60	60	120	60	30	60	6	—	—	—	—	ca. 120[a]	—
Draft PEIS/SEA	90	n.a.	n.a.	134	90	45	60	90	75	75	183	90	94	n.a.
Final PEIS/SEA	(30)[b]	n.a.	n.a	(30)[b]	30	50	—	—	—	—	—	—	—	n.a.
Public Hearings														
Public scoping meetings	5	8	3	11	10	6	10	22	—[c]	—[c]	—	—	—	—[c]
Hearings on Draft PEIS/SEA	5	n.a.	n.a.	14	13	?	9	16	3[d]	?	—	—	?	(6)[i]

Table 7. (*Continued*)

	US								Germany					
	Wind PEIS	Hawai'i Clean Energy PEIS	Great Plains PEIS	Solar PEIS	Geo-thermal PEIS	Biomass Crop PEIS	Outer Continental Shelf PEIS	Corridor PEIS	SEA AWZ North Sea	SEA AWZ Baltic Sea	SH state land-use plan SEA	RP state land-use plan SEA	Mecklenburg regional land-use plan SEA	Transmission Development Plan SEA
Provision of Information														
Project website	special	special	special	special	agency	agency	special	special	agency	agency	agency	agency	agency	special
Online available:														
— meeting transcripts	—	n.a.	yes	yes	—	—	yes	yes	—	—	—	—	—	—
— comments	yes	n.a.	—	yes	—	—	yes	yes	—	—	yes[e]	—	yes[e]	n.a.
— scoping report	yes	n.a.	—	yes	yes	—	yes	yes	—	—	—	—	—	yes
— draft PEIS/SEA	yes[f]	n.a.	n.a.	yes	yes[f]	—	—	yes	—	—	yes[f]	—	—	yes
— final PEIS/SEA	yes	n.a.	n.a.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	n.a.
— technical reports	—	n.a.	yes	yes	—[g]	—	yes	yes	—	—	—	—	—	—
Notification on news via RSS-Feed, Email-newsletter etc.	yes	yes	yes	yes	yes	yes	yes	yes	—	—	—	—	—	(yes)[h]

n.a. = not applicable

[a]Opportunity for the public and non-governmental organizations to provide comments on the planned regional land-use plan, however, the SEA or the environmental report were not mentioned.

[b]Time for protest against the Final PEIS by persons who participated in the planning process, and have an interest that may be adversely affected.

[c]Scoping meeting not public, only with representatives of public agencies and organizations.

[d]One national meeting and two meetings in neighboring countries.

[e]Available is the *Abwägungsdokumentation*.

[f]No longer available since Final PEIS/SEA was published.

[g]But educational materials on geothermal energy generation and maps available as well as GIS data.

[h]RSS-Feed and email-newsletter available from the website of the Bundesnetzagentur regarding all news on energy issues (www.bundesnetzagentur.de), but not from the specific website for the Transmission Development Plan and the SEA (www.netzausbau.de).

[i]Only information of the public, no hearing of public comments.

records since the enactment of the Electronic Freedom of Information Act of March 31, 1997 (5 U.S.C. 552[a][2]). This act requires online availability of most federal agency records, although not explicitly mentioning EISs, EAs, public notices and other documents prepared under NEPA; these documents clearly fall under the requirement (Bass *et al.*, 2001). The DOE implementing these requirements explicitly recommends making use of modern technology to enhance transparency and provide convenient and timely opportunities for public review of the information relied on in preparing an EA or EIS.

In Germany there is no general explicit requirement to make SEA documents available online. However, the 2011 amended Energy Industry Act (EnwG) requires that the documents of the SEA and the draft Transmission Development Plan have to be made available online (§12c EnwG). Furthermore, the Environmental Impact Assessment Act of Schleswig-Holstein states that comments during public review of ERs can be given in written or electronic format (§12). Still, for all cases considered at least the ER and the final adopted plan are available online. In the cases of the Schleswig-Holstein state land-use plan SEA and the Mittleres Mecklenburg regional land-use plan SEA, the comments received during the public review and the response by the agency are documented and available (*Abwägungsdokumentation*). As the Schleswig-Holstein state land-use plan SEA was conducted as a pilot project for e-governance, a special website for the public review was launched which enabled online comments. However, the website was deactivated with the adoption of the final plan and the ending of the SEA. As the scoping process is in general not open to the public, the documents produced and comments received from agencies or NGOs during this step are not published in all cases. Even in the Transmission Development Plan SEA, which was meant to be carried out in a particularly transparent way in order to increase acceptance for the plan, the scoping outcome was not published. In general, the availability and accessibility of EIA and SEA documents in Germany (especially after the end of the public review period) is quite limited.

In addition to the availability of the documents in the internet in all US cases at least one option of staying informed about updates of the PEIS process via RSS-Feed or email-newsletter was provided. This enabled the interested public to be up to date with events and new documents provided related to the PEIS process automatically. In the German cases only for the transmission development such options exist, however, not accessible through the SEA-website, but through the website of the responsible agency and not specific to the plan development and SEA process (cf. Table 7).

Discussion

The analysis of the German SEA and US PEIS practice related to the development of renewable energy resources reveals great differences. Table 8 summarises the results for the three categories and reveals that in almost all aspects the German cases have been found to constitute rather deficient SEA practice, while the US PEISs performed rather satisfactory. The initial assumption that both would perform rather well thus cannot be confirmed.

Consideration of alternatives

Regarding the assessment of alternatives, the German cases overall showed a negative picture. The complete absence of a discussion of alternatives in all German SEAs analysed constitutes a major weakness. As Eales and Sheate (2011) state, in particular a poor assessment of reasonable alternatives leads to a situation where the SEAs conducted in the end have little potential of changing the strategic actions and influencing the decision-making. This limited role of the SEAs must be assumed for all German case studies. One reason given in the

Table 8. Summary of findings from case study analysis.

	Germany	US
Alternatives		
Number of alternatives	−	+
Consideration of no-action alternative	+/−	+
Type of alternatives	−	+
Detail of discussion of alternatives	−	+
Method of effects analysis	−	+
Cumulative Effects		
Identified in documents	+/−	+
Definition of cumulative effects	−	+
Focus of cumulative effects assessment	−	+
Method of effects analysis	+/−	+
Public participation		
Opportunity for public review	+/−	+
Timing of public involvement	−	+
Use of public hearings	−	+
Provision of access to relevant information	+/−	+
Active notification of citizens	−	+

Notes: + = good SEA practice, +/− = OK, improvements needed, − = deficient current SEA practice.

environmental reports of the German cases was the limitation of possible alternatives by previous decisions by other governmental or administrative bodies. This is a problem in parts arising from the lack of SEAs in policy making which in many cases is the first level of decision-making. As a SEA is not required for federal energy concepts and strategies in Germany (e.g. the Federal Energy Concept 2010), in fact, however, they are setting the frame for subsequent plans and programmes. Effective tiering and assessment of alternatives on all decision-making levels is not possible. In order to improve this situation, the EIA Act would need to be amended to include policies (concepts, strategies…) into the scope of the legislation (also pointed to by Jay, 2010). The currently existing legislative impact assessment (*Gesetzesfolgenabschätzung*), which requires since 2010 the assessment of impacts stemming from proposed legislations in Germany, does not deal with federal concepts or strategies either (Jacob and Weiland, 2012) and is in general limited in terms of public involvement and transparent decision-making.

The PEISs considered all did assess different alternatives. These were alternative concepts of achieving the stated goal of the plan or programme and the comparison of their impacts occurred in a very systematic and transparent way. The alternative concepts discussed, however, did not constitute completely different options according to the definition by Noble (2000). Here the general nature of the plans themselves (sectoral) reduced the possible scope of alternative options as they were focused on one renewable energy technology each and did not allow for an overall assessment of impacts of renewable energy generation, therefore the framing of the planning task already limited the available alternatives. Thus, although NEPA applies to all federal actions including policies and legislative proposals, PEISs for energy legislation such as the Energy Policy Act of 2005, which gave impetus for several of the renewable energy PEISs assessed here, has not been subject to impact assessment. This supports the conclusions by Andrews (1997) that NEPA is too limited in its influence on major policies or legislative action. In the US therefore compared to Germany the problem is not the missing legal regulation but their implementation in practice.

Cumulative effects assessment

The consideration of cumulative effects of renewable energy deployment is particularly relevant as these energy technologies occur decentralised in often remote areas, the numbers of installations are rising, and environmental impact of single projects often is evaluated as below the threshold of significant negative effects. The combined effect, however, from large numbers of single projects (e.g. wind

turbines) and in light of other development (e.g. oil and gas drilling, urbanisation, transmission line development) might exceed the threshold of significance (e.g. discussed for greater sage grouse (*Centrocercus urophasianus*) populations in the western United States, Walker *et al.*, 2007).

In the PEISs, cumulative effects have been included in all cases and both intra- and inter-plan effects have been covered. Furthermore, the US cases adopt the perspective of the resource side as identified by scholars before as an appropriate means for cumulative impact assessment (Dixon and Thérivel, 2011). Compared to Germany this practice shows a quite broad approach. The German SEA guideline already provides a very narrow definition of cumulative effects: it only includes intra-plan effects as a summative assessment of the plan's provisions. This definition was mirrored by the renewable energy SEAs where only intra-plan effects were considered. With this practice Germany is not in line with the European Commission's definition, which also includes inter-plan effects (European Commission, 1999). Moreover, the German practice did not focus on the cumulative effects from the perspective of the environmental resources but summarised the combined effects of the plans' provisions. This rather limited consideration of cumulative effects in the German renewable energy SEA cases has previously been described by Weiland (2010) who stated a generally deficient consideration in German SEAs. She saw reasons for this in the lack of guidance on how to do cumulative effects assessment, lack of methodologies as well as lack of explicit legal consideration of cumulative effects assessment in the EIA Act (Weiland, 2010).

With the ongoing development of methods, models, and thresholds for cumulative effects specifically targeted to renewable energy development, for example models for cumulative effects from offshore wind turbines on bird populations (Poot *et al.*, 2011) or on seabed habitat (Foden *et al.*, 2011) or thresholds for attitude change towards onshore wind development (Ladenburg and Dahlgaard, 2011), the consideration of cumulative effects in strategic assessments might improve. However, the developed approaches must become known to respective agency personnel and environmental consultants conducting the SEAs.

Public involvement

Comparing the case studies regarding public involvement revealed a number of differences in US PEIS and German SEA practice on renewable energy topics. First, in the US, public involvement in PEIS processes started earlier than in Germany. With involvement of the general public at the scoping level or even

before this step with public hearings and open comment phases, the US practice can be regarded as ahead of the German way of involving the public in strategic decision-making. The involvement of the public at the earliest possible stage, which is regarded as crucial for effective SEAs, is not yet being realised in Germany. Also the ongoing public involvement during the development of the federal transmission development plan does not fulfill the standard of early public involvement. This is particularly surprising as the SEA process parallels a legislative effort by the German federal government introducing provisions on early public involvement in permitting processes (Bundesrat, 2012). The proposed legislation would mandate agencies to promote the use of early public participation even before the formal permitting process starts — as a voluntary action without formal requirement however. By introducing this act in early 2012 the German government tried to react to accelerating criticism of the current practice of public involvement also related to transmission development.

The aspect of accessibility of information in SEAs and PEISs is particularly relevant as without information no meaningful public participation is possible (Hourdequin *et al.*, 2011). In particular, the availability of information online in addition to the display of copies in public locations (libraries, government offices) provides opportunity for review of the documents independently from office hours and distance to the display location. In the US cases, access to the PEISs and related documents via the Internet was easy and provided for information dissemination throughout the process supported by newsletters or RSS-Feeds. In the German cases only passive provision of the documents, but no active information on updates occurred and the information provided was limited. Similar findings on the deficiencies of the German provision of environmental information and SEA/EIA documents have been stated recently by other researchers (e.g. Schütte, 2011; Zschiesche and Sperfeld, 2011). One reason for the situation in Germany can be seen in the legalistic and corporatist tradition of the country. As Dryzek *et al.* (2003) concluded, this tradition results in a public bureaucracy rather hostile to freedom-of-information requests (p. 40) and favours narrow interpretations of public participation provisions. This "*administrative secrecy*" (Dryzek *et al.*, 2003, 190) is quite tangible in the SEA cases analysed here and might need some more years to change.

Generally, as studies have pointed to the relevance of public involvement and information in renewable energy deployment (e.g. Agterbosch *et al.*, 2009; Firestone and Kempton, 2007; Zoellner *et al.*, 2008), the practice found here only for the US PEISs is likely to fulfill this function. In Germany, the practice of public involvement in renewable energy SEAs is not employed as a means helping to achieve greater public acceptance for the decisions being made.

Conclusions

The initial assumption that both the US and Germany perform equally well in strategic-level assessment of environmental impacts of renewable energy development, was not found to hold true in this paper.

For Germany in particular, it must be stated that the SEAs analysed constituted an ex-post evaluation of impacts in very general terms, with little chance of influencing the planning process due to a lack of alternatives and cumulative effects assessment. Thus, the benefits that SEA processes can provide in terms of an environmentally sound development of a low carbon energy system including social acceptance have not been seized. There is a strong need for further capacity-building for SEA in Germany (as also pointed out for the EU in general by the Committee of the Regions in 2010 (CoR, 2010)) and the improvement of guidelines on SEA, which so far in Germany are very narrow and general, might be beneficial in this regard.

Comparable to the findings from Eales and Sheate (2011) for the UK, the paper reveals that both the US and Germany need to improve policy-level SEAs on the highest decision making tiers. Without the assessment of alternative solutions of (renewable) energy development at this level, subsequent assessment of impacts as well as public involvement in SEAs and EIAs is constrained by the higher level decisions, and meaningful influence on decision-making is impeded.

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References

Agterbosch, S, RM Meertens and WJV Vermeulen (2009). The relative importance of social and institutional conditions in the planning of wind power projects. *Renewable and Sustainable Energy Reviews*, 13, 393–405.

Andrews, R (1997). The unfinished business of national environmental policy. In *Environmental Policy and NEPA: Past, Present and Future*, R Clark and L Canter (eds.). Boca Raton: St. Lucie Press.

Athanas, AK and N McCormick (2013). Clean energy that safeguards ecosystems and livelihoods: Integrated assessments to unleash full sustainable potential for renewable energy. *Renewable Energy*, 49, 25–28.

Bagliani, M, E Dansero and M Puttilli (2010). Territory and energy sustainability: The challenge of renewable energy sources. *Journal of Environmental Planning and Management*, 53, 457–472.

Bass, ER, AI Herson and KM Bogdan (2001). *The NEPA Book. A Step-by-Step Guide on how to Comply with the National Environmental Policy Act*. 2. Edition. Point Arena, CA: Solano Press Books.

BDEW (2012). Erneuerbare Energien liefern mehr als ein Viertel des Stroms. http://www.bdew.de/internet.nsf/id/20120726-pi-erneuerbare-energien-liefern-mehr-als-ein-viertel-des-stroms-de [8 August 2012].

BLM (2008). National Environmental Policy Act Handbook. H-1790-1.http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_handbook.Par.24487.File.dat/h1790-1-2008-1.pdf [11 August 2012].

Blood, MR (2010). Rare tortoise makes things hairy for solar development. The Huffington Post, 2 January.

Bundesrat (2012). Entwurf eines Gesetzes zur Verbesserung der Öffentlichkeitsbeteiligung und Vereinheitlichung von Planfeststellungsverfahren (PlVereinhG), 30.03.2012.

Busch, P-O and H Jörgens (2005). International Patterns of Environmental Policy Change and Convergence. *European Environment*, 15, 80–101.

Canter, LW (1999). Cumulative effects assessment. In *Handbook of Environmental Impact Assessment, Vol. 1., Environmental Impact Assessment: Process, Methods, Potential*, J Petts (ed.), pp. 405–440. Oxford: Blackwell Science.

CEQ (1997a). Considering Cumulative Effects Under the National Environmental Policy Act. http://ceq.hss.doe.gov/nepa/ccenepa/exec.pdf [8 August 2012].

CEQ (1997b). The National Environmental Policy Act. A Study of its Effectiveness After Twenty-five Years. http://ceq.hss.doe.gov/nepa/nepa25fn.pdf [8 August 2012].

CEQ Roundtable (2003). Western Roundtable Report. http://ceq.hss.doe.gov/ntf/westernroundtablereport.pdf [8 August 2012].

Chaker, A, K El-Fadl, L Chamas and B Hatjian (2006). A review of strategic environmental assessment in 12 selected countries. *Environmental Impact Assessment Review*, 26, 15–56.

Chiabrando, R, E Fabrizio and G Garnero (2009). The territorial and landscape impacts of photovoltaic systems: Definition of impacts and assessment of the glare risk. *Renewable & Sustainable Energy Reviews*, 13(9), 2441–2451.

Clark, RL Mahoney and K Pierce (2011). SEA in the US. In *Handbook of Strategic Environmental Assessment*, Sadler B, Aschemann R, Dusik J, Fischer TB, Partidário MR and Verheem R (eds.), pp. 74–88. London, Washington, DC: Earthscan.

Cooper, JC (1993). Broad Programmatic, Policy and Planning Assessments under the National Environmental Policy Act and Similar Devices: A Quiet Revolution in an Approach to Environmental Considerations. *Pace Environmental Law Review*, 11(1), 88–155.

Cooper, LM and WR Sheate (2011). Cumulative effects assessment: A review of UK environmental impact statements. *Environmental Impact Assessment Review*, 22, 415–439.

CoR (2010). Opinion of the Committee of the Regions on Improving the EIA and SEA Directives. 84th plenary session 14 and 15 April 2010.

Dalal-Clayton, B and B Sadler (2005). *Strategic Environmental Assessment. A Sourcebook and Reference Guide to International Experience*. London, Sterling, VA: Earthscan.

Defenders of Wildlife, Earthjustice, National Audubon Society, National Wildlife Federation, National Resource Defense Council, Sierra Club, Union of Concerned Scientists, Western Resource Advocates, and The Wilderness Society (2008). Balancing renewable energy development and land conservation in a warming world. http://www.pbs.org/now/shows/503/renewable-energy.pdf [8 August 2012].

Dixon, J and R Thérivel (2011). Managing Cumulative Impacts: Making it Happen. In *Handbook of Strategic Environmental Assessment*, Sadler B, Aschemann R, Dusik J, Fischer TB, Partidário MR and Verheem R (eds.), pp. 380–395. London, Washington, DC: Earthscan.

Dryzek, J, D Downs, H-K Hernes and D Schlosberg (2003). *Green States and Social Movements: Environmentalism in the United States, United Kingdom, Germany, and Norway*. Oxford University Press, USA.

Eales, RP and WR Sheate (2011). Effectiveness of policy level environmental and sustainability assessment: Challenges and lessons from recent practice. *Journal of Environmental Assessment Policy and Management* 13(1), 39–65.

EIA (2012). Monthly Energy Review, March 2012. http://www.eia.doe.gov/emeu/mer/pdf/pages/sec7_5.pdf [8 August 2012].

Elling, B (2011). Some Wider Refelctions on the Challenge of Public Participation in SEA. In *Handbook of Strategic Environmental Assessment*, Sadler B, Aschemann R, Dusik J, Fischer TB, Partidário MR and Verheem R (eds.), pp. 356–368. London, Washington, DC: Earthscan.

European Commission (1999). Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions. Brussels.

Firestone, J and W Kempton (2007). Public opinion about large offshore wind power: Underlying factors. *Energy Policy*, 35, 1584–1598.

Fischer, TB (2002). *Strategic Environmental Assessment in Transport and Land Use Planning*. London: Earthscan.

Fischer, TB (2005). Having An Impact? Context Elements For Effective Sea Application in Transport Policy, Plan And Programme Making. *Journal of Environmental Assessment Policy and Management*, 7(3), 407–432.

Foden, J, SI Rogers and AP Jones (2011). Human pressures on UK seabed habitats: A cumulative impact assessment. *Marine Ecology Progress Series*, 428, 33–47

Geißler, G, J Köppel and P Gunther (2013). Wind Energy and Environmental Assessments — a hard look at two forerunners' approaches: Germany and the United States. *Renewable Energy*, 51, 71–78.

Houck, OA (2009). How'd We Get Divorced?: The Curious Case of NEPA and Planning. *Environmental Law Reporter*, 39, 10645–10650.

Hourdequin, M, P Landres, MJ Hanson and DR Craig (2012): Ethical implications of democratic theory for U.S. public participation in environmental impact assessment. *Environmental Impact Assessment Review*, 35, 37–44.

Jacob, K and S Weiland (2012). Die Nachhaltigkeitsprüfung im Rahmen der Gesetzesfolgenabschätzung in Deutschland. *UVP-Report*, 26(1), 10–15.

Jay, S (2010). Strategic environmental assessment for energy production. *Energy Policy*, 38, 3489–3497

Johnson, GD, MK Perlik, WP Erickson and MD Strickland (2004). Bat Activity, Composition, and Collision Mortality at a Large Wind Plant in Minnesota. *Wildlife Society Bulletin*, 32, 1278–1288.

Jones, C, M Baker, J Carter, S Jay, M Short and C Wood (eds.) (2005). *Strategic Environmental Assessment and Land Use Planning. An International Evaluation*. London, Sterling, VA: Earthscan.

Josimović, B and M Pucar (2010). The strategic environmental impact assessment of electric windenergy plants: Case study 'Bavanište' (Serbia). *Renewable Energy*, 35(7), 1509–1519.

Köller, J, J Köppel and W Peters (eds.) (2006). *Offshore Wind Energy Research on Environmental Impacts*. Berlin: Springer Verlag.

Köppel, J, G Geißler, J Helfrich and J Reisert (2012). A snapshot of Germany's EIA approach in light of the United States archetype. *Journal of Environmental Assessment Policy and Management*, 14(4), 1250022-1–1250022-21.

Ladenburg, J and J-O Dahlgaard (2011). Attitudes Threshold Levels and Cumulative Effects of the Daily Wind Turbines Encounters. *IAEE Working Paper*.

Leitner, P (2009). The promise and peril of solar power. *The Wildlife Professional*, 3, 48–53.

Maloney, P (2008). Solar Projects Draw New Opposition. The New York Times, 24 September, p. SPG2.

Naugle, DE, KE Doherty, BL, Walker, HE Copeland and JD Tack (2011). Sage-Grouse and Cumulative Impacts of Energy Development. In *Cumulative Effects in Wildlife Management Impact Mitigation* LK Harris (ed.), pp. 213–226. Boca Raton London New York: CRC Press.

Noble, BF (2000). Strategic Environmental Assessment: What is it and what makes it strategic? *Journal of Environmental Assessment Policy and Management*, 2(2), 203–224.

Poot, MJM, PW van Horssen, MP Collier, R Lensink and S Dirksen (2011). Effect studies Offshore Wind Egmond aan Zee: Cumulative effects on seabirds A modelling approach to estimate effects on population levels in seabirds. http://www.buwa.nl/fileadmin/buwa_upload/Bureau_Waardenburg_rapporten/06-466_BW_research_OWEZ_cumulative_effects-web.pdf [8 August 2012].

REN21 (2012). Renewables 2012. Global Status Report. http://www.map.ren21.net/GSR/GSR2012_low.pdf [21 June 2012].

Schütte, P (2011). Mehr Demokratie versus Verfahrensbeschleunigung? *Zeitschrift für Umweltrecht*, 4, 169–170.

Sigal, LL and JW Webb (1989). The Programmatic Environmental Impact Statement: Its Purpose and Use. *The Environmental Professional*, 11, 14–24.

Slotterback, CS (2009). Scoping implementation in National Environmental Policy Act process in US transportation agencies. *Transportation Research Part D*, 14, 83–90.

Stemmer, O (2011). Clearing the Air: A comparison of regulatory frameworks for siting wind farms. *Journal of Energy & Environmental Law*, summer 2011, 85–97.

The NEPA Task Force (2003). *Modernizing NEPA Implementation. Report to the Council of Environmental Quality*. http://ceq.hss.doe.gov/ntf/report/finalreport.pdf [27 July 2012].

Thérivel, R (1993). Systems of strategic environmental assessment. *Environmental Impact Assessment Review*, 13, 145–168.

Thérivel, R and B Ross (2007). Cumulative effects assessment: Does scale matter? *Environmental Impact Assessment Review*, 27, 365–385.

Tsoutsos, T, N Frantzeskaki and V Gekas (2005). Environmental impacts from the solar energy technologies. *Energy Policy*, 33(3), 289–296.

UBA and BMU (2010). *Leitfaden zur Strategischen Umweltprüfung*. http://www.bmu.de/files/pdfs/allgemein/application/pdf/sup_leitfaden_lang_bf.pdf [15 August 2012].

Van Buuren, A and S Nootebom (2009). Evaluating strategic environmental assessment in The Netherlands: Content, process and procedure as indissoluble criteria for effectiveness. *Impact Assessment and Project Appraisal*, 27(2), 145–154.

Walker, BL, DE Naugle and KE Doherty (2007). Greater Sage-Grouse Population Response to Energy Development and Habitat Loss. *The Journal of Wildlife Management*, 71(8), 2644–2654.

Weiland, U (2010). Strategic Environmental Assessment in Germany — Practice and open questions. *Environmental Impact Assessment Review*, 30, 211–217.

Wende, W, M Hanusch, E Gassner, D Guennewig, J Köppel, H Lambrecht, A Langenheld, W Peters and P Roethke-Habeck (2004). Requirements of the SEA Directive and the German Federal Transport Infrastructure Plan. *European Environment*, 14, 105–122.

Woody, T (2010). It's Green Against Green In Mojave Desert Solar Battle. Yale Environment 360, Yale School of Forestry & Environmental Studies. http://e360.yale.edu/content/feature.msp?id=2236 [2 July 2012].

Yin, RK (2009). *Case Study Research. Design and Methods*. 4. Edition. Los Angeles, London, New Delhi, Singapore, Washington DC: Sage.

Zoellner, J, P Schweizer-Ries and C Wemheuer (2008). Public acceptance of renewable energies: Results from case studies in Germany. *Energy Policy*, 36, 4136–4141.

Zschiesche, M and F Sperfeld (2011). Zur Praxis des neuen Umweltinformationsrechts in der Bundesrepublik Deutschland. *Zeitschrift für Umweltrecht*, 22(2), 71–78.

Chapter VI
Direct Democracy in Renewable Energy Decision-Making in Germany[16]

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Direct democracy and renewable energy deployment in Germany

Gesa Geißler

Environmental Assessment and Planning Research Group, Technische Universität Berlin, Secretariat EB 5, Straße des 17. Juni 145, 10623 Berlin, Germany

HIGHLIGHTS

- ► direct democracy in Germany plays a role in renewable energy development
- ► trend to more local direct democracy on wind, solar & biomass projects
- ► current impact of direct democracy on renewable energy deployment however limited
- ► indirect effects e.g. on investor decisions warrants further research

Keywords:

Direct democracy; Renewable energy; Public participation

ABSTRACT

The increase of renewable energy generation is part of the German current energy concept and the national climate conservation strategy. The aim of this paper has been to analyze and discuss the opportunities and use of direct democracy in renewable energy policy adoption and implementation in Germany.

The study revealed that direct democracy in Germany does play a role in the deployment of renewable energy generation technologies. With an increasing number of cases on the local level in the last years a trend to a more frequent use of initiative, referendum, and referral on wind, solar, biomass, water, and geothermal power plant projects could be stated. However, the direct impact of this development on the deployment of renewable energy technologies so far remains rather limited. The “status-quo-bias” against renewable energy development that was revealed, however, might impact the future implementation of renewable energy policies aiming at further increasing the installed capacity. Indirect effects of renewable energy direct democracy for example on investor’s decision making warrant further research.

1 Introduction

The reduction of greenhouse gas emissions (GHG) is a central element of climate protection policies in Germany. The increase of energy generation using renewable resources such as wind, water, solar, biomass, and geothermal resources, is one element of such GHG reduction policies. Germany aims at achieving a share of 80% of renewable energy generation in 2050 up from 25% in mid-2012 (BDEW, 2012). While these 25% have been a considerable achievement, reaching the goal for 2050 implies a massive expansion of installed capacity thus building numerous additional renewable energy power facilities. Previous studies into the success conditions for renewable energy deployment have identified certain influencing factors from economic (Bird et al., 2005, Carley, 2009, Fthenakis et al., 2009, Langniss and Wiser, 2003, Menz and Vachon, 2006), technological (Fthenakis et al., 2009), political (Bruns et al., 2011, Fischlein et al., 2010), and administrative ones (Bruns et al., 2011), to social acceptance (Agterbosch et al., 2009, Firestone et al., 2009, Firestone and Kempton, 2007, Wolsink, 2007, 2010, Zoellner et al., 2008). These latter studies have found that acceptance is positively influenced in particular by fair and transparent planning and permitting processes for renewable energy generation facilities (Zoellner et al., 2008). The results have shown that information and involvement of citizens in the decision-making processes is of particular relevance.

Public participation in democratic decision making can take place in various ways and is often distinguished between institutionalized and non-institutionalized forms of participation. The latter forms are not legally required for example forms of cooperative democracy (mediation, round tables etc.) (Bogumil, 2001) or protests and demonstrations (Niedermayer, 2005). Institutionalized forms of participation include for example general elections or citizen involvement (information, consultation etc.) in formalized planning and permitting processes (Roth, 1997, Niedermayer, 2005). One further element of institutionalized public influence which is gaining popularity is direct democracy (Rabe, 2006, Stadelmann-Steffen, 2011). Direct democracy, following a definition by Schiller (2011a) means procedures allowing "citizens to participate directly in decision-making on policy issues in a ballot vote on propositions initiated by citizens or by a governmental authority". In Germany direct democracy is possible on the state and local level.

Direct democracy and its impact on various topics, in particular taxation and state spending policies has been analyzed in depth (e.g. Feld, 2006, Feld and Kirchgässner, 2009). The relation to environmental policy and in particular (renewable) energy policy however, so far has been studied by few scholars. Researchers have focused for example on the relation of direct democracy and land-use decision making. In particular in the United States several studies have analyzed the use of direct democracy in growth management (Gerber and Phillips, 2003, 2004, 2005) and the conservation of open space (e.g. Kotchen and Powers, 2006, Nelson et al., 2007, Howell-Moroney, 2004; Solecki et al., 2004). Their focus was in analyzing the conditions for success of referenda and initiatives in terms of socio-economic conditions in the relevant communities. Nelson et al. (2007) for example found that open space referenda are more likely to be successful in well-educated and rather affluent communities.

For Germany Wickel and Zengerling (2010) have analyzed the regulatory conditions for direct democracy related to land-use planning and zoning. One of the few works related to direct democracy on renewable energy policy in the broadest sense has been conducted by Stadelmann-Steffen (2011). She has analyzed the influence of direct democracy on climate change policy for Switzerland using a political science approach. Her findings suggest that voters tend to avoid climate policies imposing costs with benefits occurring only in the long run as well as a preference for regulations compared to market-based instruments. Stadelmann-Steffen (2011) concludes that direct democracy in Switzerland in fact poses a hurdle to climate change policies and that anticipative behavior in parliament is crucial to successful climate policy making. These previous studies however, all did not analyze the application of direct democracy in decision making on renewable energy deployment. This question however, is of interest for several reasons:

First theory suggests two possible directions in which direct democracy may influence environmental policy. The first direction would be that direct democracy can hinder (long-term oriented) innovation (cf. Kirchgässner, 2007, Freitag and Vatter, 2006, Vatter and Freitag, 2002, Kirchgässner et al., 1999). Under this so-called 'status-quo-bias' voters tend to prefer short-term gains instead of long-term public environmental benefits in particular if the long-term benefits entail risks and uncertainties for the citizens. This could be a problem for effective renewable energy deployment: renewable energy technologies are still rather new developments which may imply uncertain effects leading citizens to vote against them to conserve the status quo and avoid possible costs in the future. The second possible direction theory suggests is, that direct democracy offers a way for pro-environmental (renewable energy) interest to influence representative policy-making and to bringing innovative environmental solutions to the agenda (Gebhart, 2002, Jänicke, 1992). This could mean that the availability of direct democracy as means of decision-making in fact would lead to support of the establishment and deployment of renewable energy policy.

A second reason is that decision making on renewable energy policies, plans and projects includes institutionalized participation in terms of consultations in formalized processes. Thus the public in most cases is already involved before decisions are being made and can voice their concerns and interests. The question arising is the relation between public participation during planning and permitting processes before governmental or administrative bodies decide on the one hand and direct democracy which allows for citizens themselves to decide on the other hand.

And finally research into the use of direct democracy in the field of renewable energy policy is relevant as from analyzing citizens' direct decision making it might be possible to draw citizens' preferences in this field.

With this paper a systematic account on the use of direct democracy on renewable energy deployment in Germany shall be given and hypotheses and need for future research shall be generated. Therefore the following two key research questions will be analyzed and discussed:

a. What opportunities do citizens in Germany have to use direct democracy in influencing renewable energy policy and its implementation?
b. How are these opportunities used?

The paper is structured as follows: section 2 provides a brief overview on direct democracy regulations in Germany before in section 3 method and data used in the analysis are outlined. The results are described in section 4 separated into regulatory context and practice of direct democracy on renewable energy. In section 5 the results are discussed before final conclusions are summarized in section 6.

2 Direct Democracy Provisions in Germany

In Germany direct democracy in contrast to other countries is not available for decisions of the federal government (for details on reasons and current discussion on this refer to Heußner, 2006, Hirscher and Huber, 2006, Jung, 2006). On the state and local level however, direct democracy exists in all 16 states and in the about 14,000 municipalities (for details on the historical development of direct democracy in Germany refer e.g. to Wiegand, 2006).

In general direct democracy or citizen lawmaking can be distinguished into three forms depending on the initiator and the objective of the vote (Table VI-1). It is possible that citizens initiate this process, meaning a vote on a specific topic, which is called a citizen referendum or initiative *(Bürgerentscheid/Volksentscheid)*. In contrast a vote initiated by a local or state government is called a referral. The citizen initiated votes furthermore can be divided into two types depending on whether they are aimed at changing or revoking a previous decision by the government which will be referred to as the citizen referendum or it puts a topic on the decision making agenda for the first time for which the term citizen initiative will be used.

Table VI-1. Forms of direct democracy in Germany.

Initiator	Objective	Instrument of direct democracy
government (state or local)		referral (Ratsreferendum/Volksabstimmung)
citizens	corrective	referendum (Korrekturbegehren)
	agenda-setting	initiative (Initiativbegehren)

The citizen initiative can occur at any time while for a corrective citizen referendum certain time limits with regard to the initial governmental decision have to be considered.

While a referral is triggered by a majority vote of the members of the local or state government, the citizen referendum or citizen initiative are only called for if in a first step a certain number of supporting signatures has been collected. For all state referenda and initiatives the three-step process displayed in Figure VI-1 applies. On state level the first step is the initiation where citizens submit their request to start the process including a certain number of supporting signatures to the responsible authority. After a legal review of the request the second stage the circulation will start. On the local level the process

only starts with the circulation thus is a two-step process. During the circulation stage a number of signatures (more than in the initiation stage) have to be collected. In order to be successful a certain signature quorum which is defined in the state regulations has to be met. The ballot vote is the last step which takes place if the legal requirements for example the signature quorum are met and if the government does not adopt the proposal brought forward themselves. The success of the ballot vote depends not only on reaching a majority for the proposal but furthermore a certain approval quorum has to be achieved. This means that adopting a proposal requires that the majority of voters represents a certain percentage of the electorate (Aguiar-Conraria and Magalhães, 2010).

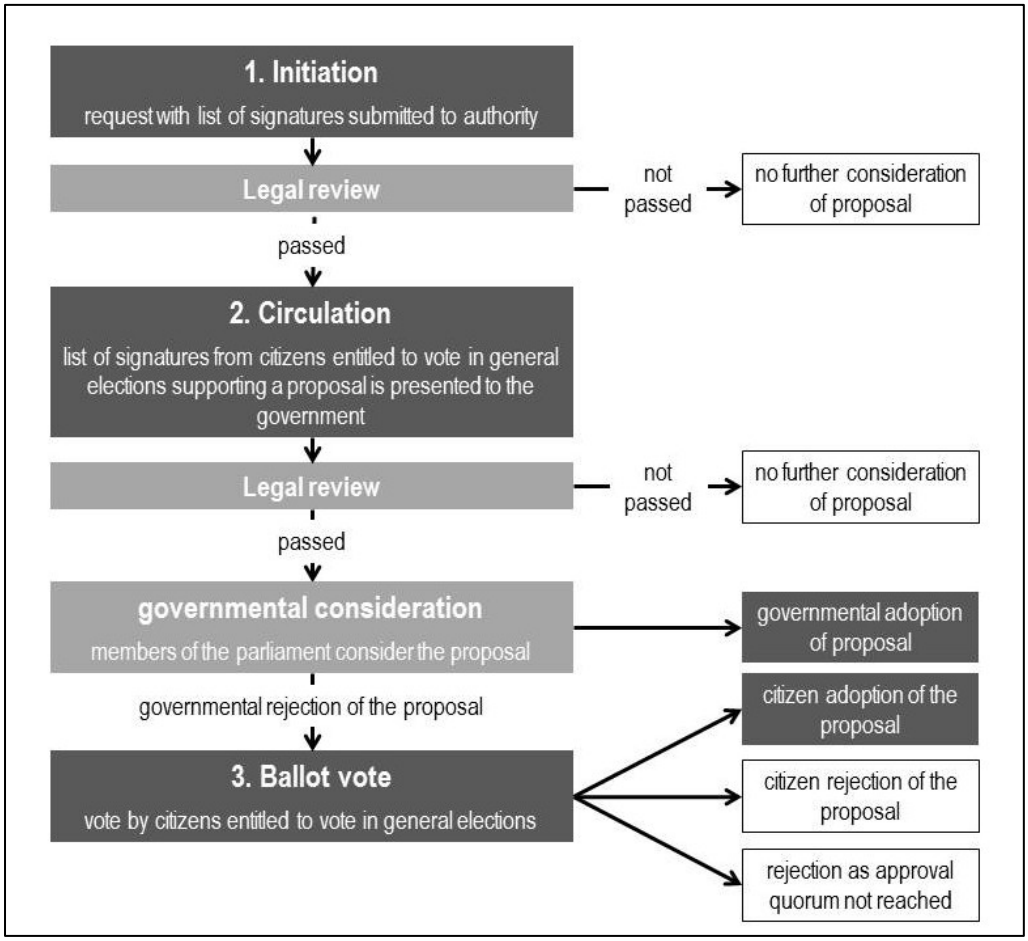

Figure VI-1. Process of triggering a citizen vote on a referendum or initiative (As the terminology is not homogenously used in the literature for this paper we follow the terms used by Eder et al. (2008) for the three stages).

On state level direct democracy in Germany has been introduced in state regulations in some states as early as in the postwar period between 1946 and 1950 (Bavaria, Rhineland-Palatine, Bremen, Berlin, North Rhine-Westphalia). The other states followed only in the early 1990s after the reunification of Germany when the new states (former GDR) established direct democracy in their constitutions and the other states followed. Since 1996 all state constitutions now provide for state level direct democracy, however, the regulations differ in the details (Mehr Demokratie e.V., 2008). Table VI-2 shows for example the different signature and approval quorums that states have adopted for state direct democracy. With 4 or 5% signature quorum during the circulation stage

Brandenburg, Hamburg and Schleswig-Holstein for example provide for quite low requirements. In contrast Hesse and Sarre with both requiring 20% are rather restrictive. Regarding the approval quorum certain states such as Bavaria or Saxony even require no approval quorums at all, while other states, in particular Sarre, have adopted quite high ones (50%).

In general initiatives, referenda, and referrals can be used to trigger citizen votes on issues that are within the decision making responsibility of the state parliaments. Decisions that are made by the administration not involving any parliamentary action cannot be directly subject to citizen votes (cf. Steinberg, 2011). With regard to renewable energy deployment for example guidance on wind farms siting that are issued by state ministries (administration) cannot be influenced by citizen initiatives or referenda.

From the issues decided by state parliaments, certain topics are excluded from direct decision making by the citizens. Budget issues for example are excluded in all 16 states. The adoption and amendment of state land-use development plans and programs, one important field as well for renewable energy deployment, is not excluded in any state.

On the local level direct democracy in Germany is since the mid-1990s in all 16 states a means for citizen participation in decision making. As local direct democracy regulations are in the jurisdiction of the states, these vary considerably and also have been adopted as early as in 1956 (Baden-Württemberg) to only recently in 2005 (Berlin). Table VI-2 provides an overview on these regulations, i.e. the signature quorum that has to be met for reaching the ballot vote, ranging from 3-2% (Hamburg) to 15-12.4% (Sarre). Furthermore the regulations limit the use of citizen initiative and referendum to certain topics and exclude others. In general topics can be addressed that are in the jurisdiction of the municipality and the local government. However, in almost all states questions of the budget are excluded from local direct democratic decision making. Furthermore, local land-use planning and zoning as well as other planning decisions can be subject to initiative and referendum in some states while being excluded by others. Table VI-2 shows the states' stances on these questions and it is obvious that in half of the states in Germany land-use planning decisions are excluded from direct democracy.

Table VI-2. Rules for state and local initiatives and referenda in German states.

	State Level [a]		Local level		
State	**Signature quorum in % of electorate [Schiller 2012]**	**Approval quorum[b] in % [Schiller 2012]**	**Signature quorum in % of electorate [Schiller 2011b]**	**Approval quorum[b] in % [Schiller 2011b]**	**Land-use planning & zoning excluded?**
Baden-Württemberg	16.7	33	10-5 [c]	25	x
Bavaria	ca. 10	no quorum	10-3 [c]	20-10	
Berlin	7	25	3	15 (turnout)	
Brandenburg	4	25	10	25	x
Bremen	5	20	5	20	
Hamburg	5	20	3-2 [c]	no quorum	
Hesse	20	no quorum	10	25	
Mecklenburg West-Pomerania	ca. 10	33	10-4.2 [c]	25	x
Lower Saxony	ca. 10	25	10	25	x
North Rhine-Westphalia	8	15	10-3 [c]	20	x
Rhineland-Palatinate	ca.10	25	15-8.8 [c]	30	x
Sarre	20	50	15-12.4 [c]	25	x
Saxony	ca.10	no quorum	15 (5) [d]	25	
Saxony-Anhalt	ca.10	25	15-5 [c]	30	
Schleswig-Holstein	5	25	10	20	x
Thuringia	ca.10	25	6-7 [c]	20-10	

[a] the state regulations only cover amendments of plain laws while for constitutional changes specific higher quorums apply
[b] majority of votes cast needs to represent a certain percentage of the electorate in order to be successful.
[c] quorum declining with raising population of municipality.
[d] local regulation can reduce quorum to five percent.

3 Method and Data

The paper is based mainly on qualitative and some quantitative data. For the regulatory conditions a document and literature analysis covering legal regulations, academic literature and reports from governmental and non-governmental sources was conducted. This work formed the basis for the subsequent analysis of the practical use of direct democracy in the field of renewable energy deployment in Germany. For the state level, data from the non-profit organization "Mehr Demokratie e.V." was used. This interest group promotes the use of direct democracy and collects data on all state level direct democracy activity. The information provided in their reports was supported by a search on direct democracy cases through the states' parliaments' online statistic databases.

For the local level the database on local initiatives, referenda, and referrals (*Datenbank Bürgerbegehren*) was a primary source. This database is an online available resource (www.datenbank-buergerbegehren.de) which is hosted by the „Forschungsstelle Bürgerbeteiligung" at the Bergische Universität Wuppertal and the „Forschungsstelle Bürgerbeteiligung und Direkte Demokratie" at the Philipps-Universität Marburg. This database is the only comprehensive source of information on local initiatives, referenda, and referrals in Germany as no official statistics exist. The data is generated from surveying state and local governmental administrations and through self-reporting of cases from engaged citizens, NGOs, or others. The reported data is verified through the administrators of the database (staff of the hosting universities) and made available to the public via a searchable website based on a Wiki. The administrators claim no completeness of the data they provide. Additional information was mainly acquired through internet research analyzing official information from government agencies, information from NGOs and interest groups, and from the media. The period analyzed here ranges from 1994 to the end of 2011 as before 1994 no direct democracy cases on renewable energy have been reported.

4 Results

4.1 Regulatory conditions for direct democracy on renewable energies in Germany

First, the relevant elements of the renewable energy system will be summarized. Subsequently the check against the direct democracy regulations will allow drawing a picture of possible influence by these instruments.

Germany has been actively fostering the development of renewable energies since the late 1980s. As a result of these supportive policies, the renewable energy sources' share in electricity consumption in mid-2012 accounted for more than 25% (BDEW, 2012). Wind energy supplied the largest part of electricity generated from renewable energies (9.2 %), with 29.3 GW of installed wind power capacity in mid-2012 (BDEW, 2012). Nearly all of the 22,515 installed wind turbines today are located on land (Fraunhofer IWES, 2012). Hydropower accounted for 4.0%, photovoltaic for 5.3%, biomass for 5.7% and geothermal energy generation for 0.005% of the German electricity consumption in mid-2012 (BDEW, 2012). As Figure VI-2shows, the deployment of the five renewable energy

technologies started off at different points in time with hydropower being an element of Germany's energy mix already before 1990 while wind energy deployment just started at that time with a first boom phase from the mid-1990s to the early 2000s (Bruns et al., 2011). Biomass had its take off between 2004 and 2006 with a rapid increase in installed capacity. Solar energy in contrast started to boom after the amendment of the feed-in tariff regulations of the Renewable Energy Sources Act *(Erneuerbare-Energien-Gesetz)* in 2004 but with smaller growth rates. Finally, geothermal energy deployment is still in a starting phase (Bruns et al., 2011).

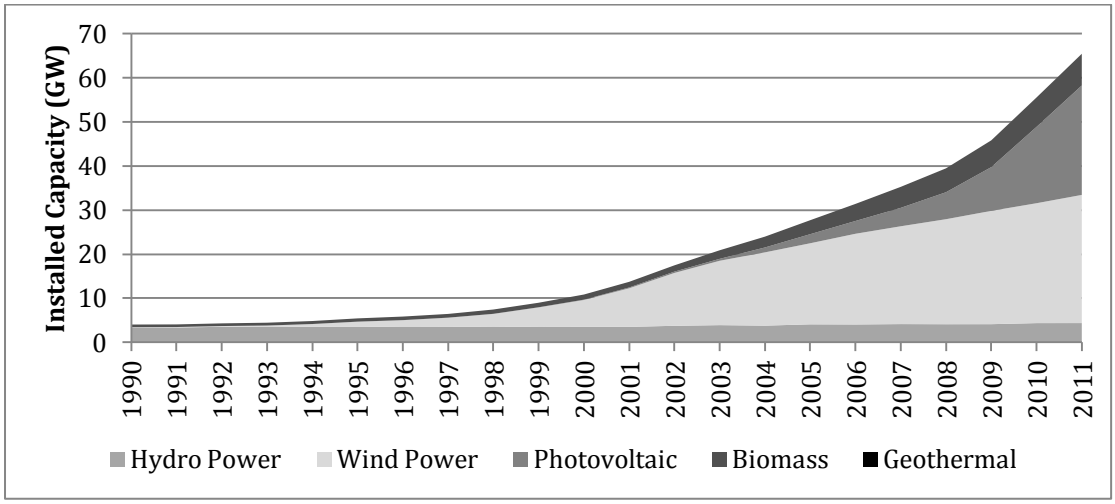

Figure VI-2. Installed renewable energy capacity in Germany, development from 1990 to 2011 (Data: BMU, 2012).

The goals for the future development of renewable energy generation in Germany are set in the Federal Energy Concept of 2010 which states that until 2020 the renewable energy sources' share in total electricity consumption shall be 35% and shall further raise to 80% in 2050 (Bundesregierung, 2010). This is one element of the German climate conservation strategy aiming at rigorously reducing greenhouse gas emissions in the coming years.

In addition a variety of state, regional, and local policies on renewable energy development exist which are as well relevant for achievement of the German renewable energy goals. All states for example have come up with energy strategies including renewable energy sources and have included state specific goals for renewable energy generation in their state land-use development plans and programs *(Landesentwicklungspläne/-programme)*. These plans and programs are adopted by the state parliaments as binding documents and their goals and objectives guide the subsequent planning levels namely regional plans, local land-use plans *(Flächennutzungsplan)*, and local zoning regulations *(Bebauungsplan)* which have to implement the state targets (cf. Table VI-3). These local level plans are developed by the local administration and become binding by votes of the local parliaments (city or county council). For solar power development in particular but as well for other renewable energy technologies local land-use and zoning plans allowing for the respective use have

to be adopted before projects can be realized. Thus local land-use planning and zoning are particularly relevant for renewable energy deployment.

For realization of renewable energy projects in Germany different permits are necessary depending on the type of technology used and other project specific characteristics (for details refer e.g. to Klinski, 2005). These permits are granted by state or local administrations as discretionary or bound decisions. If local or state owned land shall be used for renewable energy projects, additionally governmental approval from city or county councils or the state parliament for selling or leasing these lands can be needed.[17]

Table 3 summarizes the major governmental actions and decisions relevant for renewable energy development in Germany and the availability of direct democracy for influencing these decisions.

[17] i.e. in some states forests are in large parts being owned by the state (i.e. Bavaria) which can be used for wind energy generation.

Table VI-3. Decisions relevant for the deployment of renewable energies in Germany on Federal, State and Local level and the availability of direct democracy.

Government level	Renewable energy related decisions	Rules on direct democracy
Federal	adoption and amendment of the Renewable Energy Sources Act (EEG) setting the feed-in tariffs adoption of the Federal Energy Concept of 2010	direct democracy **not** available
State	adoption of state energy concepts/strategies including scenarios, goals and strategic measures for implementation (e.g. Energiestrategie 2030 des Landes Brandenburg) adoption of state land-use development plans or programs including goals and objectives for renewable energy development (e.g. Landesentwicklungsplan Sachsen 2012) decisions on selling or leasing state owned lands for renewable energy projects	direct democracy available
	adoption of state renewable energy funding programs (e.g. loan programs)	direct democracy likely **not** available (budget restrictions)
State/Local	adoption of regional plans including goals and objectives for renewable energy development & designation of suitable sites e.g. for wind energy (Regionales Raumentwicklungsprogramm Mecklenburgische Seenplatte) adoption of regional energy concepts (e.g. Regionales Entwicklungskonzept Südlicher Oberrhein)	direct democracy available
	granting of permits for wind, solar, biomass, geothermal, hydropower facilities (e.g. Pollution Control Permit, Building Permit)	direct democracy **not** available (administration decides)
Local	adoption of local land-use & zoning plans including goals and objectives for renewable energy development & designation of sites e.g. for wind or solar power	direct democracy available: e.g. Bavaria, Saxony, Thuringia direct democracy **not** available: e.g. Baden-Württemberg, North Rhine-Westphalia, Schleswig-Holstein
	adoption of local (renewable) energy concepts	direct democracy available
	decisions on selling or leasing locally owned lands for renewable energy projects	direct democracy available

4.2 Practice of direct democracy in relation to renewable energy deployment

4.2.1 *State level activity*

Until July 2012 in total 77 state referenda and initiatives have reached the circulation stage. Out of these 19 reached the status of a ballot vote (Mehr Demokratie e.V., 2012). None of these votes were related to renewable energy so far, meaning that on the state level direct democracy in practice has not have any substantial influence on renewable energy deployment until today.

Since April 2012 however, in Bavaria signatures are being gathered for a citizen initiative called "Pro sun – Bavaria for independent energy" *("Pro Sonne – Bayern für unabhängige Energie").* This initiative is proposing legislation to be adopted by the state that would support solar power deployment in Bavaria complementing the Federal Renewable Energy Sources Act. Furthermore the initiative, if adopted, would require the Bavarian state government to submit a proposal to the Federal Assembly *(Bundesrat)* on repealing recent amendments to the Renewable Energy Sources Act and implementing certain more ambitious goals the initiative has set (Pro Sonne, 2012). The initiative is largely supported by solar industry representatives and organizations.

4.2.2 *Local level activity*

On the local level, since 1994 until end of 2011, about 5,740 direct democracy cases have been initiated with about half reaching the stage of a ballot vote. This means that in the ca. 14,000 German municipalities per year about 250-300 proposals reach the circulation stage and about 120 local ballot votes take place (Mehr Demokratie e.V., 2010). Figure VI-3 shows the cumulative numbers of initiatives, referenda, and referrals for all states per year between 1994 and 2011 (grey graph). The trend shows after an increase in the mid-1990s (when several states enacted direct democracy regulations) and a subsequent drop at the turn of the century a slightly increasing number of local direct democracy cases over the last ten years.

With regard to renewable energy local direct democracy cases there has also been a rise in Germany with a steep increase from 2008 to 2009. From in average 5.9 cases annually between 1994 and 2005 the annual numbers rose incrementally since 2006 to 14 in 2008 (cf. Figure VI-3). After 2008 the following two years saw a rapid growth up to 40 (2009) and 39 (2010) cases thus increased more than threefold. In 2011 the number was slightly lower again with 32 cases accounting for 9% of the total number of cases, up from an annual average of 2% between 1994 and 2005. These numbers include all types of renewable energy technologies meaning wind power, solar power, biomass, hydropower, and geothermal power.

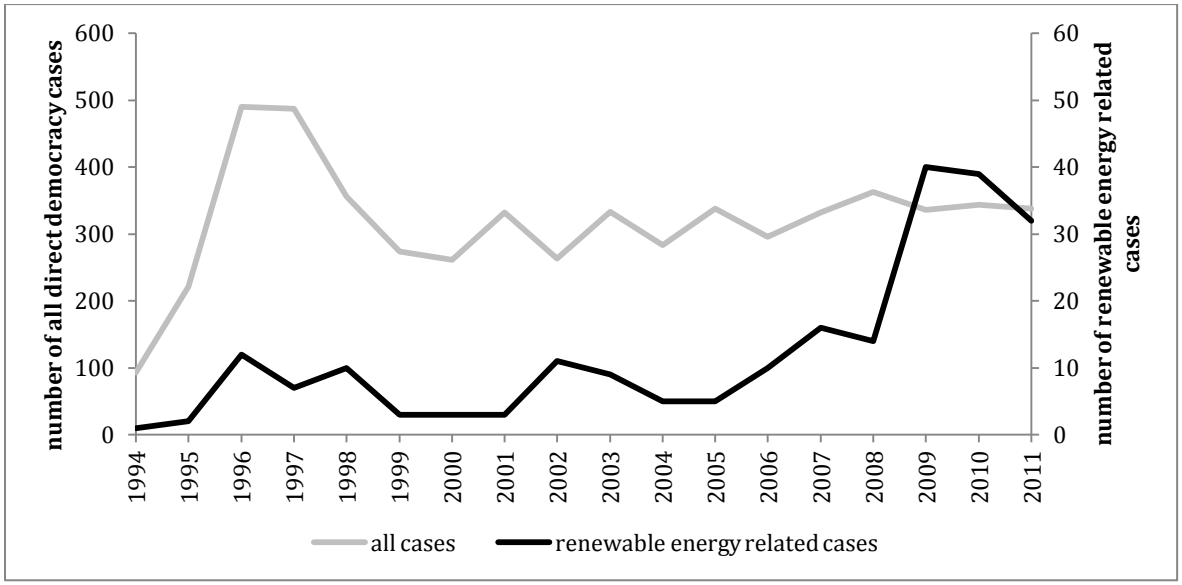

Figure VI-3. Number of renewable energy related cases of direct democracy (wind, solar, water, biomass, geothermal) in German states between 1994 and 2011 (n=222) and total number of all cases in this period (n=5,740) (Data: Datenbank Bürgerbegehren).

The geographical analysis shows that most of the renewable energy related direct democratic decisions are being made in only two states: Bavaria and Schleswig-Holstein. Figure VI-4 shows the number of renewable energy related direct democracy cases within the last eighteen years. The 100 cases in Bavaria account for about 45% of all cases and the 50 cases in Schleswig-Holstein for additional 23%. Comparing this with the number for all direct democracy cases, where Bavaria accounts for only 35% and Schleswig-Holstein for just about 6%, it becomes clear that in these two states direct democracy on renewable energy related cases occurs more often than the average suggests. For Bavaria the trend is comparable to the overall trend represented in Figure VI-3 with an increase from 2008 to 2009 where the number of cases doubled. In 2011 as well 10% of all direct democracy cases were renewable energy related. In Schleswig-Holstein the increase from 2008 to 2009 was even steeper from zero cases to 15 in 2009. Between 2009 and 2011 renewable energy related direct democracy cases accounted for about 40% of all cases in Schleswig-Holstein.

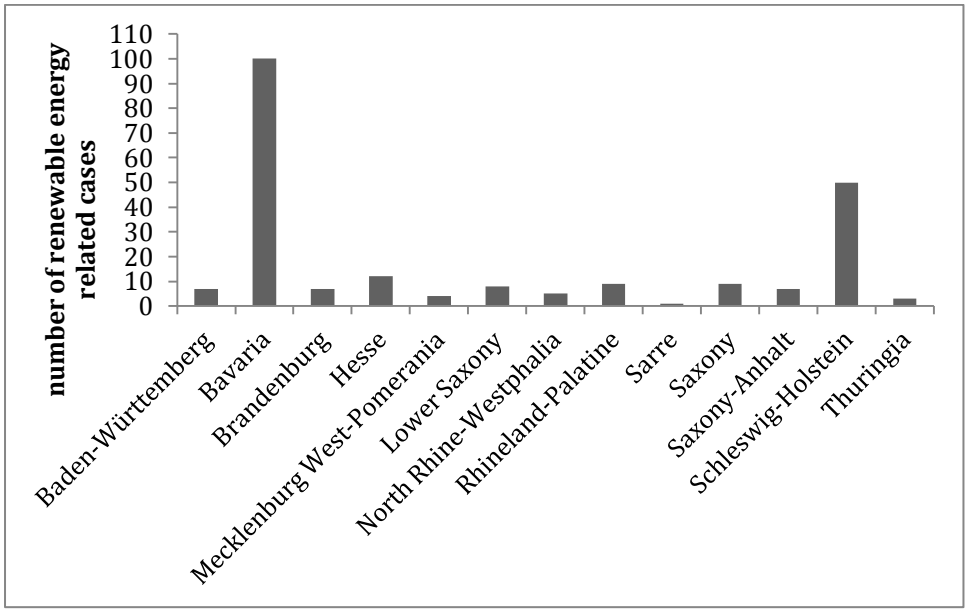

Figure VI-4. Number of initiatives, referenda, and referrals related to renewable energy projects per state between 1994 and 2011 (n=222). The city states Berlin, Bremen, and Hamburg have not seen any cases until 2011 (Data: Datenbank Bürgerbegehren).

The differentiation of the renewable energy projects according to the technology in Figure VI-5 shows that in almost all years since 1994 biomass and wind power related cases occurred whereas solar, water and geothermal projects were only in single years subject to direct democratic decision making with solar power increasing since about 2006. Regarding the total numbers, wind energy by far outnumbers the other technologies with 126 cases out of 222 (57%), followed by biomass with 52 (23%) and solar with 40 cases (18%). For the two states having most cases of renewable energy related direct democracy cases the situation differs considerably. While Bavaria has seen cases on all renewable energy technologies, in Schleswig-Holstein all of the cases dealt with wind power. Figure VI-5 furthermore illustrates the steep increase in cases from 2008 to 2009 showing that wind power cases rose from an annual average of 4.2 (1994-2008) to 20 cases in 2009 meaning a 15-fold increase compared to 2008 (3 cases). Most of these cases in 2009, 15 out of 20 occurred in Schleswig-Holstein. Besides wind power solar power as well saw a considerable increase of cases from 2008 to 2009 from 2 to 15, a 13-fold increase. All of these solar power cases in 2009 occurred in Bavaria. Together with two wind power and two biomass cases in Bavaria, the two states Schleswig-Holstein and Bavaria in 2009 accounted for 36 out of 41 renewable energy related direct democracy cases (88%) and thus the steep increase resulted in large part from activity in these two states.

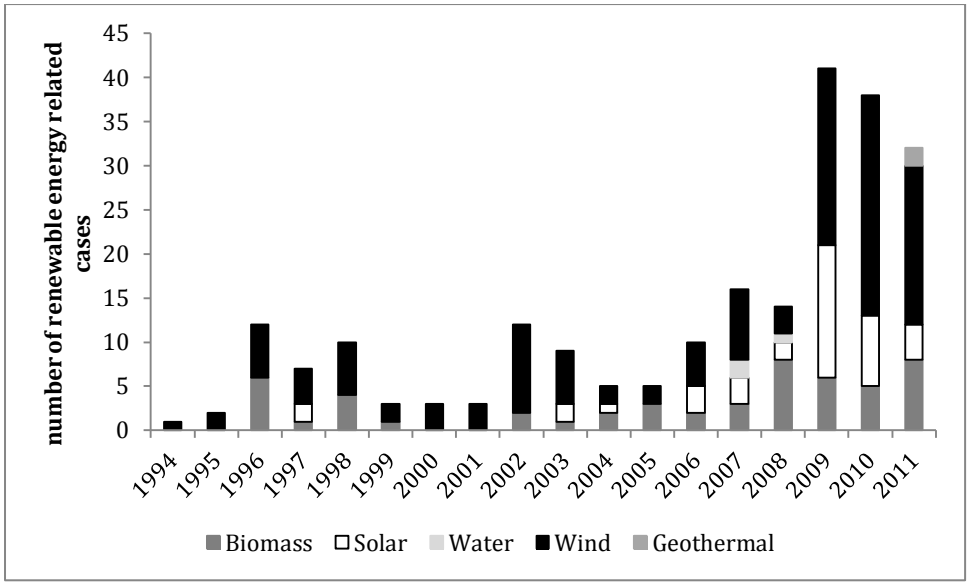

Figure VI-5. Renewable energy related direct democracy cases between 1994 and 2011 split into renewable energy technologies; n=222 (Data: Datenbank Bürgerbegehren).

The initiator of citizen decision making in the majority of cases is the public and only a small fraction is referred to the citizens for a vote by the local government. For the average over all cases Figure VI-6 shows that governmental referrals account for only about 14%, while for renewable energy related cases even less, about 10% are referrals. The largest shares in both groups are citizen referendums, meaning proposals aiming at amending an existing decision. In the case of renewable energy related decisions, citizen referendums are even more frequent than the average. On the other hand citizen initiatives, meaning agenda-setting proposals, occur in about 6% of all renewable energy related cases compared to the average of about 14%.

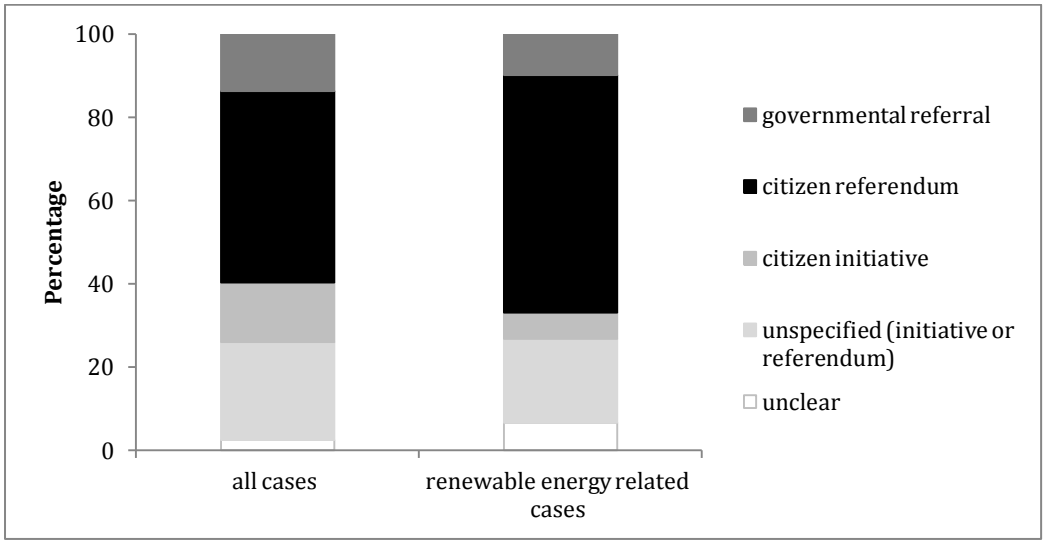

Figure VI-6. Type of citizen lawmaking – share amongst all cases and renewable energy related cases between 2004 and 2011 (Data: Datenbank Bürgerbegehren).

The following Figure VI-7 shows on the one hand the initial goal of the proposed decision and on the other hand the result of the process differentiating between proposals supporting renewable energy deployment and those being against renewable energy. For

some cases the information provided was not sufficient to determine the goal, as the exact wording of the proposal was not available.

Aiming against renewable energy in the first place were 71% of the cases with only 20% being supportive of renewable energy. However, not all of the 71% percent actually resulted in a decision against renewable energy. Only 39% of all renewable energy related cases actually resulted in a decision that was against renewables (Figure VI-7). The larger share 43% of the cases resulted in a decision pro renewables or at least not against them. This includes all possible options by which direct democracy attempts can be terminated as displayed in Figure VI-7, from a rejection after the signature gathering on legal grounds, adoption by the government, a citizen vote adopting or rejecting a proposal or the rejection of a proposal due to missing the approval quorum.

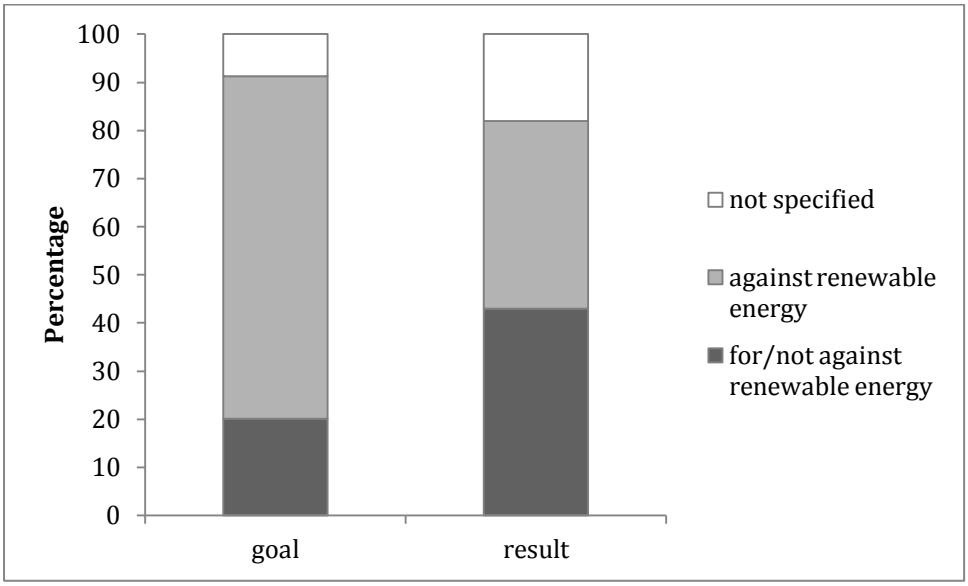

Figure VI-7. Initial goal and actual result (outcome) of the renewable energy related direct democracy cases in Germany between 1994 and 2011 (Data: Datenbank Bürgerbegehren and own research).

The majority of renewable energy cases against the development ask voters to decide whether or not a certain land-use or zoning designation for a specific planned renewable energy facility shall be repealed. Furthermore, cases have occurred where voters were asked to vote on a proposal on banning a certain type of renewable energy generation completely in the respective municipality. In single cases as well decisions of a local municipality to sell a piece of property for the construction e.g. of a bioenergy facility have been asked to be repealed by ballot vote.

The majority of renewable energy cases for the development of these uses called for the repeal of local decisions not allowing for renewable energy development and often suggested specific locations to be designated for renewable energy use.

5 Discussion

Due to the unavailability of direct democracy on the federal level in Germany, the strategic policies on the development of renewable energy have not been influenced by citizen legislations so far. However, the ongoing state level effort in Bavaria could, if

successful in initiating a ballot vote, indirectly influence federal policy. If the initiative could determine Bavaria's position in the Federal Assembly regarding the adoption of amendments to the Renewable Energy Sources Act, this might influence the further legislative process.

On the state level direct democracy on renewable energy topics is possible but so far has not resulted in any citizen vote. The reasons for this situation are not obvious but at least in some states energy related initiatives and referenda failed in the past due to high signature requirements. In the state of Brandenburg a citizen initiative called "no new open-cast mining in Brandenburg – for sustainable energy policy" ("Keine neuen Tagebaue in Brandenburg - für eine zukunftsfähige Energiepolitik") in 2008/2009 was initiated and the signature quorum of 80,000 signatures or 3.9% of the electorate in the circulation stage was not met. One obstacle was seen in the requirement that signatures could not be collected on the streets in Brandenburg (§ 17a Volksabstimmungsgesetz) but only in designated local governmental offices (Grüne Liga, 2009). In general signature and approval quorums and regulations in Germany are regarded rather restrictive in comparison to international practice (Schiller, 2012) and have been identified as negatively influencing the use of direct democracy before (Eder et al., 2008, Magin et al., 2008). However, ongoing discussions about lowering the quorums in several states could change this situation in the near future (for example North Rhine-Westphalia, Baden-Württemberg). Another reason at least for missing referenda revoking state decisions supporting renewable energy deployment might be the level of detail that state renewable energy policy and plans provide. The rather broad goals for renewable energy generation stated in state land-use development plans or energy concepts meet the public's general opinion on shifting towards renewable energy generation.[18] The situation on the state level compared to the local level with the majority of cases being referenda aiming against renewable energy projects (Figure VI-7), might be explained by the "value-action-gap" discussed for example by Blake (1999) and Nadai and van der Horst (2010). Although environmental and energy concerns are widespread, the willingness of citizens to adjust and change their lifestyle and habits is limited. Acceptance of climate change concerns and increased renewable energy generation exists, but there is reluctance to accepting renewable energy generation facilities in the neighborhood with trade-offs on landscape or land values etc. . The lack of state level direct democracy on renewable energy topics however, could also mean that policies and activities overall meet citizens' preferences and there is no need to become active. All these possible reasons however, require further empirical analysis to be confirmed or rejected.

The regulations for local referenda and initiatives in Germany vary considerably regarding the possibility of influencing renewable energy deployment. The exclusion of land-use planning and zoning from referenda and initiatives in several states affects the use of these means on renewable energy topics. Land-use planning and zoning decisions are in certain cases the only governmental decisions that are needed to realize renewable energy projects and thus the only point where public influence via direct democracy could

18 A public-opinion poll by TNS Infratest in 2011 revealed that 94 % of the German population regards the expansion of renewable energy generation as important (Agentur für Erneuerbare Energien e. V., 2012).

occur. Permit decisions being administrative and no parliamentary decisions generally cannot be addressed by direct democracy. The result is a very heterogeneous situation amongst German states regarding the usability of referenda and initiatives to influence renewable energy development. Still, the practice of renewable energy related direct democracy on the local level reveals an increase with a steep rise after 2008. This rapid growth was induced by the increase of direct democratic decision making on renewable power projects in two states only, Schleswig-Holstein and Bavaria. In Bavaria this development was concurrent with a large growth of solar power facilities with about 1,524 MW newly installed capacity in 2009 a growth of about 64% (Knoll, 2010). With the increase of solar projects requiring land-use plan amendments and zoning decisions in Bavaria, as well the use of initiative and referenda on solar projects grew. In other states with considerable, although still lower growth of solar power in 2009, as Baden-Württemberg or North Rhine-Westphalia however, initiatives and referenda were not used. One likely reason is the exemption of land-use planning and zoning from direct democracy in both states.

The high number of renewable energy related direct democracy cases in Schleswig-Holstein cannot directly be related to an increase of installed wind power capacity which did not increase above the average in 2009. Furthermore, as initiatives and referenda on land-use planning and zoning are excluded in Schleswig-Holstein direct democratic activity on the local level would rather not be expected to occur. The explanation for the large number of wind power initiatives, referenda, and referrals in Schleswig-Holstein since 2009 is found in the amendment of regional plans including designation of suitable wind power sites. Local government decisions related to this process became subject to direct democracy since 2009 as local governments were mandated by citizen votes to express support or objection to the draft regional plans in the official consultation process. In this case direct democracy was used to indirectly influence the renewable energy planning process on the regional level as no direct way (citizen votes on land use planning or project permitting) existed. This demonstrates that even in states which exclude land-use planning and zoning decisions from direct democracy, initiatives and referenda can be possible on decisions that set the frame for land-use plans. This effect was also described by Wickel and Zengerling (2010) in their analysis of the legislative regulations and court rulings on this topic.

In Schleswig-Holstein the use of direct democracy interacted with the official public participation process during the amendment of the regional plans. As most of the citizen votes occurred already before the consultations on the draft regional plans took place, one can conclude that the official public involvement occurred too late and citizens chose direct democracy as alternative means to express their concerns earlier in the process. Regarding this relation of direct democracy and other institutionalized or non-institutionalized public involvement processes further research would be of interest. It would be for example relevant to analyze whether the use of initiative and referendum can be regarded as indicator for deficient, too little or too late information and public involvement during the decision-making process. This analysis could include other fields

of direct democracy application with formalized planning and permitting procedures including public consultations such as traffic planning, urban development or waste management.

The variation in use of direct democracy on different renewable energy technologies and the dominance of wind power related direct democracy activity on the local level might be explained by the overall deployment of renewable energy in Germany (Figure VI-2). Wind power has the largest share of cumulative installed capacity as well as the largest annual growth. Solar and biomass power are the second and third in growth of installed facilities and capacity over the last years in Germany which as well is represented by the number of direct democracy cases. These explanations however, require further qualitative research into the explanatory factors for the initiation of renewable energy related initiatives, referenda, and referrals.

Overall the analysis of local level practice revealed the tendency that direct democracy is rather used to prevent renewable energy deployment (Figure VI-7). However, the specific reasons of citizens for using direct democracy could not be analyzed as this information was not provided for in the database. The focus of application was in the use of referenda (Figure VI-7) in order to repeal previous decisions aiming at facilitating realization of renewable energy development. Thus the "status-quo-bias" seems to be prevalent in the majority of local direct democracy application on renewable energy issues. Stadelmann-Steffen (2011) as well found such reluctance to changing the status quo, in her study however focusing on national climate change policy in Switzerland which cannot directly be compared to the local level activity here. Finding that such a status-quo-bias exists, however, does not allow concluding that in order to achieve the intended expansions of renewable energy generation in Germany direct democracy should be restricted as otherwise the needed investments would likely be hampered by citizens asserting their preference for maintaining the status quo. As Fischer (2010) concludes, allowing for direct democracy on future oriented projects requires intensive public discussion in order to change the valuation of the future in citizens' perception and overcome the status-quo-bias. The implication of the German situation studied here is that communication and discussion of the future benefits of the proposed developments might not have been sufficient in many cases. This might as well lend support to the earlier hypothesis that decision making processes and the involvement of the public are currently not adequately communicating the implications of the proposed actions and their importance for future development. Validation of this hypothesis would warrant further research.

A limitation of this analysis is that it was restricted to the direct effects of direct democracy on renewable energy policy and its implementation in Germany. A further consideration of the indirect effects such as the "credible threat" that direct democracy regulations impose (Fischer, 2010) in regions with experience in use of initiative and referenda would be of interest. As Fischer and Praetorius (2008) found for carbon capture and storage investments a reluctance to invest in this technology amongst energy companies because of anticipated public protests, the increasing use of initiative and referendum on renewable energy deployment in certain regions might influence

investment decisions as well. Or the possibility of initiatives and referenda might change investor's routines in project development and management towards more inclusive and consensus oriented collaborative decision making approaches. Such an anticipative behavior resulting from experience with direct democracy at least could be confirmed by Stadelmann-Steffen (2011) for Swiss parliamentary activity with regard to climate change policy.

6 Conclusions

The aim of this paper has been to analyze and discuss the opportunities and use of direct democracy in renewable energy policy adoption and implementation in Germany.

The study revealed that direct democracy in Germany does play a role in the deployment of renewable energy generation technologies. With an increasing number of cases on the local level in the last years a trend to a more frequent use of initiative, referendum, and referral on wind, solar, biomass, water, and geothermal power plant projects could be stated. However, the direct impact of this development on the deployment of renewable energy technologies remains rather limited so far. With no direct democracy activity on renewable energy policy on federal and state level the influence of direct democracy on high level policies, plans, and legislation is not given in Germany. On the federal level this is clearly due to the unavailability of direct democracy for federal level decisions in Germany. On the state level no clear reason for the lack of initiatives and referenda on renewable energy issues could be identified. The high requirements for initiating ballot votes in some states might have an impact.

The reasons for local level occurrence of initiatives, referenda, and referrals are not clear and pose further research needs. In particular the relation and interaction between direct democratic decision-making and public involvement in formalized planning and permitting processes warrants further consideration.

With renewable energy policies however, aiming at further increasing the installed capacity the role of direct democracy in renewable energy deployment might get larger. In particular in states like Bavaria where wind power development is just commencing, the influence on planning decisions might increasingly being influenced by direct democracy. Furthermore, the international situation for example in eastern European countries like Hungary and Czech Republic as presented by Smith (2012) reveals that also beyond Germany direct democracy is increasingly being used in biomass and wind power decision making. Further research therefore on the direct and indirect effects of direct democracy on renewable energy deployment is warranted.

References

Agentur für Erneuerbare Energien e. V., 2012. Akzeptanz Erneuerbarer Energien in der deutschen Bevölkerung, Bundesländergenaue Ergebnisse einer repräsentativen Umfrage von TNS Infratest im Auftrag der Agentur für Erneuerbare Energien. http://www.unendlich-viel-energie.de/uploads/media/56_Renews_Spezial_Akzeptanzumfrage_2011_online.pdf (accessed 4 April 2012).

Agterbosch, S., Meertens, R.M., Vermeulen, W.J.V., 2009. The relative importance of social and institutional conditions in the planning of wind power projects. Renewable and Sustainable Energy Reviews, 13, 393-405.

Aguiar-Conraria, L., Magalhães,P.C., 2010. Referendum design, quorum rules and turnout. Public Choice, 144, 63-81.

BDEW (Bundesverband der Energie- und Wasserwirtschaft e.V.), 2012. Erneuerbare Energien liefern mehr als ein Viertel des Stroms. http://www.bdew.de/internet.nsf/id/20120726-pi-erneuerbare-energien-liefern-mehr-als-ein-viertel-des-stroms-de (accessed 8 August 2012).

Bird, L., Bolinger, M., Gagliano, T., Wiser, R., Brown, M., Parson, B., 2005. Policies and market factors driving wind power development in the United States. Energy Policy, 33, 1397-1407.

Blake, J., 1999. Overcoming the 'value-action-gap' in environmental policy: tensions between national policy and local experience. Local Environment, 4 (3), 257-278.

BMU (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit), 2012a. Zeitreihen zur Entwicklung der erneuerbaren Energien in Deutschland. http://www.erneuerbare-energien.de/erneuerbare_energien/datenservice/zeitreihen/doc/45919.php (accessed 9 July 2012).

Bogumil, J., 2001. Neue Formen der Bürgerbeteiligung an kommunalen Entscheidungsprozessen – Kooperative Demokratie auf dem Vormarsch!? Vortrag auf der Fachkonferenz „Stadt und Bürger" des Deutschen Städtetages am 01.03.2001 in Kassel.

Bruns, E., Ohlhorst, D., Wenzel, B., Köppel, J., 2011. Renewable Energies in Germany's Electricity Market. A Biography of the Innovation Process, Springer Verlag, Heidelberg.

Bundesregierung, 2010. Energiekonzept für eine umweltschonende, zuverlässige und bezahlbare Energieversorgung. http://www.bundesregierung.de/Content/DE/_Anlagen/2012/02/energiekonzept-final.pdf?__blob=publicationFile (accessed 6 February 2012).

Carley S., 2009. State renewable energy electricity policies: An empirical evaluation of effectiveness. Energy Policy, 37, 3071–3081.

Eder C., Vatter A., Freitag M., 2009. Institutional Design and the Use of Direct Democracy: Evidence from the German Länder. West European Politics, 32(3), 611-633.

Feld, L.P., 2006. Ökonomische Auswirkungen direkter Demokratie, in: Hirscher, G., Huber, R. (Eds.), Aktive Bürgergesellschaft durch bundesweite Volksentscheide? Direkte Demokratie in der Diskussion. München (Argumente und Materialien zum Zeitgeschehen, 46), pp. 89–106.

Feld, L.P., Kirchgässner, G., 2009. Wirkungen direkter Demokratie – Was sagt die moderne politische Ökonomie?, in: Heußner, H.K., Jung, O. (Eds.), Mehr direkte Demokratie wagen. Volksentscheid und Bürgerentscheid: Geschichte | Praxis | Vorschläge, second ed. Olzog Verlag, München, pp. 417-30.

Firestone, J., Kempton, W., 2007. Public opinion about large offshore wind power: Underlying factors. Energy Policy, 35, 1584-1598.

Firestone, J., Kempton, W., Krueger, A., 2009. Public Acceptance of Offshore Wind Power Projects in the USA. Wind Energy, 12(2), 183-202.

Fischer, C., Praetorius, B., 2008. Carbon capture and storage: settling the German coal vs. climate change dispute? International Journal of Environmental Technology and Management, 9 (2-3), 176-203.

Fischer, J.A.V., 2010. Stuttgart 21: Mit direkter Demokratie aus der Sackgasse?. Wochenbericht des DIW Berlin, 51-52, 19-25.

Fischlein, M., Larson, J., Hall, D. M., Chaudhry, R., Peterson, T. R., Stephens, J. C., Wilson, E. J., 2010. Policy stakeholders and development of wind power in the sub-national context: A comparison of four U.S. states. Energy Policy, 38, 4429-4439.

Fraunhofer IWES, 2012. Windmonitor. Installierte Windleistung in Deutschland. http://windmonitor.iwes.fraunhofer.de/windwebdad/www_reisi_page_new.show_page?page_nr=363&lang=de (accessed 1 August 2012).

Freitag, M., Vatter, A., 2006. Initiatives, Referendums, and the Tax State. Journal of European Public Policy, 13, 89-112.

Fthenakis, V., Mason, J.E., Zweibel, K., 2009. The technical, geographical, and economical feasibility for solar energy to supply the energy needs of the US. Energy Policy, 37 (2), 387–399.

Gebhart, T., 2002. Direkte Demokratie und Umweltpolitik. Wiesbaden: Deutscher Universitätsverlag.

Gerber, E.R., Phillips, J.H., 2003. Development Ballot Measures, Interest Group Endorsement, and the Political Geography of Growth Preferences. American Journal of Political Science, 47, 625-39.

Gerber, E.R., Phillips, J.H., 2004. Direct Democracy and Land Use Policy: Exchanging Public Goods for Development Rights. Urban Studies, 41 (2), 463-79.

Gerber, E.R., Phillips, J.H., 2005. Evaluating the Effects of Direct Democracy on Public Policy: California's Urban Growth Boundaries. American Politics Research, 33, 310-30.

Grüne Liga, 2009. Volksbegehren "Keine neuen Tagebaue in Brandenburg - für eine zukunftsfähige Energiepolitik". http://www.lausitzer-braunkohle.de/volksini.php (accessed 18 July 2012).

Heußner, H. K., 2006. Aktive Bürgergesellschaft durch bundesweite Volksentscheide? Erfahrungen aus dem Ausland: Das Beispiel USA. in: Hirscher, G., Huber, R. (Eds.), Aktive Bürgergesellschaft durch bundesweite Volksentscheide? Direkte Demokratie in der Diskussion. (Argumente und Materialien zum Zeitgeschehen, 46) München, pp. 37–60.

Jänicke, M., 1992. Conditions for environmental policy success: an international comparison. The Environmentalist, 12 (1), 47-58.

Jung, O., 2006. Ja zum bundesweiten Volksentscheid in Deutschland. in: Hirscher, G., Huber, R. (Eds.), Aktive Bürgergesellschaft durch bundesweite Volksentscheide? Direkte Demokratie in der Diskussion. (Argumente und Materialien zum Zeitgeschehen, 46) München, pp. 15–23.

Howell-Moroney, M., 2004: What Are the Determinants of Open-Space Ballot Measures? An Extension of the Research. Social Science Quarterly, 85 (1): 169–79.

Kotchen, M., Powers, S., 2006. Explaining the appearance and success of voter referenda for open-space conservation. Journal of Environmental Economics and Management, 52: 373-90.

Kirchgässner, G., 2007. The Status Quo Bias in Direct Democracy: Empirical Results for Switzerland, 1981 – 1999. Paper presented at the World Meeting of the Public Choice Societies, Amsterdam, March 30, 2007.

Kirchgässner, G., Feld, L. P., Savioz, M., 1999. Die direkte Demokratie. Modern, erfolgreich, entwicklungs- und exportfähig. München: Helbing & Lichtenhahn; Vahlen.

Klinski, S., 2005. Überblick über die Zulassung von Anlagen zur Nutzung Erneuerbarer Energien. http://www.clearingstelle-eeg.de/files/private/active/0/Klinski_Genehmigungsrechtliche_Anforderungen_2005.pdf (accessed 10 April 2012).

Knoll, B., 2010. Wachstum wie erwartet. 3,87 Gigawatt neuer Solaranlagen im Jahr 2009 deckten Strombedarf von über einer Million Deutschen. Photon, September 2010, 22-23.

Langniss, O., Wiser, R., 2003. The renewable portfolio standard in Texas: an early assessment. Energy Policy, 31, 527-535.

Magin R., Eder C., Vatter A., 2008. Direkte Demokratie in den Bundesländern. Ein Vergleich der Institutionen und Anwendungsmuster. in: Hildebrandt A., Wolf F. (Eds.), 2008, Die Politik der Bundesländer. Staatstätigkeit im Vergleich. Verlag für Sozialwissenschaften, Wiesbaden, 345-362.

Mehr Demokratie e.V., 2010. Volksentscheids-Ranking 2010. http://www.mehr-demokratie.de/fileadmin/md/pdf/bund/berichte/2010-ranking-mehr-demokratie.pdf (accessed 6 February 2012).

Menz, F. C., Vachon, S., 2006. The effectiveness of different policy regimes for promoting wind power: Experiences from the states. Energy Policy, 34, 1786-1796.

Nadai, A., van der Horst, D., 2010, Wind power planning, landscapes and publics. Editorial. Land Use Policy, 27, 181-184.Nelson, E., Uwasu, M., Polasky, S., 2007. Voting on open-space: What explains the appearance and support of municipal-level open space conservation referenda in the United States? Ecological Economics, 62: 580-93.

Niedermayer, O., 2005. Bürger und Politik: Politische Orientierungen und Verhaltensweisen der Deutschen, second ed., VS Verlag: Wiesbaden.

Pro Sonne, 2012. Startschuss Bürgerbegehren für mehr Photovoltaik. Pressemitteilung. http://www.pro-sonne-bayern.de/uploads/tx_lbrcontentlayout/pi7/12.04.23_Volksbegehren_Pressemitteilung_final.pdf (accessed 9 July 2012).

Rabe, B. G., 2006. Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards. Arlington, VA, U.S.: PEW Center on Global Climate Change.

Roth, R., 1997. Die Kommune als Ort der Bürgerbeteiligung. in: Klein, A., Schmalz-Bruns, R. (Eds.), Politische Beteiligung und Bürgerengagement in Deutschland. Möglichkeiten und Grenzen. Bonn: Bundeszentrale für politische Bildung, pp. 404-47.

Schiller, T., 2011a. Local direct democracy in Europe – a comparative overview. in: Schiller, T. (Eds.), Local Direct Democracy in Europe. Wiesbaden: VS Verlag für Sozialwissenschaften / Springer Fachmedien Wiesbaden GmbH Wiesbaden, pp. 9-29.

Schiller, T., 2011b. Local direct democracy in Germany – varieties in a federal states. in: Schiller, T. (Eds.), Local Direct Democracy in Europe. Wiesbaden: VS Verlag für Sozialwissenschaften / Springer Fachmedien Wiesbaden GmbH Wiesbaden, pp. 54-74.

Schiller, T., 2012. Initiative Instruments in Germany: Variations in Regional States. in: Setälä, M., Schiller, T. (ed.) 2012, Citizen's Initiatives in Europe. Procedures and Consequences of Agenda-Setting by Citizens. Palgrave Macmillan, pp. 89-112.

Smith, M.L., 2012. Wind Power and Biomass Referendums in the Czech Republic and Hungary. Presentation at the International Symposium Environmental Impacts of Direct Democracy, 21-23 March 2012, Berlin.

Solecki, W.D., Mason, R.J., Martin, S., 2004. The Geography of Support for Open-Space Initiatives: A Case Study of New Jersey's 1998 Ballot Measure. Social Science Quarterly, 85 (3): 625–38.

Stadelmann-Steffen, I., 2011. Citizens as veto players: climate change policy and the constraints of direct democracy. Environmental Politics, 20 (4), 485–507.

Steinberg, R., 2011. Die Bewältigung von Infrastrukturvorhaben durch Verwaltungsverfahren – Eine Bilanz. Zeitschrift für Umweltrecht 7-8, 340-350.

Vatter, A., Freitag, M., 2002. Die Janusköpfigkeit von Verhandlungsdemokratien. Zur Wirkung von Konkordanz, direkter Demokratie und dezentralen Entscheidungsstrukturen auf den öffentlichen Sektor der Schweizer Kantone. Schweizerische Zeitschrift für Politikwissenschaft, 8, 53–80.

Wickel, M., Zengerling, C., 2010. Beeinflussung der gemeindlichen Bauleitplanung durch Bürgerentscheide - Möglichkeiten und Grenzen, NordÖR, 3: 91-7.

Wiegand, H.-J., 2006. Direktdemokratische Elemente in der deutschen Verfassungsgeschichte. Berlin: BWV Berliner Wiss.-Verl. (Juristische Zeitgeschichte : Abt. 1, Allgemeine Reihe, Bd. 20).

Wolsink, M., 2007. Wind power implementation: The nature of public attitudes: Equity and fairness instead of 'backyard motives'. Renewable and Sustainable Energy Reviews, 11, 1188–1207.

Wolsink, M., 2010. Near-shore wind power - Protected seascapes, environmentalists' attitudes, and the technocratic planning perspective. Land Use Policy, 27, 195-203.

Chapter VII
Conclusions and Outlook

1 Introduction

This PhD thesis has been focused on the role of environmental assessment in renewable energy diffusion in Germany and the US.

The first part of this chapter (Section 2) draws conclusions by summarizing the previous chapters. The research questions that were presented in Chapter I will be answered. In the following part of this chapter (Section 3), hypotheses and future research needs are being outlined.

2 Conclusions

2.1 Environmental Assessment Regulations in Renewable Energy Diffusion

Question 1: How is EA regulated in the US and Germany in the field of renewable energy diffusion? What are differences and similarities and mutual strengths or shortcomings?

The analysis of the regulatory system in the US and Germany governing environmental assessment reveals large similarities regarding the process and the contents of the instrument (Chapter IV). One major difference is that the US NEPA requires EAs for projects, plans, programs, and policies, whereas in Germany policies are not covered by the EIA Act. The German EIA Act is a direct implementation of the EU directive on SEA, which does not cover policies (cf. Chapter IV). Thus, renewable energy concepts and strategies are not subject to EA in Germany.

Furthermore, due to the limitation of the NEPA to federal actions in the US, and the large variation in state level regulations on impact assessment, major differences in the reach of impact assessments exist compared to Germany. Whereas in Germany the characteristics of a proposed action, e.g. the type of technology or the size of a project, determine the applicability of the environmental assessment regulations, in the US the characteristics and the ownership of the site of the proposed action determines whether and which (federal and/or state) environmental assessment regulations may apply.

In summary, this implies that in Germany renewable energy diffusion faces the same regulatory conditions and standards regarding environmental assessment procedures all over the country. This provides for a degree of predictability and certainty for actors involved in renewable energy technology diffusion. In the US, however, the standards differ considerably: from no requirement for environmental assessment in certain places, to EAs according to federal regulations, and/or EAs according to state regulations in other places. The situation, that even both regulatory contexts from state and federal level might apply to one proposed renewable energy activity and that these are not necessarily coordinated, implies a greater complexity and less clarity and predictability for actors (cf. Chapter IV). Additionally, in the US it is not ensured for all renewable energy projects that have significant impacts on the environment, that these are assessed and considered

in the decision making. However, this is the case in Germany because the EIA Act applies uniformly.[19]

A major question resulting from these findings concerns the impact these differences in the regulatory system have on the diffusion of renewable energy technologies. This is further elaborated in Section 3.1 below.

2.2 Environmental Assessment Practice in Renewable Energy Diffusion

Question 2: How do Germany and the US cope with the specific challenges of renewable energy diffusion in environmental assessment practice? What are respective strengths and weaknesses?

The special challenges that renewable energy technology diffusion poses compared to traditional energy development, have been outlined in Section 3 of Chapter I.

The decentralized allocation of many renewable energy generation facilities can result in landscape-level changes to the hosting environment, compared to rather spatially confined, single location changes occurring from traditional energy generation facilities. The fact that renewable energy technologies have spatially wide spread effects in average and the possible accumulation of impacts from a large number of individual projects should be addressed in EA practice in renewable energy diffusion. Furthermore, the possible positive and negative effects of renewable energy technologies need to be considered equally in EA practice in order to allow decision makers to choose the right options which would result in least environmental harm.

With these specific challenges from renewable energy diffusion the strategic level of impact assessments has been identified as being in particular relevant (cf. Chapter V). On the strategic level the consideration of cumulative effects of several proposed actions as well as the discussion and comparison of different alternatives and their respective impacts can be better realized compared to the project level. Therefore the focus of the analysis of the EA practice in Germany and the US in renewable energy diffusion has been on strategic environmental impact assessments.

The analysis of SEAs conducted for renewable energy plans, programs and policies in the US and Germany revealed in particular weaknesses of the German practice. The lack of meaningful assessment of alternatives and cumulative effects in the German SEAs that have been studied is a major deficiency (Chapter V).

The US cases instead included the assessment of different alternatives and could thus have an influence on the finally adopted plans, programs and policies. Also cumulative effects combining the effects from the proposed action and already existing or foreseeable activities have been systematically considered. The SEA practice in the US regarding the cumulative effects assessment was informed by detailed guidelines establishing standards for implementation.

[19] The practice in Germany shows however, that in the case of wind farms numerous projects are realized without a full EIA as significant impacts on the environment are ruled out in the screening process and thus the preconditions for an EIA are not given.

The special relevance of cumulative effects from renewable energy technology diffusion together with other activities affecting certain species has been proven by several authors recently (e.g. Voigt et al. 2012). The assessment of population-level cumulative impacts from a resource-centered perspective thus is of special importance. This supports the strong need for improvement on this topic for EA practice in Germany.

Besides these differences, in both the US and Germany it became evident that improvements are needed with regard to policy level SEAs on the highest decision making tiers. The assessment of impacts of legislations, regulations, strategic concepts and policies regarding renewable energy diffusion has in both countries not been conducted systematically. This lack of policy level SEA making in the US has already been stated by Clark et al. (2011) for all fields of NEPA application, thus the practice in renewable energy diffusion does not differ.

Whereas in the US the legal regulations for environmental assessment (NEPA) also apply to these high level decision making activities and policy SEAs should be carried out, in Germany even the legal regulations (EIA Act) do not require policy SEAs. Thus, while in the US the environmental assessment practice needs to be changed to include policy SEAs, in Germany first the legal regulations would likely need to be amended to include policies besides plans and programs before such assessments would be carried out in practice (cf. Chapter V).

Related to the call for strategic EAs is the idea to have a tiered environmental assessment system where subsequent project level assessments might benefit from the earlier SEAs. The project level EAs would only need to deal with additional topics which have not been addressed on the SEA level and could optimally be realized faster and less cost intensive. Spengle (2011) regards this tiering approach as specifically useful for renewable energy diffusion as with SEAs identifying suitable and unsuitable locations for renewable energy development, on the project level projects proposed on such suitable sites likely would not need to go through the complete EIA process. Such projects could be realized undergoing the shorter process of an Environmental Assessment under NEPA if occurrence of significant environmental impacts has been avoided by the previous strategic site selection. This could result in saving time and money on the side of renewable energy investors. Salter (2011) as well regards this use of EAs for renewable energy projects as generally appropriate and calls for their intensified use in combination with mitigated FONSIs (cf. Chapter II for general information on the concept of EA and FONSI in the NEPA process). This approach would foster the goal of avoidance and minimization of negative impacts in order to reach the level of non-significance and would allow omitting a full EIA process.[20]

However, Spengle (2011) concludes that the current EA practice in the US is not meeting this concept. From the analysis of the Wind Energy Programmatic EIS terminated in 2005 he concludes that this PEIS failed in reducing effort of impact assessments on the project

[20] With this approach however, the question of the implementation of endangered species regulations and the respective permits has not been addressed. Whether a similarly tiered approach would be viable for those interests requires further discussions.

level as in almost all subsequent wind power projects full EIAs had been conducted. For Germany no information on the impact of SEAs on subsequent project EIAs is available. However, as no EA process comparable to the US one exists, the impact could only be measured by the level of detail and the scope of the project EIA that has been conducted.

The often apparent "green against green" conflict (climate protection vs. biodiversity conservation) in realizing renewable energy technology diffusion is another specific challenge that needs to be considered in environmental assessments. In a case study on the interplay between biodiversity and climate change regimes Kim (2004) concludes that environmental assessments might be an adequate means of dealing with such regime interplay.[21] As one goal of environmental assessments is to inform decision makers about the likely consequences of a proposed activity on the environment both negative and positive effects on the environment need to be considered. The need for change in environmental assessments for renewable energy actions thus lays in the inclusion of likely positive impacts on the global climate and an integrative consideration of all environmental concerns. Scrase & Sheate (2002) label this "integration across environmental media".

This integration of negative and positive impacts on all environmental media in environmental assessments for renewable energy activities does not require any regulatory change in both the US and the German environmental assessment legislations. In both regulatory systems the global climate is covered as part of the environmental assets to be included in the environmental assessment. Also the consideration of both negative as well as positive effects on the environment in environmental assessments is intended by the US and the German legislations. Therefore no legislative amendments are required but changes in their understanding and implementation by the relevant authorities and stakeholders in practice. For the US Salter (2011) argues in the same direction when calling for a "reinterpretation of NEPA" by federal agencies when dealing with renewable energy diffusion. Thaler (2012) argues that it is needed to "evolve NEPA from a statute that only looks at the costs of doing something, to a statute that also looks at the costs of doing nothing in the face of climate-driven need for more GHG emission-free electricity generation". He points to the need for re-focusing NEPA and the environmental assessment process and stresses the importance of guidelines for the consideration of climate change impacts in EAs. Some US states already have acted in this regard and have developed EA guidelines on climate impact consideration as summarized by Geißler et al. (2011). A US federal level guideline so far only exists as a draft published by the CEQ but has not been adopted up to now.

In Germany there has been even less involvement with the issue of climate impact assessment in EA and no guidance exists (Geißler et al. 2011). The draft amendment of the European EIA-Directive however, includes the proposal to explicitly include climate

[21] Kim (2004) analyzed the likely effects of the interplay of biodiversity and climate change goals in forests. He points out that in designing carbon-sequestration projects (e.g. reforestation or afforestation) the competing goals of biodiversity conservation and greenhouse gas emission reduction need to be considered and adequately addressed. He sees environmental impact assessments as the approach to deal with such situations.

change into the list of subjects that need to be addressed in EIAs (Art. 3, European Commission 2012). If this change of the EIA-Directive in the end should be adopted, Germany would be required to implement this change into their national legislation as well. In comparison to the US this inclusion of climate change impacts in EA would then occur top-down from European to German legislation whereas in the US rather individual states meaning the subnational level moved ahead.

Major questions resulting from these conclusions are whether the strengths of the US EA practice identified here could be transferred to Germany and more general how cross-national knowledge transfer and learning from best practice could be realized in making environmental assessments apt for challenges of renewable energy diffusion. This topic will be further discussed in Section 3.2 below.

2.3 Public Participation in Renewable Energy Diffusion

Question 3: How do Germany and the US realize participation in renewable energy diffusion? How is the relation of public involvement in EA and other forms of public participation?

In both the US and Germany public participation is part of the EA processes. The publication of the environmental impact study or report, the opportunity for review of these documents by the public and the consideration of comments from the public in the final decision making are steps both countries' EA regulations allow for. In the US however, even before the environmental impact study or report are prepared the public is informed about the start of the EA process by public notice and can voice comments in the scoping process. This early public involvement from the start of the EA is not required by the German EIA Act and does not occur in practice either. Thus, there is major difference regarding the timing of the involvement of the public (cf. Chapter II and Chapter V). Furthermore, the analysis of strategic impact assessments on renewable energy diffusion in Chapter V reveals differences in the practice of information provisioning in EAs between the US and Germany. Here as well the US showed a better performance than Germany which is as well supported by findings from Odparlik et al. (in press).

In the case of Germany the need for changes to a more open and transparent EA process can be concluded. The legalistic and corporatist tradition as described by Dryzek et al. (2002) is still tangible in the current practice of public involvement in EA. Although first steps towards more and earlier public involvement of the public are taken, these are not sufficient. The recently adopted legislation on the enhancement of public involvement[22] aims at more timely involvement of the public in permitting processes. However, this act does not require such early public involvement but only asks the permitting agencies to promote the use of early public involvement amongst investors seeking permits. Thus, the notification and involvement of the public from the start of the permitting process still is a voluntary action depending on the willingness of the investor.

[22] Gesetzes zur Verbesserung der Öffentlichkeitsbeteiligung und Vereinheitlichung von Planfeststellungsverfahren (PlVereinhG)

Due to the differences in scope of EA regulations in the US as outlined in 0, however, public involvement is not guaranteed to occur in every renewable energy project. As not all renewable energy diffusion activities in the US involve EAs (reach of NEPA and availability of state regulations), projects in certain states such as for example Texas can be realized without any public involvement. In contrast in Germany, where EA regulations apply uniformly to renewable energy diffusion activities all over the country, public involvement in these cases is guaranteed to occur (cf. Chapter IV). Thus, in the US while the overall practice of public participation in EA when taking place is good compared to Germany, changes are needed to enable citizens to be involved equally in all states in renewable energy diffusion activities.

Thus, both countries exhibit certain strengths as well as weaknesses in public participation in EA in renewable energy diffusion.

Besides formalized public involvement during EA processes also other mechanisms such as direct democracy have been involved in renewable energy diffusion in the US and Germany (cf. Chapter VI and Geißler 2013). Influencing decisions in renewable energy diffusion by citizen votes has been identified as being possible on state and local level in both countries. The analysis of the practical use revealed however, that so far in Germany on state level no citizen votes on renewable energy topics have occurred (Chapter VI) whereas in several states in the US this had played an important role (Geißler 2013, Rabe 2008, 2006, Simmons et al. 2013).

On the local level in both the US and Germany some states have been found where direct democracy in decision making on renewable energy activities was rather frequently used (Chapter VI and Geißler 2013). And again similarly in both countries local ballot votes on renewable energy projects were rather used to oppose and stop these activities providing support to the hypothesis that status quo bias is involved in such decision making. In the states exhibiting direct democracy activity against renewable energy projects on the local level these activities however, did not endanger the achievement of renewable energy policy goals. Still enough projects were successful so that no significant influence could be stated. However, with increasing numbers of citizen votes on renewable energy activities on the local level the situation might change in the future and further consideration of this form of public participation in renewable energy diffusion is of relevance. Besides the direct effects of citizen votes and other forms of public involvement, the indirect effects might have an influence; this however has not been examined in this thesis and remains an open question and a possible field of further research. Possible options for further research into the role of the “credible threat” of public participation in renewable energy diffusion will be discussed in Section 3.1 below.

From the research in Chapter VI furthermore the hypothesis was generated that a relation between direct democracy and other forms of public participation such as public consultations in EAs exists. One relevant question in this regard is whether deficient public involvement in permitting and planning processes and EAs triggers a turn of citizens to direct democracy for influencing decisions? Answering this question would require a detailed analysis of cases in which direct democracy occurred to be able to

identify the reasons for citizens to make use of this instrument. The results of such analyses could be relevant for decision makers and investors in renewable energy diffusion in designing public participation processes that are likely to prevent public opposition and focus more on collaborative decision making and consensus.

3 Outlook on Future Research

A goal of this dissertation was to generate hypotheses and questions for further research. Based on the previous discussion of conclusions of this thesis two aspects have been identified as being in particular relevant for future studies. These two topics will be discussed in more detail in the following sections.

3.1 Measuring the Influence of Environmental Assessment in Renewable Energy Diffusion

The first field for further detailed research would be the characterization of the role of environmental assessment in renewable energy technology diffusion and its validation by qualitative means.

It could be confirmed by the research of this PhD thesis that environmental assessments are required for renewable energy deployment activities in both the US and Germany and as well that there exists a practice of environmental assessments in renewable energy diffusion. However, it remains unclear which direct and indirect effects environmental assessments exactly have on renewable energy diffusion.

Questions would be for example:

Direct effects

- In how many cases have renewable energy projects not been permitted on the grounds of an EA? What have been the reasons for denial?
- Did mitigation requirements resulting from EAs lead to the abandoning of proposed projects by investors?
- Is the number of renewable energy projects not realized due to findings of the EAs significant in terms of renewable energy policy goals?

Indirect effects

- How does environmental assessment influence investors' choices of project locations for renewable energy projects?
- Does uncertainty regarding the applicability of environmental assessment regulations to a renewable energy proposal negatively influence the diffusion process? Can it be verified that locations with clear and streamlined environmental assessment processes are favored by investors compared to rather complex and fragmented processes or are other factors more relevant?
- Do strategic level impact assessments positively influence the diffusion of renewable energy technologies by providing planning certainty to investors? Do investors consider results of SEAs in their decision making?

- Does the "credible threat" of direct democracy but as well of public resistance and opposition in general (social and public acceptance) impact renewable energy investment decisions?

The second set of questions on the indirect effect ties in with results of Lüthi (2010), Lüthi & Prässler (2011), and Lüthi & Wüstenhagen (2012) but would need to focus more closely on the details of impact assessments in investor's decision making. A more disaggregated analysis of the role of administrative decision making processes for investors' decisions would be needed. This would mean to build upon models such as the one employed by Lüthi & Prässler (2011) and develop and detail the aspect of "permitting costs" further. Besides the indicator of "administrative process duration" which these authors considered, further attributes and their influence on investment decisions for a certain renewable energy project location should be included. Table VII-1 provides a first collection of likely relevant indicators to be included in such an extended model of decision making processes of renewable energy investors for or against certain locations.

Table VII-1. Possible indicators for inclusion in a model for the decision making process on renewable energy project locations and rationale for relevance of the respective indicators (table structure based on Lüthi & Prässler 2011).

Indicator/Attribute	Rationale
existence of any EA legislation requiring EIA/SEA for renewable energy projects	could mean additional costs for compliance with regulations compared to no EA
existence of several national, state, local level EA regulations likely applying to renewable energy projects	could mean additional costs for managing multiple regulations compared to just one
existence of strategic plan or program and SEA providing initial screening of sites and/or designation of suitable or non-suitable areas	providing planning certainty, reduced efforts for investors in site screening, possibly reduced effort in project EAs
existence of previous successful renewable energy EA cases	can provide for confidence in agencies
existence of a one-stop permission process	providing predictability of required documents and responsibilities, reducing costs for managing multiple processes
existence of EA guidance for renewable energy diffusion	providing predictability of required assessments and responsibilities
existence of direct democracy enabling legislation	could be threat for investors, fearing opposition to renewable energy development could employ ballot initiatives to stop proposed project
previous experience with direct democracy (ballot initiatives have been carried out in the past)	could be threat for investors, fearing opposition to renewable energy development could employ ballot initiatives to stop proposed project

Results of such research could in the first place help answering the question whether EA constitutes a real "systemic problem" for renewable energy diffusion as defined by Negro

et al. (2012). By analyzing EA in context with other factors influencing renewable energy investment decisions it would become evident whether EAs currently constitute significant costs and are a barrier to renewable energy diffusion. Or on the other hand whether the influence is rather limited and reducing existing weaknesses of EAs would only have limited relevance for the success of renewable energy diffusion.

Second, results could contribute to the discourse on the suitability of traditional economic models of rationality or bounded rationality in explaining investor decision making (Wüstenhagen & Menichetti 2012).

Finally, results could be helpful for policy makers in designing better environmental assessment policies, regulations, and guidance for the application in renewable energy technology diffusion.

3.2 Understanding Environmental Assessment Change and the Role of Cross-national Policy Learning

As the previous discussions have shown, several fields for improvements of EA in renewable energy diffusion have been identified. The comparative analysis of the US and Germany, however, revealed differences in the need for improvements and areas where mutual learning from good practice could occur. The question arises how this mutual learning in the field of environmental assessment regulation and practice in renewable energy diffusion can be realized. The body of literature on the processes of policy transfer, policy diffusion or policy convergence is growing (Dolowitz & Marsh 2000) and for other aspects of the diffusion of renewable energy technologies studies on policy convergence have already been carried out. For example studies on the diffusion and convergence of renewable energy policies such as feed-in-tariffs or portfolio standards (e.g. Jacobs 2012, Kitzing et al. 2012, Busch 2003). For environmental assessments or framed broader planning and permitting processes of renewable energy technologies so far no research into cross-national learning or convergence have been conducted.[23] However, understanding the processes involved in changes of environmental assessment (and planning and permitting) regimes and the role cross-national exchange and learning have in these processes might be beneficial for facilitating them.

Research by Dolowitz & Medearis (2009) into the situation of cross-national policy transfer from Germany to the US on the field of urban environmental and planning policies suggests that the exchange of experience is rather limited. They find that an "ideological predisposition" in the US is inhibiting organized policy transfer due to a "culture of exceptionalism" amongst US actors.

It could be of interest to analyze whether these finding as well apply to environmental assessment policy and whether this notion of exceptionalism might not as well be found on the German side. It can be hypothesized that the understanding that Germany is a frontrunner in environmental and energy policy is rather wide spread amongst German

[23] Environmental Impact Assessment regulations have been subject of studies on environmental policy convergence as part of larger sets of environmental policies studied for example by Busch & Jörgens (2005) or Holzinger et al. (2008).

actors in environmental impact assessment. This might lead to the belief that one cannot learn and benefit from others, in particular not from the perceived laggard (the US) in terms of energy, climate, and environmental policy. There is no empirical support for this situation, however, the limited participation of German EA actors in international conferences on environmental assessment as well as a limited acknowledgement and participation in EA discourse in international journals might be first indicators.

However, even if the hypothesis should hold true that cross-national policy transfer between Germany and the US is limited, there might be exchange occurring between the US and the European level which would indirectly involve Germany. Several elements of the recently presented draft amendment of the EIA-Directive by the European Commission exhibit obvious similarities to elements of the US NEPA process. The introduction of a form of Environmental Assessment with the option of developing a kind of mitigated FONSI (cf. Chapter II) or the mandatory scoping phase being only two examples. The question whether the process of the amendment of the EU EIA-Directive involved some form of intentional policy transfer from the US and which exact mechanisms of convergence (Bennett 1991) played a role could be subject of future research. For Germany in the end this could result in an indirect transfer of US experience as the finally adopted EIA-Directive would have to be transposed into national regulations finally.

Furthermore, initiatives such as by the International Energy Agency's (IEA) Wind Executive Committee to "increase the accessibility of information on a variety of topics, including assessment methodologies, cumulative impact studies and impact mitigation strategies" (IEA Wind 2012) could support cross-national policy learning. Holzinger et al. (2008) as well as Holzinger & Knill (2008) summarize such mechanisms under the term "transnational communication". These authors find that transnational communication alongside with international harmonization caused a considerable degree of convergence of environmental policies across 24 countries they analyzed (Holzinger et al. 2008). From this conclusion they derive the need for further research on the detailed processes through which transnational communication leads to convergence of environmental policies (ibid.). Following these conclusions the role of the IEA and similar initiatives on convergence of EA practice in renewable energy diffusion in the cooperating countries would deserve attention in future research.

4 Summary

Overall the conclusion can be drawn that EA for renewable energy diffusion needs to be improved in certain aspects in order to be able to meet the special requirements of this energy system. Some elements in EA legislation and practice pose certain problems in renewable energy diffusion which in particular come to the fore due to the specific characteristics of this development but as well exist for EAs in general.

However, EA is as it can be concluded from this work not that much in need of innovation as a general concept but rather the way of implementation including the

understanding and interpretation of the instrument by relevant stakeholders are in need of adaptations to renewable energy diffusion.

In order to achieve the necessary changes of environmental assessments it is important to better understand the processes of change of this instrument. In particular the role cross-national policy learning and transfer of experiences have in triggering such changes needs to be further studied as good practice examples of certain EA aspects have been identified.

References

Bennett C (1991). What is policy convergence and what causes it? British Journal of Political Science 21, 215-233.

Busch P & H Jörgens (2005). International Patterns of Environmental Policy Change and Convergence. European Environment 15, 80-101.

Busch P (2003). Die Diffusion von Einspeisevergütungen und Quotenmodellen: Konkurrenz der Modelle in Europa. FFU-report 03-2003.

Clark R, Mahoney L & K Pierce (2011). SEA in the US. in: Sadler B, Aschemann R, Dusik J, Fischer TB, Partidário MR & R Verheem (eds.). Handbook of Strategic Environmental Assessment. London, Washington, DC: Earthscan. pp. 74-88

Dolowitz DP & D Marsh (2000). Learning from Abroad: The Role of Policy Transfer in Contemporary Policy-Making. Governance: An International Journal of Policy and Administration 13 (1), 5-24.

Dolowitz DP & D Medearis (2009). Considerations of the obstacles and opportunities to formalizing cross-national policy transfer to the United States: a case study of the transfer of urban environmental and planning policies from Germany. Environment and Planning C: Government and Policy 2, 684-697.

Dryzek JS, Hunold C, Schlosberg D, Downes D & H-K Hernes (2002). Environmental Transformation of the State: the USA, Norway, Germany and the UK. Political Studies 50, 659-682.

European Commission (2012). Proposal for a Directive of the European Parliament and of the Council amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

Geißler G (2013). Public involvement in wind power policy and project implementation via direct democracy. Presentation at the Conference on Wind Power and Environmental Impacts (CEW) in Stockholm on February 5, 2013. http://www.naturvardsverket.se/upload/miljoarbete-i-samhallet/sveriges-miljoarbete/forskning/vindval/cwe/Social%20acceptance%20and%20public/PR%C3%84_Geissler_CWE2013_2013-02-05_Website.pdf.

Geißler G, Köppel J & LF Odparlik (2011). Addressing Greenhouse Gas Emissions in Environmental Impact Assessments – The Discursive Making of Guidance in the United States. UVP-report 25 (4), 215-221.

Holzinger K & C Knill (2008). The Interaction of Competition, Co-operation and Communication: Theoretical Analysis of Different Sources of Environmental Policy Convergence. Journal of Comparative Policy Analysis: Research and Practice 10 (4), 403-425.

Holzinger K, Knill C & T Sommerer (2008). Environmental Policy Convergence: The Impact of International Harmonization, Transnational Communication, and Regulatory Competition. International Organization 62 (4), 553-587.

IEA Wind (2012). IEA Implementing Agreement for Co-operation in the Research and Development of Wind Turbine Systems.

Jacobs D (2012). Renewable Energy Policy Convergence in the EU. The Evolution of Feed-in Tariffs in Germany, Spain and France. Ashgate Publishing Limited, Surrey.

Kim JA (2004). Regime interplay: the case of biodiversity and climate change. Global Environmental Change 14, 315-324.

Kitzing L, Mitchell C & PE Morthorst (2012). Renewable energy policies in Europe: Converging or diverging?. Energy Policy 51, 192–201.

Lüthi S & R Wüstenhagen (2012). The price of policy risk – Empirical insights from choice experiments with European photovoltaic project developers. Energy Economics 34, 1001-1011.

Lüthi S & T Prässler (2011). Analyzing policy support instruments and regulatory risk factors for wind energy deployment – A developers' perspective. Energy Policy 39, 4876-4892.

Lüthi S (2010). Effective deployment of photovoltaics in the Mediterranean countries: Balancing policy risk and return. Solar Energy 84, 1059-1071.

Negro SO, Alkemade F & MP Hekkert (2012). Why does renewable energy diffuse so slowly? A review of innovation system problems. Renewable and Sustainable Energy Reviews 16, 3836-3846.

Odparlik LF, Köppel J & G Geißler (in press). The grass is always greener on the other side: der Zugang zu Umweltprüfungs-Dokumenten in Deutschland im internationalen Vergleich. UVP-report.

Rabe BG (2006). Second Generation Climate Policies in the American States: Proliferation, Diffusion and Regionalization. Paper presented at the conference on "Climate Change Politics in North America," Woodrow Wilson International Center for Scholars, Washington, D.C., May 18-19, 2006.

Rabe BG (2008). States on Steroids: The Intergovernmental Odyssey of American Climate Policy. Review of Policy Research, 25(2): 105-128.

Salter T (2011). NEPA and Renewable Energy: Realizing the Most Environmental Benefit in the Quickest Time. Environs Environmental Law and Policy Journal University of California Davis 34 (2), 173–187.

Scrase JI & WR Sheate (2002). Integration and Integrated Approaches to Assessment: What Do They Mean for the Environment? Journal of Environmental Policy & Planning 4, 275-294.

Simmons R, Dawson K & KD Harris (2013). Green Energy Democracy. A Venue for Zealots and Professionals. In: Reilly S & RM Yonk (eds.). Direct Democracy in the United States. Petitioners as a Reflection of Society. Routledge, New York. 189-212

Spengle ES (2011). A Shift in the Wind: The Siting of Wind Power Projects on Public Lands in the Obama Era. Indiana Law Journal 86 (3), 1185-1217.

Thaler J (2012). Fiddling as the world floods and burns: How climate change urgently requires a paradigm shift in the permitting of renewable energy projects. Environmental Law 42, 1101-1156.

Voigt CC, Popa-Lisseanu AG, Niermann I & S Kramer-Schadt (2012). The catchment area of wind farms for European bats: A plea for international regulations. Biological Conservation 153, 80–86.

Wüstenhagen R & E Menichetti (2012). Strategic choices for renewable energy investment: Conceptual framework and opportunities for further research. Energy Policy 40, 1-10.

Author Contribution Statement

Three of the core chapters of this thesis (Chapters II, III and IV) have been developed by the author in cooperation with colleagues and the supervisor of this thesis. The author of the thesis in all three cases has been involved considerably in the conceptual design, research and writing of the three papers. The following sections provide more detailed information on the contributions by the involved authors of the papers.

Chapter II: The manuscript "A snapshot of Germany's EIA approach in light of the United States archetype" (published in the Journal of Environmental Assessment Policy and Management, Vol. 14, Issue 4) has been developed by all four authors together with an approximately equal share of contributions.

The conceptual design and structure of the paper was developed by Johann Köppel, Jessica Reisert and the author together. The writing being done in iterative cycles thus, all three authors have contributed to all parts of the paper. Jennifer Helfrich then reviewed and improved the paper with a focus on language and grammar and furthermore implemented necessary revisions concerning as well the conclusions.

Chapter III: The manuscript "Upside down – Weiterentwicklung von US-amerikanischen Konzepten zur naturhaushaltlichen Kompensation" (published in Naturschutz und Landschaftsplanung, Vol 44, Issue 12) has been developed by the author and Johann Köppel.

The research underlying the paper has been mainly done by the author while writing the article was completed jointly.

Chapter IV: The manuscript "Wind Energy and Environmental Impact Assessments - a hard look at two forerunners' approaches: Germany and the United States" (published in Renewable Energy 51) has been developed by the author together with Johann Köppel and Pamela Gunther.

The overall responsibility for the structure and the content of the paper was with the author. Major parts of the research underlying the paper have been conducted by the author during a research stay in the US. Johann Köppel and Pamela Gunther introduced additional insights and information to the paper. The writing was done by the author with additions and support by the other authors. Johann Köppel and Pamela Gunther furthermore provided critical feedback and reviewed earlier versions of the paper.

Chapter V: The manuscript "Strategic Environmental Assessments for Renewable Energy Development – comparing the United States and Germany" (in press with the Journal of Environmental Assessment Policy and Management) has been developed and written by the author alone without co-authors.

Chapter VI: The manuscript "Direct Democracy and Renewable Energy Deployment in Germany" (under review with Energy Policy) has been developed and written by the author alone without co-authors.

Curriculum Vitae and List of Publications

Gesa Geißler is researcher and lecturer at the Environmental Assessment and Planning Research Group at the Berlin Institute of Technology since 2008. She graduated with a degree in Landscape Planning (Diplomingenieurin Landschaftsplanung) from the Berlin Institute of Technology. Her studies included a 10-months stay as Fulbright-Fellow at Portland State University in Oregon (USA) where she was part of the graduate program in Urban and Regional Planning. Since 2008 she has been involved in several research projects and is lecturing in graduate and undergraduate programs focusing on environmental assessment and impact mitigation.

List of Publications

Peer-reviewed articles

Geißler G (2013). Strategic Environmental Assessments for Renewable Energy Development - comparing the United States and Germany. Journal of Environmental Assessment Policy and Management 15 (2), 1340003-1 – 1340003-31. http://dx.doi.org/10.1142/S1464333213400036

Geißler G, Köppel J, Gunther P (2013). Wind Energy and Environmental Impact Assessments - a hard look at two forerunners' approaches: Germany and the United States. Renewable Energy 51, 71–78. http://dx.doi.org/10.1016/j.renene.2012.08.083

Geißler G (2012). Bürger- und Volksentscheide beim Ausbau der erneuerbaren Energien in Deutschland. UVP-report 26 (5), 221-226.

Geißler G, Reisert J, Köppel J (2012). Editorial - Environmental Impacts of Direct Democracy. UVP-report 26 (5), 206-207.

Köppel J, **Geißler G**, Helfrich J, Reisert J (2012). A snapshot of Germany's EIA approach in light of the United States archetype. Journal of Environmental Assessment Policy and Management 14 (4), 1250022-1-1250022-21. http://dx.doi.org/10.1142/S1464333212500226

Geissler G, Köppel J (2012). Upside down – Weiterentwicklung von US-amerikanischen Konzepten zur naturhaushaltlichen Kompensation (Wetland Mitigation and Conservation Banking). Naturschutz und Landschaftsplanung 44 (11), 364-370.

Odparlik LF, Köppel J, **Geißler G** (2012). The grass is always greener on the other side: der Zugang zu Umweltprüfungs-Dokumenten in Deutschland im internationalen Vergleich. UVP-report 26 (5), 236–243.

Lüdeke J, **Geißler G,** Köppel J (2012). Der neue Offshore-Netzplan zur Regelung der Anbindung von Offshore Windparks. Analyse und Diskussion der Prüfung seiner Umweltauswirkungen. UVP-report, 26 (3+4), 183-190.

Geißler G, Köppel J, Odparlik LF (2011). Addressing Greenhouse Gas Emissions in Environmental Impact Assessments – The Discursive Making of Guidance in the United States. UVP-report 25 (4), 215-221.

Köppel J, **Geißler G** (2010). Umweltprüfungen an der TU Berlin. UVP-report, 24 (5), 206–209.

Oral presentations

Geißler G (2013). Public involvement in wind power policy and project implementation via direct democracy. Conference on Wind Power and Environmental Impacts (CWE) in Stockholm on February 5-7, 2013.

Geißler G (2012). Partizipation und Bürgerbeteiligung in den USA. 11. UVP-Kongress in Dresden, November 9-11, 2012.

Geißler G (2012). Blick über den Tellerrand – internationale Ansätze zur Kompensation. Fachtagung Naturschutzrechtliche Eingriffsregelung und Bewertungsverfahren in Berlin, June 4, 2012.

Geißler G (2012). Lessons learned from US Renewable Energy SEAs. 32nd Annual Conference of the International Association for Impact Assessment - IAIA12 Energy Future: The Role of Impact Assessment, Porto, Portugal on May 27 - June 1, 2012.

Geißler G (2012). Renewable Energy Referenda in Germany. International Symposium on Environmental Impacts of Direct Democracy in Berlin, Germany on March 21-23 2012.

Geißler G (2012). Introduction to the Program and the Research Field. International Symposium on Environmental Impacts of Direct Democracy in Berlin, Germany on March 21-23 2012.

Geißler G, Köppel J, Reisert J (2011). Hidden treasures overseas. Inspiring Lessons for Germany from SEA in the US – The Case of Renewable Energy Planning. Special Conference on Strategic Environmental Assessment - IAIA SEA Prague II 2011 from September 21-23, 2011.

Köppel J, **Geißler G** (2010). Balancing Climate and Biodiversity for Renewable Energy Projects in Germany and the United States. 16th International Symposium on Society and Resource Management (ISSRM) in Corpus Christi, Texas from June 6-10, 2010.

Köppel J, **Geißler G** (2010). Wind Energy Policies and EA in Germany and the U.S.A. 30th Annual Conference of the International Association for Impact Assessment (IAIA) in Geneva, Switzerland from April 6-11, 2010.

Geißler G (2009). The Ballot Box - Threat or Blessing for Planning?. International Symposium on Society and Resource Management (ISSRM) in Vienna, Austria from July 5-9, 2009.

Author's Declaration

I prepared this dissertation without illegal assistance. This work is original except where indicated by special reference in the text and no part of the dissertation has been submitted for any other degree. This dissertation has not been presented to any other University for examination, neither in Germany nor in another country.

Gesa Geißler

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