ENVIRONMENTAL ASSESSMENT OF ONSHORE WIND ENERGY PLANS IN GERMANY AND SCOTLAND: A PROCEDURAL COMPLIANCE WITH RESPECT TO INTEGRATION OF CLIMATE CHANGE IMPACTS

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Zusammenfassung

Die Effekte des Klimawandels sind spürbar und es sind Maßnahmen erforderlich, diese schwerwiegenden Auswirkungen zu kontrollieren oder zu verringern. Diese Maßnahmen beinhalten die Vermeidung von Treibhausgasemissionen oder die Reduktion der atmosphärischen Konzentration sowie eine Anpassung an das vorhandene Klima und seine Auswirkungen. Erneuerbare Energiequellen tragen zur Eindämmung des Klimawandels durch die Reduzierung von Treibhausgasen konventioneller Energiequellen bei. Wie auch alle anderen sauberen Energiequellen spielt die Windenergie durch Reduzierung des CO2-Ausstoßes eine entscheidende Rolle bei der Bekämpfung des Klimawandels. Deutschland und Schottland sind beide Vorreiter bei der Entwicklung und Gewinnung landgebundener Onshore-Windenergie. Beide Staaten haben Im Rahmen ihrer Planungspolitik ehrgeizige Zielsetzungen durch Reduzierung von Treibhausgasemissionen die Auswirkungen des Klimawandels in Grenzen zu halten. In Deutschland und Schottland werden die Entwicklungen der Onshore-Windenergie durch Raumordnungsverfahren gesteuert, nach denen in der Regel Umweltverträglichkeitsprüfungen durchgeführt werden. In der Tat werden Umweltverträglichkeitsbewertungen als Mittel zur Umsetzung des Klimaschutzes in den Raumordnungsverfahren benutzt.

Diese Forschungsarbeit soll zu einem strategischen Ansatz für die Entwicklung der Onshore-Windenergie in Deutschland und Schottland beitragen, wobei das Ausmaß der durch den Klimawandel verursachten Probleme und die klimatischen Faktoren der SEA in Raumordnungsverfahren auf regionaler und lokaler Ebene bei der Onshore-Windenergieplanung berücksichtigt werden. Diese Untersuchung hilft, die Beziehung zwischen SEAs prozessualer Wirksamkeit und den Herausforderungen bei der Umsetzung in Hinblick auf die Auswirkungen des Klimawandels in Deutschland und Schottland für die Onshore-Windenergiebranche besser verständlich zu machen. Der methodische Rahmen basiert auf der Auswertung relevanter Gesetze und Vorschriften, Grundsatzdokumenten und wissenschaftlicher Literatur bezüglich der Umweltbewertung von Onshore-Windplanungen. Zusätzlich wurden Experten befragt und Fallstudienanalysen deutscher und schottischer Onshore-Windenergiepläne durchgeführt.

Ein Vergleich der Ergebnisse beider Länder zeigt, dass sowohl Deutschland als auch Schottland die SEAs auf politischer Ebene verbessern müssen, um die Auswirkungen des Klimawandels auf verschiedenen räumlichen Ebenen angehen zu können. Die Studie zeigt ferner, dass es gleichermaßen wichtig ist, aktuelle und zukünftige Trends des Klimawandels und des Windverhaltens mithilfe von Klimamodellen zu verfolgen, da diese Informationen

dazu beitragen, das komplexe Phänomen des Klimawandels und dessen Auswirkungen effizient anzugehen. Die Studienergebnisse zeigen auch den Einfluss der SEA auf die Onshore-Windenergieplanung in Deutschland und Schottland in Hinblick auf Abschwächung und Anpassung der Auswirkungen des Klimawandels mit der Betonung der Notwendigkeit eines hohen Maßes an politischer Unterstützung, um die Belange des Klimawandels in die Onshore-Windenergie Planungsaktivitäten integrieren zu können.

Auf dieser Grundlage wird empfohlen, in der Raumplanung der Onshore-Windenergieentwicklung die Auswirkungen des Klimawandels als ein kritisches Thema zu erkennen und auf den verschiedenen Planungsebenen wirksam zu berücksichtigen. Darüber hinaus sind für die Onshore-Windenergieplanungen starke politische Zielsetzungen erforderlich, um die Entscheidungsfindungen im Bereich des Klimawandels zu unterstützen.

Abstract

The effects of climate change are tangible and actions are required to control or reduce these serious effects. These actions include preventing greenhouse emissions or reducing the atmospheric concentration and also adjusting to the existing climate and its effects. Renewable energy sources recognise the contribution of conventional power sources to climate change mitigation through the reduction of greenhouse gases. Like all other clean energy sources, wind energy plays a crucial role in combating climate change by reducing CO_2 emission. Germany and Scotland are both forerunners when it comes to onshore wind energy development. Both have ambitious greenhouse emission reduction targets, often as part of their planning policies on reducing climate change impacts. In Germany and Scotland, the onshore wind energy developments are controlled by the spatial plans, by which environmental assessments must generally be carried out. Indeed, environmental assessment systems are recognised as the vehicle for the implementation of climate protection within spatial planning.

This research seeks to contribute to a strategic approach to onshore wind energy development in Germany and Scotland, taking into account the extent of climate change issues and climatic factors in SEA of spatial plans at the regional and local level in the onshore wind energy planning. The research helps to better understand the relationship between SEA in terms of its procedural effectiveness and its implementation challenges with regard to climate change impacts in Germany and Scotland in the onshore wind energy industry. The methodological framework is based on the assessment of relevant laws and regulations, policy documents, and scientific literature related to the environmental assessment of onshore wind planning. In addition to that, interview experts and case study analysis of German and Scottish onshore wind energy plans have been carried out.

Comparing the findings from both the countries, the study reveals that both Germany and Scotland need to improve policy level SEAs when addressing climate change impacts at various spatial scales. The study further reveals that it is equally important to keep track of present and future trends in climate change and wind patterns by using climate models since these information help to efficiently address the complex phenomenon of climate change impacts. The results also indicate the influence of SEA in onshore wind energy planning in Germany and Scotland in terms of mitigating and adapting climate change impacts and stresses on a high level of political support in order to improve the integration of climate change issues in the onshore wind energy planning.

On this basis, it is recommended that there is a need in the spatial planning of the onshore wind energy development to incorporate climate change impacts effectively at various planning levels and to recognize impacts related to climate change as a critical issue among other issues. Moreover, there is also a need for strong political objectives in the onshore wind energy planning to support decision making in the climate change arena.

Declaration

In my capacity as the researcher and author of the work described in this thesis (with the supervision of Prof. Dr.-Ing. habil. Ulrike Weiland), I recognize and confirm that, to the best of my knowledge, I have completed original work. I declare that where work completed by others has been made use of, it has been duly acknowledged and correctly referenced in the text.

The present work has not been submitted, either domestically or abroad, in the same or similar form to another examination authority for the purpose of a doctoral or other examination procedure and has not yet been published in its entirety.

Hina Khan Baloch: ________________________________

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List of Acronyms and Abbreviations

Abbreviation	Expression
BauGB	Baugesetzbuch
BIES	Business, Energy and Industrial Strategy
BImSchG	Bundes-Immissionsschutzgesetz
BNatSchG	Bundesnaturschutzgesetz
BSH	Bundesamt für Seeschifffahrt und Hyrographie
CCC	Committee on Climate Change
CEC	Commission of European Communities
CH_4	Methane
CO_2	Carbon Dioxide
DECC	Department of Energy & Climate Change
DENA	Deutsche Energie-Agentur
EA	Environmental Assessment
EAG Bau	Europarechtsanpassungsgesetz Bau
EC	European Commission
EEG	Erneuerbare-Energien-Gesetz
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ES	Environmental Statement
EU	European Union
EU ETS	European Union Emission Trading System
FFH	Fauna-Flora-Habitat
GHG	Greenhouse Gas
GW	Gigawatt(s)
HRA	Habitats Regulations Appraisal
HRES	Highland Renewable Energy Strategy
HwLDP	Highland-wide Local Development Plan
IA	Impact Assessment
IPCC	Intergovernmental Panel on Climate Change
KfW	Kreditanstalt für Wiederaufbau
LDP	Local Development Plan
MW	Megawatt
N_2O	Nitrogen Oxide
NDCs	Nationally Determined Contributions
NEP	National Energy Policy
NIMBY	Not In My Back Yard
NPF3	National Planning Framework 3
NRW	North Rhine Westphalia
OECD	Organisation for Economic Cooperation and Development
PAN	Planning Advice Note
PPP	Plan, Policy and Programme
PPS	Planning Policy Statements
RA	Review Area
RC	Review Category
RED	Renewable Energy Directive
RegFNP	Regionaler Flächennutzungsplan
ROG	Raumordnungsgesetz

RoV	Raumordnungsverordnung
SA	Sustainability Appraisals
SDP	Strategic Development Plans
SDPA	Strategic Development Planning Authority
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SFSAG	Spatial Framework & Supplementary Advice & Guidance
SG	Supplementary Guidance
SLDP	Stirling Local Development Plan
SNH	Scottish Natural Heritage
SPG	Supplementary Planning Guidance
SPP	Scottish Planning policy
SRC	Sub Review Category
SSSI	Sites of Special Scientific Interests
TFNP	Teilflächennutzungsplan
THC	The Highland Council
TWh	TeraWatt hour(s)
UK	United Kingdom
UNEP	United Nation Environmental Programme
UNFCCC	United Nation Framework Convention on Climate Change
VVG	Vereinbarten Verwaltungsgemeinschaft
WTG	Wind Turbine Generator
WWF	World Wide Fund

1 Introduction

This chapter attempt to present an overview of the whole research, by clarifying research importance, highlighting problem statement, and outlines the structure and contents of the thesis.

1.1 Research Rationale and Focus

The research presented here is considered as important by reflecting at several factors such as described below.

1.1.1 The Changing Climate

The earth's climate condition is continuously changing. This change in climate is an almost universally acknowledged issue, and it is the greatest danger that the earth currently faces (Karl et al., 2009; Solomon et al., 2009). The Intergovernmental Panel on Climate Change (IPCC) has formally defined climate change as an uninterrupted, continuous change in the climate that persists over several decades and is identified by variable properties. Climate change can also refer to changes in the climate over time, whether this occurs because of natural causes or because of human actions (IPCC, 2018).

The temperature on our planet has changed drastically and quickly before, due to the excessive production of greenhouse gases, such as nitrous oxide (N_2O), methane (CH_4), and carbon dioxide (CO_2). These gases absorb and then trap infrared radiation, causing the lower layers of the atmosphere to heat up (Holdstock, 2008; Shuman, 2010). According to the IPCC’s special report on global warming, the current warming period is happening much faster than during any previous events and it is due to the anthropogenic activities, which are one of the foremost rationales for this increase in average temperature (IPCC, 2018).

Scientists all over the world are 90% certain that the high temperature which the earth has experienced in the last few decades is because of human-caused GHG emissions (Bernstein and Rice, 2013; IPCC, 2007). In addition, scientists have had no success in finding any other credible explanation for the global warming phenomenon. The atmosphere’s rising level of GHG emissions has a positive forcing effect, rapidly changing the climatic condition that leads to climate change. Therefore, it is crucial to limit or control (if not stop entirely) anthropogenic activities that contribute to temperature change.

1.1.2 Decarbonized Future

Due to an increased level of Greenhouse Gas (GHG) emissions, it has been found that one of the most significant challenges facing 21st-century humans and the environment is climate change (Schipper and Pelling, 2006). Developmental activities have released greenhouse gases into the atmosphere that have then started to accumulate. Consequently, extreme weather events, partnered with a rise in surface air and subsurface ocean temperature, have started happening with more frequency. Scientists are predicting an increase in natural disasters and extreme weather, such as waves of heat, cold, and heavy rain. The ocean's mean sea level will also keep rising (IPCC, 2014).

Human activities are playing a major role in increasing the rate of climate change. They are responsible for dumping approximately 8 billion metric tons of carbon into the atmosphere each year. Of these 8 billion tons, 1.5 billion tons are from a result of deforestation and 6.5 billion tons are from burning fossil fuels (Chandel et al., 2016). Unfortunately, the most promising sources of clean energy, which do not emit any GHG emissions tend to depend on the climate – as can be seen with renewable energy sources like windmills and solar panels (Fant et al., 2016). A reduction of GHG emissions is a key part of any strategy regarding how to overcome the problem of climate change. Planners are considered capable of (and responsible for) reducing our vulnerability towards climate change and developing strategies to limit how the world is affected by climate change (Stern, 2006).

1.1.3 Climate Change and Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is an essential part of the mission of evaluating the state of climate change and to make a plan to help mitigate it. Conceivably, SEA helps to shine a spotlight on issues related to climate change that are found at all planning levels in order to make the process sustainable. This is one of the SEA's primary goals. Wende et al., (2012) conclude that ''Strategic Environmental Assessment is a particularly suitable instrument for the implementation of climate protection at the regional or local level, or in sectoral planning, such as transport planning'' (p. 92). Moreover, climate change impacts when integrated into the early planning stages of the process will ensure that any development done will be done sustainably. This will also confirm that the effects of climate impacts are considered in all aspects of development. Since continuing climate risks requires us to adapt and make efforts to alleviate the negative climate impacts from the first stage of planning through the last, this study, therefore, intends to analyse SEA's ability to mainstream climate change analysis as it relates to the onshore wind energy industry in Scotland and Germany. This research only focuses on the onshore wind energy sector due to different planning systems and frameworks of onshore and offshore wind energy spatial plans. Furthermore, the research will also analyse the SEA's influence on the planning procedures of German and Scottish onshore wind energy. This is done to highlight the SEA's potential when it is applied to plans and programmes that pertain to wind-generated energy. It is assumed that Germany, with an outstanding portfolio in renewable energies, especially onshore wind energy, might be seizing the benefits of early and strategic analysis of the impacts that climate change has on planning for onshore wind energy. Contrarily, Scotland, which also has had a tremendous history regarding environmental assessment, might prove pertinent in addressing climate change impacts early in the SEA process as well. The analysis of SEA practice related to climate change and onshore wind energy has been consequently limited to a few studies. Therefore, this research helps to analyse the extent to which Germany and Scotland perform in assessing the impacts of climate change in SEA when planning for onshore wind energy developments.

1.2 Statement of the Problem

This section frames out research problems, which later aids in identifying research objectives. In addition to that, it brings together the views and approaches of different authors and researchers in order to clarify the principles, benefits, and procedures of SEA to address the complex issues of climate change in onshore wind energy planning.

1.2.1 State of Research in Environmental Assessment and Onshore Wind Energy

The process of SEA promotes decision-making that is environmentally sustainable. It helps ensure that the environment is considered when developing policy, plans, and program proposals. It has been acknowledged that spatial planning plays a vital part in dealing with climate change – both by adapting to the inevitable effects of the issue and by limiting those negative impacts (Wilson and Piper, 2010). This opinion is validated by the fact that the spatial arrangement of cities and the way that we use and develop land both have substantial effects on how the trajectory is formed, with regards to climate change (Davoudi et al., 2009). SEA is going to be essential when it comes to making moves to adapt to the changing climate (Greiving and Fleischhauer, 2012; Wilson, 2006). Adopting long term, strategic approaches are essential when it comes to territorial development and spatial planning. These approaches are needed in marine areas, on land, in transport development, tourism, energy policies, industry, and regional development (CEC, 2009, p. 5). Additionally, the European Union Commission also tends to layout guidelines and discusses the best practices to ensure that climate change will be accounted for when policies for strategic environmental assessments, spatial planning, and environmental impact assessments are enacted (CEC, 2009). According to Josimović and Pucar (2010), SEA is one of the most crucial tools for the effective implementation of sustainable development plans, moreover, it aids in acknowledging the possible spatial consequences of changes to space.

Previous research has documented the state of the SEA as it applies to how wind energy is developed, such as Phylip-Jones and Fischer (2015), where researchers focused on the SEA effectiveness of the wind energy planning in Germany and UK under three aspects: the SEA report's quality, the completeness of coverage of the SEA's procedure stages, and the SEA's effect of decision making. The research suggests that there is a need for improvement in SEA especially in the quality of SEA reports. Another research conducted by Geißler (2013), also focuses on the practice of SEA on renewable energy plans in terms of alternatives, cumulative effects, and public involvement. The results of her research also revealed that there is a strong need for improvement in SEA practice when planning for renewable energies in Germany and the United States. Similarly, Cape-Ducluzeau (2015), also studied the SEA of renewable energy from the South African context focusing on the strategic geographical areas for wind and solar energy developments. However, to the author's knowledge very few (recent) publications are available in the literature that addresses the issues focusing on SEA of wind energy land use plans, which shows that the research related to SEA´s potential in wind energy planning is still at its preliminary stage and requires exploration. Thus, this research investigates the current status and the potential of SEA in onshore wind energy planning in Germany and Scotland in order to promote a stronger linkage between SEA procedures and climate change issues.

1.2.2 Recognizing Climatic Impacts in the SEA of Onshore Wind Energy

According to projections and evidences, climate change has become an urgent problem of utmost priority that is currently posing an enormous threat to nature and the planet itself (Schellnhuber et al., 2014). To efficiently combat the issues of the changing climate, it is crucial to reduce risks by a combination of adaptation and mitigation measures. These need to happen in both the long and the short term, for it to have a chance of success (IPCC, 2018). The SEA procedure is a significant tool that can be used methodically to assist with how climate change effects can be mitigated, and also aid our ability to adapt with regards to planning and development (Shakil and Ananya, 2014). Climate change has become one of (if not the most), a severe threat to our planet and therefore it demands prompt policy response (Stern, 2006). It is crucial to address climate change from a SEA viewpoint because the ways that climate change affects the environment are significant and cumulative. Climate change is inevitably associated with sustainable development, and considering the long term, cumulative effects are the objectives of the SEA (Posas, 2011a). Since climate change has garnered considerable critical consideration, therefore there is a need to consider the SEA practices in Germany and Scotland in terms of climate change.

By doing so; attention will be drawn to addressing the nexus between climate change issues in SEA of spatial plans. This will also highlight other important aspects, for instance, the obstacles in integrating SEA process and climate change together, and finally suggesting measures to promote the incorporation of climate change in the SEA procedure. This research analyses; how information about the changing climate is communicated in the SEA of onshore wind energy plans and how it might influence the responses and behaviours of plan makers and decision-makers to take appropriate actions in order to reduce climate change issues through planning actions. When the probability of climate change impacts becomes substantial then there is a need for making robust decisions when addressing the risks and opportunities of future conditions in order to address how the changing climate is affected. Impact Assessment (IA) in this case plays a crucial role here, including Environmental Impact Assessment (EIA) where the consequences of individual projects are assessed, and Strategic Environmental Assessment (SEA) which involves assessing policies, plans, and programmes with regards to environmental concerns. In this research, it was found that the SEA role is analysed to observe how climate change can influence the onshore wind energy planning process. SEA helps confirm that the designing of the plans, policies, and the programmes at a strategic level, properly addresses both the needed mitigation of climate change – minimizing GHG emissions - along with adaptation which involves the strategies to manage the future climate risk on the proposal.

SEA when at its very primary stage is a useful tool used to address the challenges that have been established by the changing climate. It addresses the problems in a systematic way and supports actions to adjust to climate change during the process of planning. Addressing any challenges and then taking account of the opportunities regarding climate change that are found during the development processes is most effective when it is enacted very early in the planning phase. In order to increase the survivability and sustainability of natural and human systems and reduce the vulnerability to the impacts that face higher uncertainty levels –

impacts like climate change, for instance – this research acknowledges the importance of integration of the climatic factors into the planning processes of wind energy farms, at the very early stage when the new strategies or policies are still in the process of being developed i.e., before the implementation of municipal plans or projects.

Finally, within the SEA discourse, only a few attempted to understand the nexus between SEA and how climate change impacts the regional and local levels (Larsen et al., 2013; Posas, 2011a; Susilowardhani, 2014; Nadruz et al., 2018; Wende et al., 2012). No efforts were made to mainstream the effects of climate change into the SEA of onshore wind energy plans, therefore this research holds a significant position in this context. In reality, the application of SEA with the perspective of dealing with the issues caused by climate change during the planning process is still narrow in scope and needs attention. This research addresses this gap by focusing on issues that determine the extent of incorporating climatic factors into the SEA regarding onshore wind energy plans in Scotland and Germany. To the knowledge of the author, there have been no studies on the interaction of SEA on onshore wind energy plans within the climate change context, therefore this research aids in reinforcing the practicality of SEA in addressing critical issues of the changing climate in onshore wind energy planning.

1.2.3 Wind Energy Industry Vulnerabilities to Changing Climate

Renewable energy technologies have been considered clean energy sources, with fewer negative environmental impacts than conventional energy technologies. Wind energy has been recognized as an incredibly efficient source of clean and renewable energy to lessen the amount of GHG emissions going into the atmosphere. Wind energy has been found to have an increasingly crucial part in alleviating the effects associated with climate change. The potential of wind power to produce clean energy greatly depends on current and future climatic conditions. Several scientific literature present studies that show how wind energy farms are likely to suffer from climate change impacts (De Lucena et al., 2010; Pryor et al., 2005; Pryor and Barthelmie, 2013; Shen and Lior, 2016).

At this point, many of the possible ways in which climate change will affect wind energy, and infrastructure have not been well studied. Climate change will affect these huge infrastructures (and thus also their operations and designs) significantly. Therefore, it will be extremely important to understand these effects. The average service life of wind turbines is about 20 years, therefore the longer the planning horizon is, it becomes increasingly more important to take note of climate issues and factor them into the process of planning. According to a study, the scientists predicted that the changing climate will directly impact the production of the wind energy yield, leading to fluctuations, changes in the wind patterns, and a decrease in the production of clean wind energy produced by turbines (Miller and Keith, 2018). Following this study another research claims that this is happening because the artic is getting warmer due to anthropogenic GHG emissions causing a decrease in the temperature difference which ultimately cause weaker winds across the central US; UK; the northern Middle East and parts of Asia (Karnauskas et al., 2018).

Corresponding to this research, another study highlights that climate change impacts may be caused by large scale wind power generation locally. According to this study, the renewable energy generated by wind turbines is making the air warmer by redistributing the heat in the atmosphere, and increasing the ground temperature locally, which is completely different from the climate change and global warming that has been caused by fossil fuel overuse (Miller and Keith, 2018). However, their research has been highly criticized because it was misinterpreted, and wrong impressions were created from their research - which misrepresented the facts that were explained in the paper. On the other hand, there is also enough scientific literature that shows how the changing climate influences the potential of wind energy production. According to another study the scientists expect climate change to alter the variability and intensity of near-surface winds – either by producing local effects or by changing the overall large-scale flow (Davy et al., 2018).

Similarly, Pryor and Barthelmie (2010) also study the susceptibility of wind energy to a globally changing climate by reviewing the ways in which the increasing variability of the global climate could alter the operating conditions of wind energy producers and even impact the resource itself. On contrary to that, another study conducted by British Antarctic Survey revealed that the potential for wind energy generation in the UK, including Scotland and in large parts of northern Europe - which includes Germany as well- would increase, if global temperatures eventually reach 1.5 degrees Celsius (BAS, 2018). Furthermore, the researchers conclude that there will be a potential 10% increase in the ability of the UK (including Scotland) to use onshore wind energy generation if the global temperature rises to 1.5 degrees (Hosking et al., 2018). Considering the current situation of Germany and the UK's onshore wind energy industry, (in which Scotland is the foremost and leading wind energy producer), the results of this research will be relevant to decisions regarding possible future investment in onshore wind farms in Scotland and Germany. Considering all the current researches conducted regarding how climate change effects wind energy generation and vice versa, this research critically need to analyse the policies related onshore wind energy generation, to be able to enhance the resilience of the energy system with regards to how climate change has negatively impacted Germany and Scotland. By focusing on the climatic aspects being integrated, and the extent of them, into the wind energy planning system this research further stresses the need for onshore wind energy industry to be climate proof and be able to deliver their expected outcomes under future climate conditions.

1.3 Research Purpose

The above illustrations of the notion of SEA clearly display the fact that climate change needs considerable critical attention in the process of SEA. In investigating the notion of this research and addressing the research purposes identified below, this study has adopted a qualitative and largely exploratory approach. This is due to the lack of previous research on this particular subject, as well as the overall inapplicability and inadequacy of existing knowledge, theory and past research to understand the concept of climate change integration in SEA, particularly in the onshore wind energy industry. The exploration of the results in order to answer the main research question is conducted in a series of steps as shown in figure 1.1.

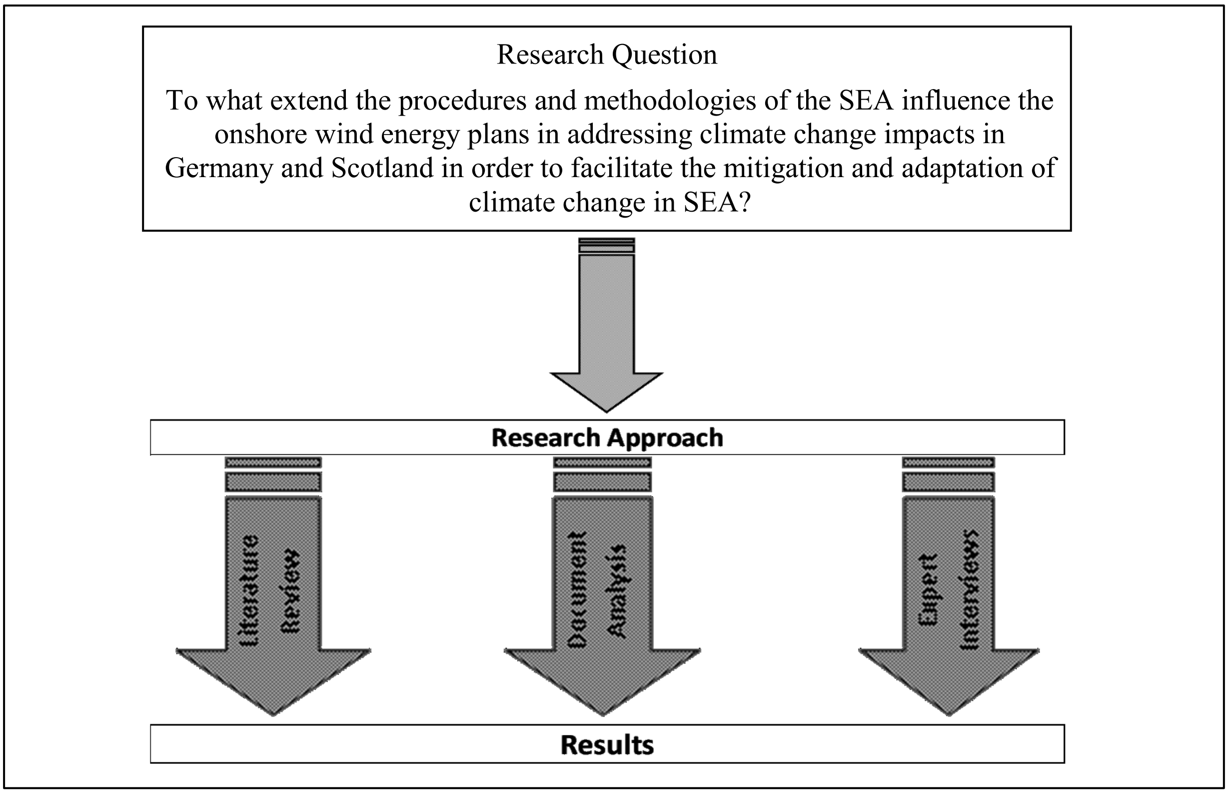


Figure 1.1 Research exploration steps

Source: Elaborated by author

This research is guided by an interest in improving and understanding how SEA can help to address challenges of impacts related to climate change especially in the context of onshore wind energy planning. Several more specific research objectives are derived,

- **To critically review the procedural stages of SEA of onshore wind energy developments with emphasis on addressing climate change issues,** in order to understand the nature and the potential of SEA in decision making, what factors or aspects are relevant to SEA for onshore wind energy parks and finally to identify those structural elements around which it is proposed that, why it is essential to incorporate climate change impacts in SEA for onshore wind energy parks.
- **To assess and review the SEAs of onshore wind energy plan´s features of Scotland and Germany,** which are used for the analysis and assessment of climate change in spatial plans of onshore wind energy developments in order to understand their practical experiences of the current application of SEA in an onshore wind planning context and how climate change is integrated into their SEA system which can guide in proposing a system that helps to counterbalance the complex impacts of climate change.
- **To undertake a comparative analysis of factors that are considered as constraints and opportunities in the full integration of climate change into SEA process,** through investigating the incorporation of climate change in SEA of wind energy planning by evaluating it through country context and finally to explore the status and potential of SEA in incorporating the consequences of climate change impacts in the SEA for onshore wind energy parks.
- **To identify appropriate and enhanced measures that can improve the integration of climatic factors into SEA** of spatial plans of the onshore wind energy developments through exploring possible measures that help to foster the inclusion of climate change impacts in the SEA of onshore wind energy plans in order to propose an improved and enhanced SEA system as a tool assisting in the consideration of climate change related issues at the strategic level of decision making in the onshore wind energy plans of Scotland and Germany.

Detailed descriptions of how these objectives are achieved along with the results are presented in the last chapter of this dissertation.

1.4 Structure of Thesis

This dissertation is composed of eight themed chapters. The first chapter is the introductory chapter, following the second chapter which describes the research methodology. Then the third and fourth chapters deal with forming the conceptual part of the thesis, while the fifth, sixth and seventh chapters formulate the empirical part of the research, and finally, the eighth chapter is based on discussion, conclusion, and recommendations. Moreover, the thesis follows the structure shown in figure 1.2.

Chapter one introduces the research outline containing research significance, problem statement, aims, and objectives of the study, as well as the structure and the contents of the dissertation.

Chapter two formulates the material and methods used for this research that are used to assess the scope of climate change integration into the SEAs of wind plans in Germany and Scotland. The methodological approach used in this study is a mixed methodology, based on literature analysis and qualitative analysis. The literature review explains the conceptual part of the thesis and attempts to illuminate the SEA discourse of wind energy plans within the context of climate change. The qualitative analysis used in this research for the empirical analysis is based on two approaches i.e. experts interviews along with document analysis of SEAs of onshore wind energy plans.

Chapter three begins by outlining the conceptual dimensions of the research and outlines the conceptual background of the SEA discourse summarizing key components of SEA with regard to climate change impacts.

Chapter four outlines background information and relevant legislation and policies for the analysis of wind energy plans in Germany and Scotland. This section describes several components of the planning process of the onshore wind energy parks in the above-mentioned countries, highlighting the potential barriers and overcoming those conflicts in the spatial planning process of the onshore wind energy parks.

Chapter five discusses the foundation for the comparative framework and the contextual information of the SEA reports of the onshore wind energy developmental plans reviewed for case studies of Germany and Scotland. In addition to that, this chapter gives a detailed insight into the area of the plan, how the plan was formulated, and its SEA process, promoting in the interpretation of the outcomes.

Chapter six begins the empirical phase of the research and mainstream the climatic aspects in the selected onshore wind energy plans of Germany and Scotland by case study analysis. This chapter includes a detailed assessment of the eight case studies with four each from Germany and Scotland. The chapter will conclude with a reflection on the outcomes of the case studies analysis.

Chapter seven deals with the qualitative analysis of expert interviews on the subject of climate change inclusion in SEA. The chapter systematically focuses on every issue of each step of the SEA process as it applies to the integration of climate change aspects in the SEA of wind energy plans by highlighting major findings and steps to improve the practice of SEA in onshore wind energy planning within the context of climate change.

Finally, **Chapter eight** briefly summarizes and critiques the findings and ties all the chapters together drawing an overall conclusion from several conceptual and empirical strands; in addition to that, the chapter finally outlines a number of associated recommendations for further research.

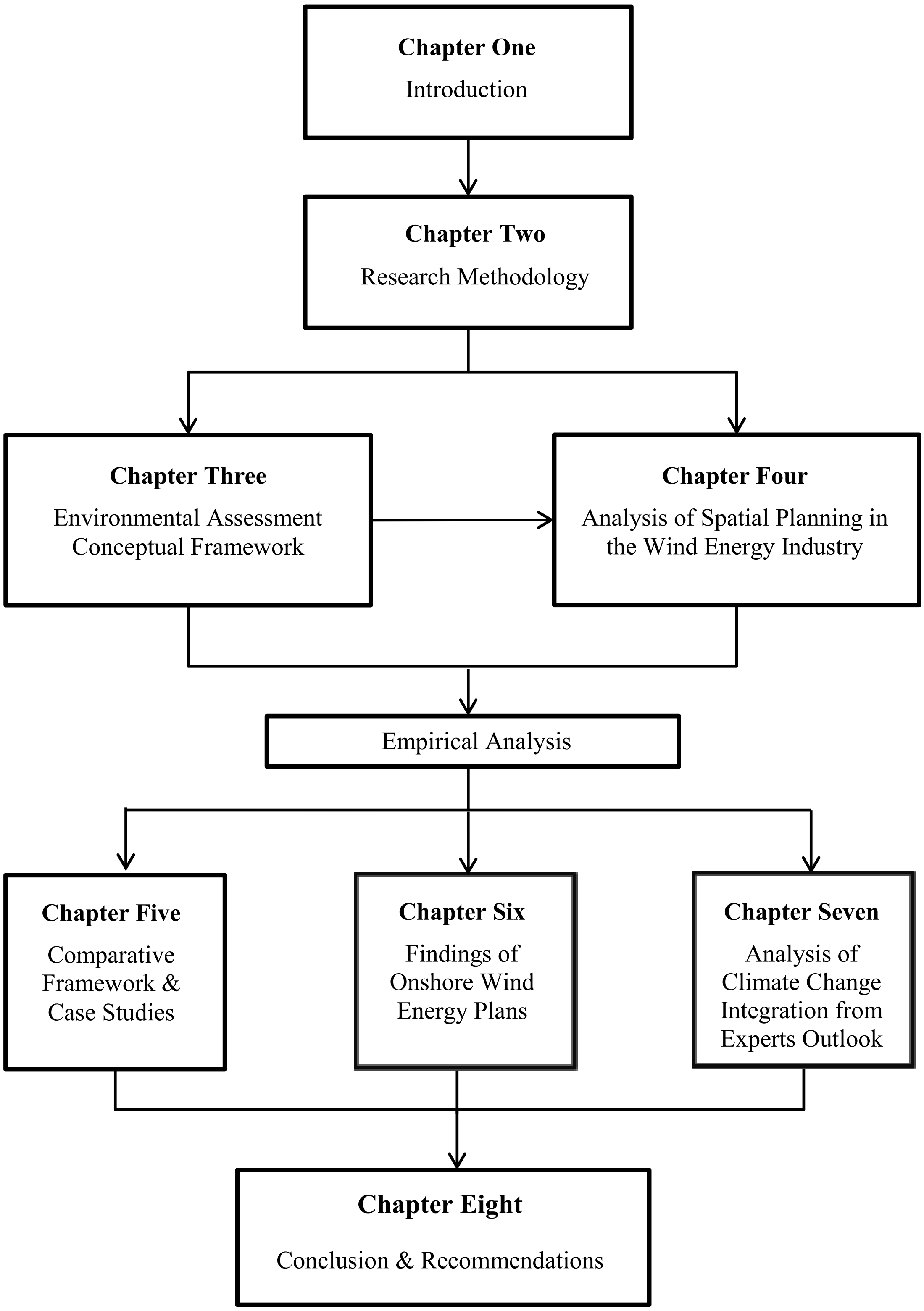


Figure 1.2 Structure of the thesis

2 Research Methodology

This part of the dissertation tends to explain the whole research approach and strategy. The main idea of the research is basically focusing on the scope of climate change integration in the SEA for spatial plans of onshore wind energy in Germany and Scotland. Regions start responding to climate change when potential climate change impacts, mitigation strategies, and adaptation concerns are considered in their planning and programming processes and enhancing them accordingly (Sevic et al., 2011). Hence, the research aids to investigate or identify those factors that control the extent to which climate change is and can be more thoroughly incorporated into Germany and Scotland´s SEAs of onshore wind energy plans. In this research, the degree to which climate change factors are incorporated into spatial plans of Germany and Scotland is explored via literature review, expert interviews, case-study research, and SEA reports analysis. This section of the research focuses on the methodological structure, which is used to find answers to the research questions. All the research methodologies mentioned in this section are based on the aims and objectives of this study. In this way, the methodology creates a frame of consistency between the conceptual and theoretical frameworks and the specific lines of investigation. This chapter primarily focuses on the research design, methodologies used, and data collection approach.

2.1 Research Strategy

After elaborating an assessment framework, the methodological framework for this study is designed in such a way that the research is conducted in a systemic and consistent manner and also methodological relationships between the theory, the practice, and the research are determined. To conduct research on the cross country comparison of the SEA procedural and methodological aspects in order to assess to what extend the climate change issues and climatic factors are incorporated in SEA of spatial plans in the wind energy sector, a combined conceptual and empirical framework strategy is chosen. A conceptual framework draws attention towards concepts and discourse relevant to climate change and SEA at the spatial planning level and informs a study (Tashakkori and Teddlie, 2010), whilst the adoption of empirical frameworks facilitates to analyze the data with collected evidences. This approach is vital to discover explanations for findings and allows for a broader but more phenomenon-centered perspective (Ritchie and Lewis, 2003). According to Reiter (2017), in order to be reliable and accurate, it is crucial to conduct the exploratory research in a more transparent, authentic, and robustly self-reflexive manner which also includes following a series of guidelines to ensure how reliable the exploratory research is.

The unraveling approaches based on the author´s assessment framework which are used in this research provides a better understanding of the behavior and nature of the phenomenon being researched, which is climate change issues in SEA, and also increases the validity of the research; contribute to a more holistic breadth of considerations and aids in assisting interpretation. Both empirical and conceptual framework used in this study are very useful for qualitative research (Miles and Huberman, 1994). The empirical framework helps to strengthen the rigor of the study while the conceptual framework helps to refine the research questions in some complementary manner (Punch, 2005). This approach helps to make a case for the 'iterative' process used in the study. The combined conceptual and empirical framework strategy used in this research consists of three levels that are bound together by the overarching research question. At the highest level of the 'abstraction ladder,' the study explores the theories and concepts and analyses them in the context of current climate change and SEA of spatial plans at regional and local level discourse. At the lower level of the abstraction ladder, the current scenario of climate change and SEA of spatial plans in the wind energy sector are explored in the context of the direct or indirect observation or experience, and then an evaluative and comparative framework is drawn.

2.2 Research Design

The research design embodies the major methodological thrust of the study, with a distinct and specific approach in order to answer the research questions in the best-suited manner (Cormack, 1996). According to Creswell and Poth (2016), the purpose of the research design is to attain greater control of the study and to improve the validity of the study by investigating the research problem. As stated by Punch (2005), research type, questions, and research aims, affect the methods of the study. Therefore, the research design adopted in this study is largely exploratory, as it explores the potential of SEA in addressing the climatic factors in the onshore wind energy industry.

For most parts, the research utilizes qualitative methods. The research also adopts a review of literature, which establishes the theoretical framework of this study. Figure 2.1 represents the framework of the knowledge acquisition model adopted for this research, which helps to elaborate on the exploratory nature of this research. In acquiring knowledge, the researcher proceeds through several stages in order to identify gaps between assumptions and real-life situations. The first stage involves the task of identifying the characteristics of the problem, which under the context of this research is identifying the potential of SEA in addressing the climate change issues in onshore wind energy plans. Based on this knowledge, it is assumed that SEA could influence the onshore wind energy plans when integrating climate change issues in Germany and Scotland.

Therefore, the purpose of the SEA is framed to present a clear grounding for exploration. Motivated by this assumption, the current state of German and Scottish onshore wind energy plans are investigated. The findings of the investigation help to identify the gaps between the assumptions of real-life situations, which ultimately motivated to take further investigation. Taking all of the results into account, associated response actions are proposed in order to enhance the integration of climate change impacts in SEA of onshore wind energy plans in Germany and Scotland.

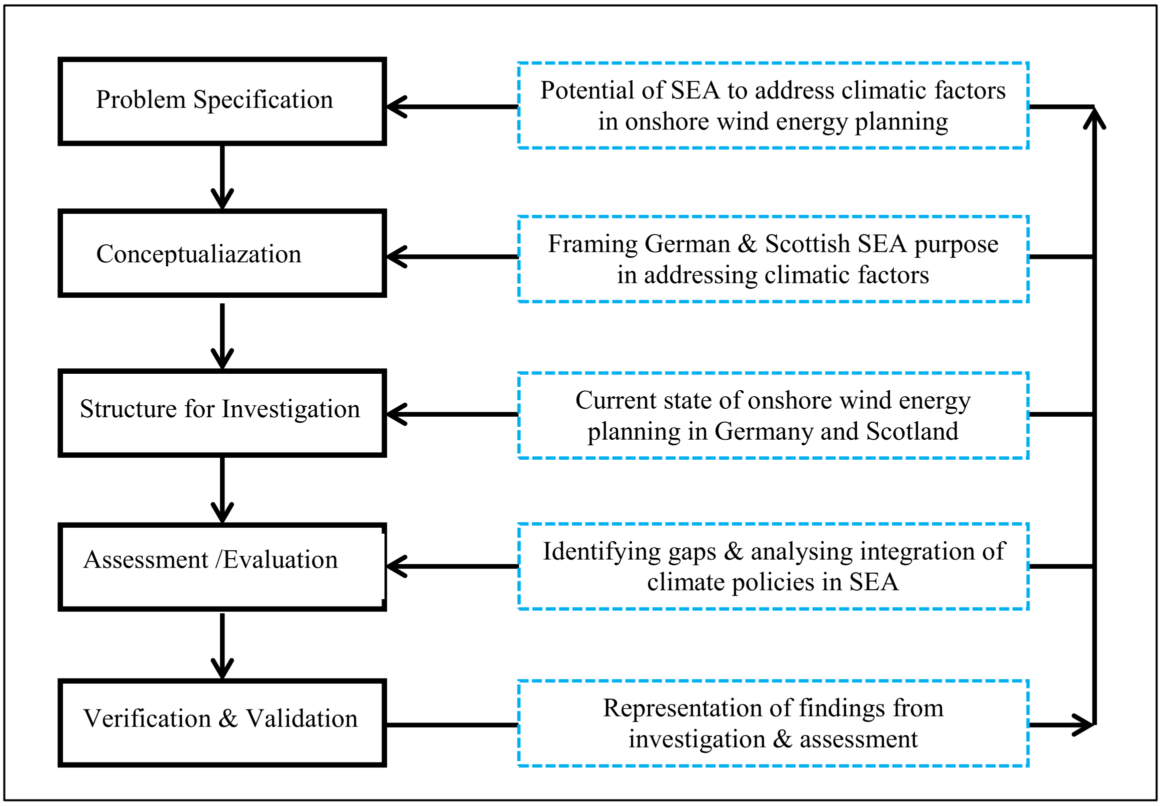


Figure 2.1 Knowledge modelling approach overview
Source: Elaborated by author

This type of unraveling approach gives a better understanding of the nature and behavior of the research phenomenon which is climate change issues in SEA and benefits the research by enhancing its validity; contribute to bring a general picture and aids in assisting interpretation. In order to achieve the core aim of this study, the research design of this dissertation encompasses a preparatory stage at first where the scope of the research is defined. This stage is followed by three main research steps as displayed in figure 2.2, which presents a procedural flow diagram of all the methodologies designed for this dissertation.

2.2.1 Preparatory Stage

The preparatory stage of the research consists of screening the literature for information that will be relevant to research and useful in setting its scope. Moreover, in this stage, the aims and objectives of the research are devised based on familiarization with existing literature in the area of research. This first stage also helped to show the validity of the research: i.e. the consideration of climate change in the context of SEA is a crucial, but virtually less addressed area of the literature – a gap in the SEA methodology and procedure. Finally, this initial stage helps to identify the possible cases for analyzing climate change issues in the context of the SEA of spatial plans by examining a comparative analysis between Germany and Scotland. Alongside desk study, this stage utilizes two simplified forms of content analysis (Mayring, 2015). The first approach is an internet-adopted, which deals with examining relevant literature, internationally published articles, eBooks, conference proceedings, academic articles, and works that include institutional literature such as guidance documents and reports. The second approach was a library-based content analysis, which helped in analyzing data, which was not publicly available or very expensive. These two approaches used in the research are complementary, allowing for an average of both methods and data collection strategies for the investigation of climatic factors in the SEA of spatial plans.

2.2.2 Conceptual Framework

This approach is mainly based on the literature review. The main task here is to conduct a thorough literature review, related to the theory and practice of SEA in regards to the significance of incorporation of climate change impacts in the SEA. According to Merriam (1998), the literature review is an essential part of the study as it contributes to the development of theories and research design, additionally, the conceptual framework coming out of the literature review aids to shape the research questions and points of emphasis. Winchester and Salji (2016), claim that the main purpose of the literature review is to help researchers to develop ideas for further research, to consolidate existing knowledge about a subject, and to assist researchers in the identification of further gaps in current knowledge and how the research in the selected topic areas could contribute to further understanding in order to contextualize research data. Therefore, adopting a literature review as the major research method at this very early stage mainly aimed at presenting the state of the art research, to deduce approaches, to answer the research problems and questions, and then clearly identifying the research objectives respectively. Exploration of the SEA literature was an important step as it was needed to fulfill the basic scope of the research which is, objective 1: To critically review the procedural and methodological aspects of SEA of onshore wind energy developments with emphasis on addressing climate change issues in Germany and Scotland and to examine current SEA procedural and methodological discourse and practice.

This approach is divided into two stages, first is to review and analyse the procedural compliance of SEA in onshore wind energy planning (see chapter 4), for a better, more in-depth understanding of the SEA system and its effect on the decision making in the onshore wind energy plans. This step helps to review the policies related to wind energy planning. Furthermore, this approach brings together the views of various authors and researchers in order to unravel the potential for the adoption of the SEA.

The second stage identifies the contextual factors that aid to recognize the potential of SEA in integrating the climate change impacts into the onshore wind energy plans. Moreover, in the second stage, the research aims to highlight the necessities and benefits of addressing the climate change impacts in the SEA (see chapter 3) to understand its potential in the planning process of onshore wind energy parks. Moreover, climate change objectives for both the regions are identified including the laws and regulations of SEA concerning the reduction of (and adaptation to) climate change impacts in Germany and Scotland.

Formulating a conceptual framework also fulfilled the second objective of the study, which is, objective 2: To assess and review the procedural and methodological aspects of SEA features of Scotland and Germany, which are used for the evaluation and the analysis of climate change in spatial plans of the onshore wind energy plans. Moreover, the conceptual framework also aided to identify the scope of rationale relevant to the field of research, form the initial research questions and hypotheses, and define narrow areas of conceptual foundations (Miles and Huberman, 1994).

This approach used a mixture of methodologies to thoroughly examine the available vast knowledge of SEA in Germany and Scotland. One of the methodologies used to attain this goal is called a retrospective method, which is more contemplative in nature and achieved by reviewing the most recent journal articles. The data obtained from these methods will highlight the importance of climate change concerns that happen within the scope of SEA and also highlighting the current scenario of onshore wind energy status in these countries. Furthermore, parameters were identified by extracting criteria from literature review, and have been conceptualised in a manner in which the parameters decide the level of climate.

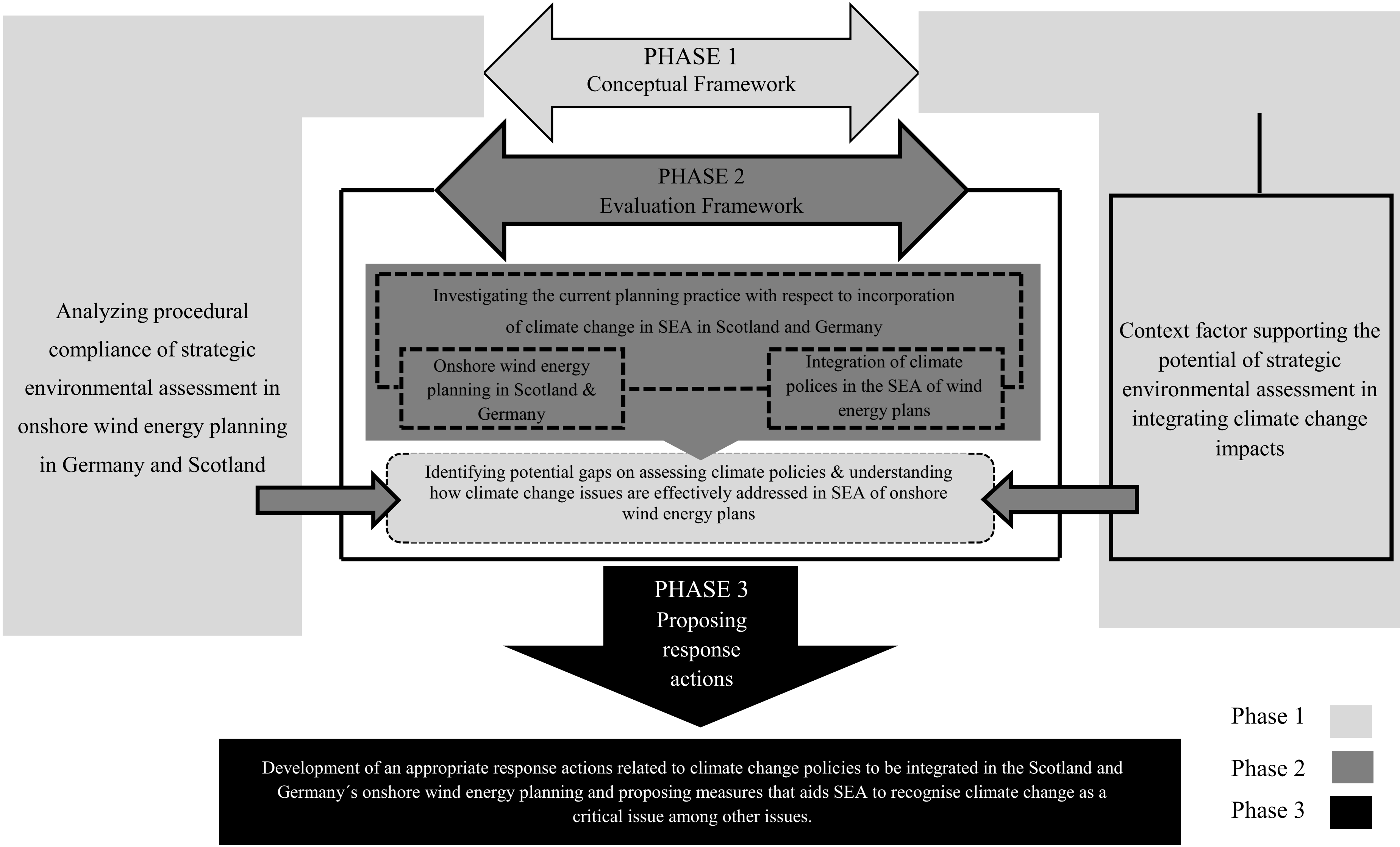


Figure 2.2 Procedural flow diagram of the methodology used for this research
Source: Elaborated by author

change integration into SEA (Wende et al., 2012), in this case, German versus Scottish vision of environmental statements.

Finally, it explores views of different researchers, which helps to identify a set of factors that are considered essential which supports the potential of SEA to integrate the climate change impacts into its system. This is done in order to identify potential gaps related to the integration of climate change impacts into the SEA system. This assists in developing effective climate policies that could help to effectively address the climatic factors in the SEA of onshore wind energy plans.

2.2.3 Evaluation Framework

This approach is carried out in order to accomplish objective 3: "To undertake a comparative analysis of factors that are considered as constraints and opportunities in the full integration of climate change into SEA" which are, used for the analysis and assessment of climate change in spatial plans of the onshore wind energy development. The main task here is to analyse the current planning practices in Scotland and Germany with regards to the inclusion of climate change impacts in the SEA of onshore wind energy parks. The performance of these systems are analysed in relation to their roles at various spatial levels where the strengths and the weaknesses of the SEA in terms of its integration with climate change are identified. This phase also includes two stages. The first step is performed through further literature review and document analysis including governmental reports, official publications, research articles, and SEA reports of onshore wind plans (see chapter 5). This step involves a case study design approach with an in-depth analysis of eight case studies, four each from Germany and Scotland highlighting the processes, practices, and outcomes of SEA in the onshore wind energy planning as applied in Germany and Scotland in terms of climate change integration. The case studies were then compared by using the Lee and Colley Review Package (Lee and Colley, 1992; Lee et al., 1999) which was widely used by several researchers as a tool to examine the quality of the environmental statements. This review package is basically organized in a hierarchical structure with different tiers of evaluation. The Lee and Colley review package adopted for the purpose of this research is mainly structured into four major review areas. Each review area was divided into two review categories which were further divided into three sub review categories. Therefore, altogether the review package consisted of twenty-four sub review categories. Table 2.1 shows a detailed structure of the amended Lee and Colley review package which includes added climate change criteria. The analysis identifies key issues related to Scotland and Germany´s onshore wind energy plans, strengths, and weaknesses in the current status of wind energy planning in relation to the incorporation of the effects of climate change. In addition to that, it also unravels the causes for poor assimilation of climate change issues into SEA and finally highlights the opportunities and constraints in the SEA system of onshore wind energy parks. The analysis of the case study findings and survey results are presented in more detail in chapter six of this dissertation.

The second step used in this approach includes a series of interviews (see chapter seven) aiming at understanding the onshore wind energy planning in Scotland and Germany. Furthermore, this approach investigates the contextual factors which influence the integration of climate change impacts in the SEA of onshore wind energy plans. These semi-structured interviews are conducted with key personals involved in urban planning and renewable energy. The research design of this second step is further explained in the following section. The semi-structured interviews are mainly conducted with SEA experts, practitioners, planning officers, academic personnel with a research background in renewable energy and SEA. A total of eleven interviews with SEA experts were carried out. Most of the interviews were conducted on the telephone that lasted at least 60 or more minutes. The purpose of these interviews with relevant personals is to investigate key issues identified from the first step. Moreover, it helps to indicate any major deficiencies and aids to provide strategic options to improve the integration of the climate change aspects into the SEA of onshore wind energy plans in Scotland and Germany. A more detailed explanation of how the tasks in this phase are performed to achieve objective number three of this research is explained below.

2.2.3.1 Case Study Strategy

Case studies are the most commonly used high-quality research methodologies (Yazan, 2015), which is used as an empirical analysis to investigate a phenomenon where a holistic view of real-world events are investigated (Yin, 2014). Gerring (2004) states that case studies are essentially the "intensive study of a single unit with an aim to generalize across a larger set of units" (p. 341). A case study approach allows the researcher to vigilantly analyse the available data within a specific context. According to Kumar (2014), the case study approach is of vital importance, particularly when the study is focused on extensively exploring and understanding the real-world situation rather than confirming and quantifying. Yin (2014) has listed three basic case study categories: exploratory, explanatory, and descriptive. However, according to him these different types of case studies are not exclusive as they can overlap or complement each other. In this research, the approach adopted to analyse the case studies is based on three principal courses of action. The following section explains in more detail how the case study approach was designed and undertaken in this research.

2.2.3.1.1 Methodological Criteria and Basis for Selection

The case study methodology aids in an in-depth study of a real-life situation (Amaratunga et al., 2015). This methodology was therefore employed in this research in order to draw attention to the processes, practices, and outcomes of SEA in the wind energy industry as applied in Germany and Scotland in terms of climate change integration at the regional and local level. The case study methodology adopted in this research to evaluate the onshore wind energy plans is Lee and Colley review package (Lee and Colley, 1992; Lee et al., 1999). This package has been widely used in order to evaluate the quality and accuracy of the environmental statements. The review package is based in a hierarchical structure where the review topics are hierarchically arranged under four major areas of review, which are then further divided into review categories and subcategories. The more highly-detailed structure of this review package is described further in the following sections. In this research, case studies are very necessary to test the comparative framework of SEA between Germany and Scotland and obtain an in-depth understanding of the incorporation of climate change into the SEA in practice. According to Yin (2014), the exploratory case study methodology aids to explore any phenomena in the data, which the researcher finds interesting. Therefore, objective three of this research which deals with the qualitative analysis of wind energy planning reports in terms of climate change integration, the exploratory case study methodology was implemented in order to analyse the extent of incorporation of climate change issues into SEA reports of onshore wind energy plans. To end this, the adopted methodology is considered appropriate for providing answers to research objective three. The classical approaches to select case studies, for example, either ideal or negative, sampling-based, typical or unique cases (Patton, 2002) showed inflexibility as it was irrelevant to this research. The selection of case studies hence considered using a structured approach to encourage comparison between them. The following strategies were considered in selecting the case studies for this research:

a) Influence of Spatial Planning on CO_2 Reduction Target

The available evidence from policy and research tools leaves no doubt that the planning system plays a pivotal role in the policy of climate change. However, spatial planning showed leverage in tackling climate change issues, based upon its broad definitions, types and levels of intervention, tools, and resources available to it. Such chosen criteria for selecting the case studies helped to understand what such planning mechanism can do, and under which scheme of policy of climate change implementation of the research might be most likely to succeed. To ensure an efficient approach to reducing greenhouse gas (GHG) emission as well as the availability of different sources of clean, renewable energy, a multi-tiered governance structure should be implemented, through which the regions are expected to set goals in line with or better goals at the national level.

This is where the planning mechanism has an especially constructive role in climate policy. Yet, contrary, this is too where the planning framework system was structured as a part of the issue. In Germany's case, plans of onshore wind energy chosen from many German states are selected to forecast opposing outcomes because of varying planning levels and systems. Accordingly, the German case studies are selected based on different spatial levels including regional and municipal levels to understand the impact of spatial planning in reducing GHG emission targets. While in the case of Scotland, the four selected case studies are obtained from Scotland's thirty-two council areas, ranging from the largest (Highland) to the smallest (East Renfrewshire) local government areas. This approach helped identify factors that might work as constraints or opportunities to mitigate and adapt mechanisms planning that are widely recognized in the literature of climate change.

b) Recognizing Suitable SEAs of Onshore Wind Energy Plans

The German and Scottish case studies were primarily chosen since the onshore wind energy plans from both countries meet the following criteria:

i. The case studies are chosen based on procedural features of SEA – that is, the documents follow a structured SEA procedure or integrate the majority of SEA measures into various hierarchies or contents.
ii. The regions chosen for study must be inclusive with the wind energy plans. In the case of Germany, they must have sub-plan use of wind energy in the region (also called Teilplannutzung der Windenergie).
iii. Case studies are chosen from various states and policy stages depending on how successful they are in rising the goals for CO_2 emissions reduction.
iv. In the case of a re-powering of the wind farm, various wind energy programs must be discussed – whether it is a new plan or partly revised.
v. Coverage of multiple regional and environmental perspectives (i.e. small and large communities with varying environmental conditions).

vi. Case studies with full assessments got significant attention, and thus documentations of the final stage as well as assessments results were available. This allowed individuals to focus on the entire evaluation process, which included public comments and consulted authorities with clear environmental responsibilities.

This study is primarily based on the onshore wind energy plans only. One of the key reasons to exclude plans of offshore wind energy is that there are many major differences across countries when it comes to planning projects related to offshore wind, which has implications for the ultimate decision-making mechanism and public feedback function. For example, in the Scottish case, due to the fact that local authorities and municipalities do not extend over offshore regions, because the approval and planning of offshore wind farms is controlled centrally in the United Kingdom (UK). While in Germany, the scheme of maritime planning and control is divided between territorial waters and the Exclusive Economic Zone (EEZ), for which a federal agency (also called: BSH- Bundesamt für Seeschifffahrt und Hyrographie) is responsible. The regional authorities (federal states) in Germany are primarily responsible for planning and approving developments in territorial waters, and it is a central government agency that exercises decision-making powers over the EEZ.

Because of these major variations in the distinctive intuitions, planning frameworks, marine frameworks as well as terrestrial spatial planning structure, the option of onshore wind energy appears to be most fitting for this study, and therefore selected for further investigation.

Eight evenly divided case studies were chosen according to the above requirements, with four cases coming from Germany and the other from Scotland. Given that the SEA system in both countries depicts institutions with specific influential components and constraints regarding onshore wind energy planning and climate change policies, the cases selected for this study appears to be appropriate. Moreover, a detailed description of the case studies areas and their analysis is also presented in chapter five and chapter six of this dissertation.

2.2.3.1.2 Case Study Analysis

According to Patton and Appelbaum (2003), the main goal of the case study is to unravel patterns, identify meanings, construct interpretation, and build theory. To evaluate the quality of the sample of either reports – four from each Germany and Scotland, the Lee-Colley review package (Lee and Colley, 1992; Lee et al., 1999) was used. The Lee and Colley (1992) approach rely upon the use of a hierarchy of comprehensive review criteria. The detailed structure of the review criteria is explained further in this chapter. This approach has been widely used by various researchers (Badr et al., 2011; Barker and Wood, 1999; Cashmore et al., 2002; Glasson et al., 1998; Glasson and Salvador, 2000; Gray and Edwards-Jones, 2003; Hughes and Wood, 1996; Sandham and Pretorius, 2008). The thriving usage of Lee and Colley review package globally and its simple and easily understandable structure and methodology are the rationales as to why it is considered so widely and why it is chosen as the best criteria for this study. Therefore, the approach is an internationally recognised good practice criterion and in this case, is applied in the context of Germany and Scotland as well. To keep the review package suitable to the particular context of concern, a little amendment was made to the review package such as that given in Lee and Colley (1992); Lee et al., (1999). The review package was modified at the sub category level to include specific climate change issues and topics in the process of SEA in order to provide relevancy to the topic of this research. The modified review package includes changes in the descriptions of the different sub review categories, and addition of new topics in order to allow for a proper review of the German and Scotland SEA systems, which can reflect climate change integration in the SEA of onshore wind energy plans while assessing best practice. Table 2.1 present an adapted Lee and Colley review package in which more criteria for climate change issues are added in the sub review categories of each review area. Previous studies who adopted this review package have also taken this concern (modification) in to account (Sandham and Pretorius, 2008, Badr et al., 2011).

Adapted Review Area Topics
Review Area 1- Description of the Plan, Baseline & Identification of Key Issues
Review category 1.1- Characteristics of plan & existing environment
Sub Review Category 1.1.1- The document should outline the contents, SEA process & main objectives of the plan.
Sub Review Category 1.1.2- Describe current & expected future climate baseline
Sub Review Category 1.1.3- Describe how the proposed project is vulnerable to the impacts of climate change over its life span.
Review category 1.2- Identification & evaluation of key issues
Sub Review Category 1.2.1- Outlines the climate parameter of most interest to the project
Sub Review Category 1.2.2- Assessment or identify key issues related to climate change impacts
Sub Review Category 12.3- Identify direct threat to wind turbines
Review Area 2- Identification & Evaluation of Alternatives & Impact Analysis
Review category 2.1 – Identification & assessment of alternative options
Sub Review Category 2.1.1 – A wide range of alternative options are identified
Sub Review Category 2.1.2 - Climate change implications are assessed while considering alternatives

Sub Review Category 2.1.3 - Describes how reasonable alternatives were identified
Review category 2.2 – Identification of climate change impacts
Sub Review Category 2.2.1 – Identifying current and historic trends in the climate of that area or region
Sub Review Category 2.2.2 - Identify the cumulative impacts of the wind farms
Sub Review Category 2.2.3 - Methods used in identifying and predicting climate change impacts should be explained
Review Area 3 – Assessment of Mitigation & Adaption Measures
Review category 3.1 – Evaluation of mitigation measures
Sub Review Category 3.1.1 – The document should state contingent plans to mitigate impacts where monitoring reveals adverse effects
Sub Review Category 3.1.2 - Mitigation of climatic impacts on the environment as well as on the wind farms
Sub Review Category 3.1.3 - When negative impacts on the environment are unavoidable mitigation hierarchy should be applied
Review category 3.2 – Evaluation of adaptation measures
Sub Review Category 3.2.1 – Describing adaptation solutions which are technically feasible to address projected climate vulnerabilities
Sub Review Category 3.2.2 - Integration of adaptation measures with the mitigation measures for climate change effects
Sub Review Category 3.2.3 - Identifying the preferred adaptation measures in the context of climate change
Review Area 4 – Stakeholder Involvement & Follow up
Review category 4.1 – Stakeholder consultation
Sub Review Category 4.1.1 – Identifying applicable stakeholder apart from the general public for e.g climate change expert
Sub Review Category 4.1.2 - Clearly defining the time frame of the consultation
Sub Review Category 4.1.3 - The document should include information about comments from public participation
Review category 4.2 – Monitoring & evaluation
Sub Review Category 4.2.1 – Identifying if the document mentions indicators used for monitoring climate change
Sub Review Category 4.2.2 - Includes provision for monitoring climate related measures
Sub Review Category 4.2.3 - Shall explain how monitoring is done, in order to be able to undertake appropriate remedial actions

Table 2.1Adapted review package within the context of climate change issues
Source: Elaborated by author and adapted from Lee and Colley (1992)

Since the main focus of the analysis in these case studies (onshore wind energy plans) will be the level of the integration of climate change into the SEA, therefore, modification of review areas was taken into concern. Moreover, it will help to illustrate the key aspects of climate change that are relevant to the SEA of onshore wind energy plans. The following section presents the comparison between the original and the amended Lee and Colley review package. Moreover, Appendix A also shows in detail all the review topics of the original review criteria that were initially formulated by Lee et al., (1999). However, a condensed version of the original Lee and Colley review package is shown in table 2.2.

a) Original Lee and Colley Review Package

Several studies across many sectors assess the environmental outcomes through using the review package provided by Lee and Colley in 1992 (Barker and Wood, 1999; Bojórquez-Tapia and García, 1998; Lee and Dancey, 1993; McGrath and Bond, 1997; Glasson et al., 1997 and Lee et al., 1999). In their research, both Lee and Colley (1992) framed a hierarchical analysis with grades ranging from A (well performed) to F (poorly attempted). This was reported entirely at the top of the proposed review, with marks given according to a broad, four-based sub-headings commonly defined as review areas. Moreover, such headings are based on extra layers of significant questions or topics (see Appendix A) and the following table (2.2) summarizes these layers:

Lee and Colley Review Package: A Quality-Based Assessment Tool	
1	**Development Summary, Local Environment & Baseline Conditions:**
	Plan Description
	Affected Environment
	Baseline Principles and Regulation
2	**Key Effects: Evaluators & Identifiers**
	Environmental Appraisal Scope
	Key Effects Description
	Impact Assessments
	Sustainability Plan Appraisal
3	**Alternatives Solutions, Prevention, Tracking & Guidance**
	Alternative Solutions
	Measures to Mitigate
	Analysis & Tracking
	Suggestions
4	**Result Communications**
	Display
	Present
	Doubt
	Emphasize
	Consult
	Non-professional Overview

Table 2.2: Original Lee and Colley review topics
Source: Lee et al., 1999

As previously mentioned, the quality of the content and the environmental statement is reviewed under each of the subheadings by using a scale report in the range of A-F, and their approach includes a set of 49 sub-category reviews that assist in reviewing environmental assessment reports. Methods of mitigations, for instance, include aspects such as project modification, alternative facilities provision, and compensation as well as pollution control (Lee and Colley, 1992, p. 49). The responses resulted within each category are then evaluated, and an overall grading was provided based upon a qualitative basis. The Lee and Colley review package is graded with letter A as an indication of “well-performed” to F, which refers to quite dissatisfying - exactly as of tasks poorly done or not attempted (Lee and Colley, 1992, p. 53). Furthermore, at the C-D level, there was the threshold between a passable environmental statement and an insufficient non-compliant one. The categories that provide the basis for the overall grading of the Lee et al., (1999) report are grouped into four major areas such as, i) development summary description, local environment, rules of baselines, ii) identifiers and evaluators of key affected environments, iii) alternative solutions, measures of mitigation, iv) result communications (see Appendix. A).

Complexity of the original Lee and Colley review package soon appears to be diminished when one review and admires its ability to criticize sharply a detailed report along with revealing its major strengths and weakness. Its implementation in the United Kingdom and Europe’s review of environmental statements helped recognize shortcomings in the reports, which led to revision development in the Environmental Impact Assessment (EIA) Directive (Lee et al., 1994; Lee, 1995; Sadler, 1996; Wood et al., 1996 and Lee and Brown, 1996), thus in Strategic Environmental Assessment (SEA) Directive as well. To better include the SEA findings, Lee et al., (1999) updated and re-applied the study from Lee and Colley package. According to their research, Lee et al., (1999) modified and designed the quality assessment report to assess reports of SEA towards certain standards obtained from general goals and concepts of SEA, best practices guidelines, and even from essential research studies. Different approaches of assessment are utilized to create the package, such as studies that are conducted to reflect SEA goals, procedural practices, values, and methodological approaches that best explain the inclusion of climate change issues in SEA (Crnčević, 2011; Posas, 2011a; Posas 2011b; Larsen et al., 2012; Wende et al., 2012; Larsen et al., 2013 & Bodde, 2018). With the help of the criteria obtained from these studies, the following adapted review package encouraged tackling the unique characteristics of the inclusion of climate change in onshore wind energy plans.

b) Adapted Lee and Colley Review Package

In the adapted Lee and Colley review package there are several variations between the upper and lower tiers of the original Lee and Colley review package and the revised version for this study. The results obtained by Lee and Colley indicate that the number of review areas continued to be the same, exactly as in the original and modified review package. However, the major differences happened in the review and sub-review categories, where there was a reduction from 17 to 8 in the review categories and a decrease from 49 to 24 in the sub-review categories. The topics of the upper and lower tiers of the revised review package resulted to be adaptable to the climate change issues in SEA. Moreover, the author has developed the revised review package based on a two-pronged approach. First, to evaluate the conceptual framework and the structural format of the review package, an analysis of Lee and Colley ES (Environmental Statement) quality assessment methodology is carried out. Second, the findings presented in chapter three - in terms of climate change integration in SEA of onshore wind energy plans – highlighted the content of the review package with regards to the criteria developed. Therefore, this research also demonstrates how such criteria are structured in the review, as it follows the same framework as that of Lee and Colley (Lee and Colley, 1992 & Lee et al., 1999). Subsequently, applying the results of testing the package to the German and Scottish case studies are addressed in chapter six with regards to two aspects. Firstly, the appropriateness of the SEA tool. Second, the quality of SEA-based studies reviewed on the inclusion of climate change in the onshore wind energy plans in Germany and Scotland. For further understanding, the review topics of Lee and Colley are presented in appendix A, while the modified version is shown in table 2.1.

2.2.3.1.3 Criteria for Review Package for Document Analysis

Lee and Colley (1992) designed the review package to analyse the accuracy and the quality of the environmental statements. The research in this thesis was modelled on the Lee and Colley framework because it is comprehensive, robust, and widely used. When developing the review framework that is used to assess the environmental reports and their quality, a criteria-based approach was adopted. The review framework, which is referred to as "Lee and Colley review package", is used in order to evaluate the quality of the SEA reports. This review criteria is mainly based on general SEA objectives, good SEA practice requirements, and incorporates the stages of the SEA process. One of the main reasons for using this review criterion was that it gives a systematic approach to access the quality of the SEA report. It is crucial to mention that this method requires more than one reviewer for the assessment who are sufficiently familiar with the requirements of the SEA, however, one reviewer approach has also been used widely and successfully by various authors (Gray and Edwards-Jones, 2003; Guilanpour and Sheate, 1997; McGrath and Bond, 1997) and part of Peterson (2010).

According to Peterson (2010), analysis of the review package done by two reviewers is more accurate and critical than an assessment performed by a single individual. For this research, it was however not possible to arrange another reviewer to minimize bias, therefore analysis approach which was previously used by McGrath and Bond (1997) was adopted for this study, in which a single researcher repeatedly reviewed all four SEA reports at an interval of one day. The results were then compared to the previous results. This approach is based on re-reviewing the same environmental document after an interval of time and then comparing those results to the results of previous reviews.

2.2.3.1.4 Application of Review Package for Document Analysis

The Lee and Colley review package was outlined by integrating the criteria for good quality SEA into a review format. These criteria were originally developed for project-level environmental statements (EISs) (Lee et al., 1999; Lee and Colley, 1992). In order to investigate the quality of the SEA report, it was determined that the best method for the purpose of this analysis was to use the framework and the package designed by Lee and Colley because it is widely acknowledged by environmental practitioners, and planning officers and also keeping in mind its similarity between principles of project-level EIAs and SEAs of land use plans (Bonde and Cherp, 2000). The principal reason for choosing this review package is the range of criteria that cover all the assessment tasks involved in the preparation of the SEA. Another reason behind using the structure found in the Lee–Colley package is that the package enjoys widespread use by practitioners of EA, including but not limited to planning officers (Lee et al., 1999). The review package takes account of the fact that SEA of onshore wind energy plans has additional objectives of focusing on cumulative and synergistic effects and impacts, evaluation of strategic alternatives, facilitating the integration of climate change considerations into an early stage of decision-making in the planning system, and presenting assessment, monitoring and mitigation recommendations.

The successful use of this review package by various authors globally and its easily understandable structure and methodology are the reasons why it is used for this research. Therefore, in this research, the author also used the method developed by Lee and Colley since it is considered the best achievable methodology to evaluate the quality of eight environmental reports carried out in the onshore wind energy sectors in Germany and Scotland. The Lee and Colley review criteria is based in a hierarchical or pyramidal structure. The hierarchical structure of the review package as shown in figure 2.3 has four levels of assessment, that is, Level 1: Assessment of sub-review categories, Level 2: Assessment of review categories, Level 3: Assessment of review areas, Level 4: The overall assessment.

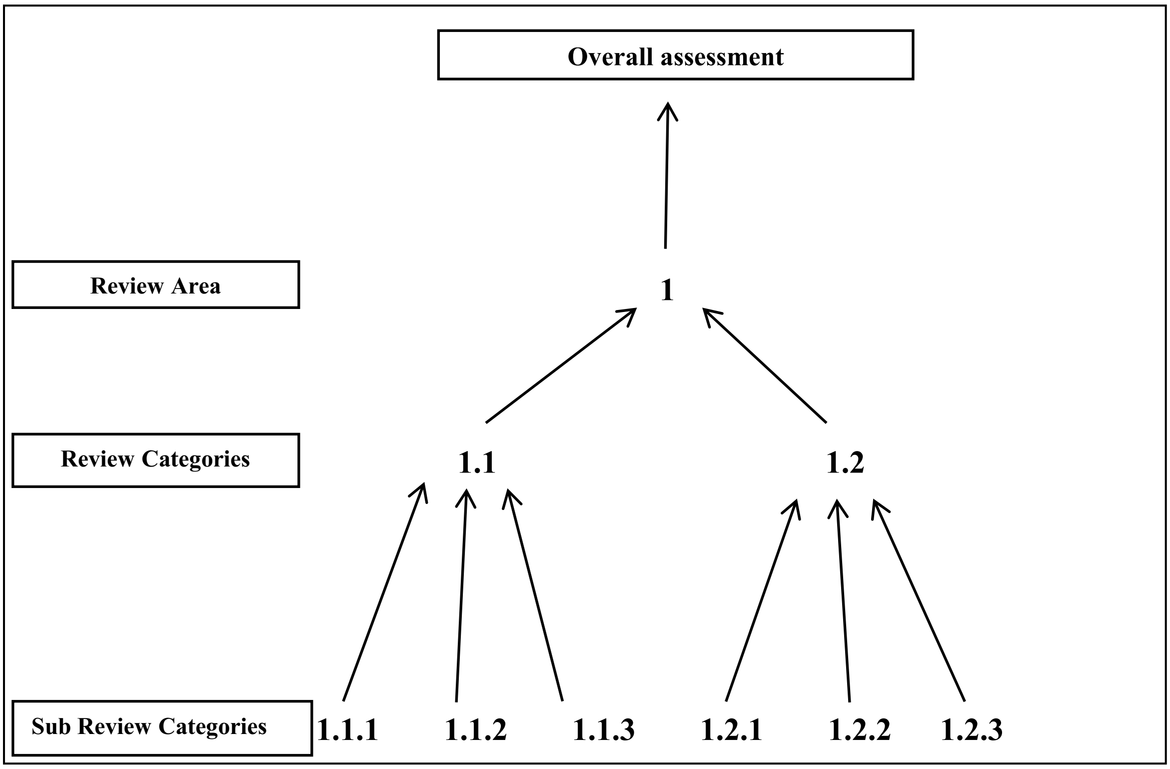


Figure 2.3 Hierarchical structure of the Lee and Colley review package.
Source: Adapted from Lee and Colley (1992).

This hierarchical pyramid structure incorporates the review topics as well as the review areas of the Lee and Colley package, which are used in the development of the review criteria. However, in order to make the review package suitable for this study, the review topics were slightly modified and adjusted according to reviewers' observation and research needs (see table 2.1). The review of the document commences at the lowest level, which is the base of the pyramid containing sub review categories (lowest level), and then gradually moves upwards to the review categories. From the review categories, the analysis heads up to review areas, and finally, the overall assessment is completed by reviewing the final review areas. The review package for this research was designed around four main hierarchically arranged review areas;

- Review area 1 – A description of the plan, baseline and the identification of key issues
- Review area 2 – An identification and evaluation of alternatives and impact analysis
- Review area 3 – An assessment of mitigation and adaption measures
- Review area 4 - Stakeholder involvement and follow-up

All the review areas and review categories are further modified and elaborated by the author, in order to meet the objectives of this research.

The ***first review area***, which is a description of the plan, baseline, and identification of key issues helps to answer questions related to characteristics of plan, it's present and expected future climate baseline and its vulnerability to the effects of climate change. This provided the basis for understanding whether the plan contained enough climate change information in the section where the plan is described and if climatic factors are highlighted where key issues are identified and evaluated.

The ***second review area***, which is identification and assessment of alternatives and impact analysis, aids in understanding if climate change implications are assessed while considering alternatives and in the impact prediction stage of the plan. This review area helped to identify if the assessment of the alternative within the context of climate change is done effectively or not since the SEAs of the onshore wind energy are long terms plans, therefore, effective consideration and evaluation of alternatives provide the opportunity to think about different pathways toward meeting or addressing climate change goals or aims. Moreover, this review area also provides an opportunity to understand whether or not the climate change impacts are predicted and assessed for the whole plan from every dimension by identifying cumulative impacts, current and historic trends in the climate of that area.

The ***third review area***, relates to the assessment of mitigation and adaption measures of the onshore wind energy plans in the context of climate change. This review area aids in understanding the adaptation strategies of the plan and how the climate change impacts are mitigated in that specific planning region by considering whether or not and how the aspects of plans or programs are aiding at reducing GHG emission or increasing the carbon sinks.

The ***fourth review area*** addresses issues related to stakeholder involvement and follow up. This review area helps to understand the importance of stakeholders in terms of exerting influence in favour of more climate-friendly planning processes. Moreover, this review area helps to reflect on issues linked to indicators and monitoring for climate associated measures.

Each review area has two different review categories, which in turn contain three sub review categories. The full list of criteria containing the review areas with review categories and subcategories are presented in table 2.1.

2.2.3.1.5 Assessment Symbols

With the help of the assessment symbols presented in table 2.3, the contents and quality of the documents are assessed, and then a grade is allocated ranging from A to F, depending on how well a task has been performed or completed. The table (2.3) also displays explanations for each grade, which shows the meaning and description of quality assessment symbols used for the grading of case study analysis. The assessment symbols are presented in alphabetical letters in order to discourage the mathematical factors of addition and subtraction, which could limit and distort the overall results (Lee et al,1999).

Assessment Symbols	Explanation
A	Relevant tasks well performed, no important tasks left incomplete.
B	Generally satisfactory and complete, only minor omissions and inadequacies.
C	Can be considered just satisfactory despite omissions and/or inadequacies.
D	Parts are well attempted but must, as a whole, be considered just unsatisfactory because of omissions and/or inadequacies.
E	Not satisfactory, significant omissions or inadequacies.
F	Very unsatisfactory, important task(s) poorly done or not attempted.
N/A	Not applicable. The review topic is not applicable in the context of this statement.

Table 2.3 Grade symbols for assessing SEA quality

Source: Lee and Colley (1992)

The results of the assessment are subsequently logged in a collation sheet (see appendix B) which is not only used to record the assessment results but also reflects briefly on the strengths and weaknesses of the assessed environmental report. Chapter six of this dissertation presents the overall analysis of the review criteria designed for this research for document analysis.

2.2.3.1.6 Degree of Satisfactoriness

To determine the strengths and weaknesses found in the SEA reports of Germany and Scotland, percentages values were used, where grades A, B, C, D, E, and F are grouped together to interpret the values in percentage "satisfactoriness". In table 2.4, the value of each grade in percentage is described. Further description of the details of the degree of satisfactoriness in each case study is presented in chapter six of this dissertation. Since all the grades reflect a differing degree of satisfactoriness, such as assessment symbol A represent well-performed, B signifies satisfactory and complete, C represent just satisfactory, D indicate just unsatisfactory, E shows not satisfactory with significant omissions and inadequacies, and F represents poor, as a result, only A and B scores can be regarded as well done and satisfactory and similarly, E and F regarded as poorly done. Hence, the average values of grades A and B were summed up to get A-B% (see table 2.4) which interprets the highest quality with relevant tasks performed and presents that the report is satisfactory. Correspondingly, the grades C and D were summed up to get C-D%, referring as average or tasks that are neither too satisfactory nor unsatisfactory but lay somewhere in borderline, and finally E-F% represent the lowest quality showing that the report is considered as poor in terms of its tasks performed (Sandham & Pretorius, 2008), with misleading reporting and key tasks unsatisfactorily undertaken or not attempted at all. The degree of satisfactoriness is basically used for broad interpretation purposes reflecting the strengths and weaknesses of a document.

Degree of Satisfactoriness	Description
A-B%	Satisfactory/Good
C-D%	Average/Borderline
E-F%	Unsatisfactory/Poor

Table 2.4 Degree of satisfactoriness

Source: Lee and Colley (1992)

2.2.3.2 Interviews with SEA Experts

Interviews with SEA experts were conducted for this research as a means of data collection. Kvale and Brinkmann (2009) stated that "interviewing is an active process where the interviewer and interviewee through their relationship produce knowledge" (p. 17). According to Peräkylä and Ruusuvuori (2011), qualitative interviews help to gain access to "areas of reality which would otherwise remain inaccessible" (p. 529). The interviews carried out in this research are mostly semi-structured in nature. A semi-structured interview is a type of inquiry that is moderately structured and involves a blend of pre-determined open-ended and closed-ended questions often accompanied by follow-up questions (Adams, 2015). These are asked in order to gain a greater understanding of the topic. Kallio et al., (2016) also outline the importance of semi-structured interviews by stating that semi-structured interviews helps the researcher in gathering evidence and insight from expert´s outlook, and lets the experts provide answers to the questions, reasons, details, and explanations of their answers. Since the goal of this research is to assess the extent of climatic factors into the onshore wind energy plans, therefore semi-structured interviews along with document analysis were considered as the suitable data collection methods employed in this research. The qualitative interviews with key informants are conducted for the following purposes;

- to bridge the gaps in qualitative data that are identified during the conceptual phase of the research;
- to confirm crucial information gathered during the literature review process;

- to gain an understanding of selected themes reflecting on onshore wind energy planning in Germany and Scotland regarding the integration of climate change aspects in their SEA process;
- to identify potential future strategies objectives to enhance the incorporation of climate change aspects into the SEA process of onshore wind energy plans in Germany and Scotland.

Additionally, the SEA expert interviews conducted in this research helped to enhance the quality of the results and provided an additional view of the case studies along with the document analysis. Utilizing the expert interview approach for this research helped to gather the most current and relevant information for the study.

2.2.3.2.1 The Interviewees

In order to achieve the goals of the research, semi-structured interviews are conducted with SEA experts, practitioners, academic personnel, and with planning officers\SEA stakeholders for each case if possible. A total of eleven SEA experts were interviewed for this research who had a vast knowledge of the SEA process and methodology along with renewable energy planning mainly onshore wind energy. Table 2.5 presents the information of all the competent SEA experts who were selected for qualitative interviews for this research.

Expert´s Code	Countries	Affiliation	Date of Interview
GER1	Germany	Academia and SEA Researcher	27.02.2018 by telephone
GER2	Germany	SEA Practitioner	12.01.2018 by telephone
GER3	Germany	SEA Practitioner and Plan Maker	18.03.2018 by telephone
GER4	Germany	SEA Practitioner	08.02.2018 by telephone
GER5	Germany	Academia and SEA Researcher	12.02.2018 by telephone
GER6	Germany	SEA Expert and Practitioner	12.02.2018 by telephone
GER7	Germany	Senior Planner	03.11.2018 by email
SCO8	Scotland	Senior Planner	04.01.2019 by email
SCO9	Scotland	SEA Expert	20.12.2018 by telephone
SCO10	Scotland	Senior Planner	15.12.2018 by telephone
SCO11	Scotland	SEA Expert and Practitioner	17.12.2018 by email

Table 2.5 Information about experts chosen for qualitative analysis
Source: Elaborated by author

Out of these eleven interviewees, seven experts were selected from Germany and four from Scotland. "Saturation of knowledge" (Bertaux, 1981, p. 37) is one of the rationales for a lesser number of interviews in Scotland. After conducting these four interviews, the research questions are identified and the desired endpoint of data collection was reached from

Scotland´s point of view. Most of the interviews were conducted on the telephone and lasted at least 60 minutes. This research also uses the snowball principle i.e. when one interviewee endorses and recommends other competent personnel for the interview. The interview begins by explaining the motivations and intentions of the researcher for the study. The aims and objectives of the research are also illustrated to the interviewee. The interviewee is then acquainted with the timing and structure of the interview. Privacy is respected and all the interviews are recorded with the consent of the interviewees. The principles of confidentiality and anonymity (Trochim and Donnelly, 2006) will be acknowledged therefore all the interviewees are kept anonymous in this dissertation.

2.2.3.2.2 Interview Process

The interviews are commenced with open-ended questions to make the interviewee comfortable, while simultaneously revealing the extent of the respondent's knowledge. The main part of the interviews consists of a combination of open-ended as well as semi-structured questions. The most important thing considered during an interview is that the questions should center on the roles and responsibilities of the respondents and the questions should be able to generate and trigger a more relevant and specific discussion. Patton and Appelbaum (2003), highlights the significance of the formation of an interview guide to assist and support with the interview process.

Therefore, for this research as well, an interview guide was produced which is used as a script and is based on research aims and objectives and relevant discourse mentioned in the literature. According to Kvale and Brinkmann (2009), the interview guide provides a structure to the qualitative interview and acts as a guideline for the interview. The interview questions designed for this research are reflected on the following topics

i) Climate change issues in the context of German and Scottish SEA studies,

ii) Quality and effectiveness of SEAs procedural methodology,

iii) Integration of climate change issues in each SEA procedural steps,

iv) Reasons or causes for limited inclusion of climate change into the SEA process and how it can be improved. A detailed interview guide used for this research is presented in appendix C.

Almost all the interviews are conducted on the telephone and are audiotaped except few which were carried out through emails. In order to create a balance and provide for consistency, the nature of the interview design is kept as mixed, i.e. the interview questions are both general as well as detailed following with a two-way discussion and communication regarding the research topic. With regard to the process of preparing, conducting, and interpreting the experts interviews, a framework provided by Kvale (1996) was followed which is based on seven stages, including interviewing, transcribing, analysing, schematising, designing, verifying and reporting. All the transcripts of the interviews are presented in appendix D of this dissertation. The method used for interpreting the interviews is time and resource-consuming, but allows for a deeper understanding of attitudes and reveals aspects that would have been hidden by doing document analysis only.

2.2.4 Proposing Response Actions

The main task in this approach is the synthesis of the key conceptual issues from phase (1) and key Scotland and Germany´s onshore wind energy planning issues from phase (2), to develop or propose relevant response actions with the climate change context (see figure 2.2). This approach is useful in order to help understand and identify important knowledge gaps, as well as possible areas in SEA to focus in the future to integrate climate change issues in the onshore wind energy plans at a regional and local spatial level. The tasks in this phase are supplemented by further analysis and review of onshore wind energy plans and interpretation of the interviews which are carried out in phase 2. The review of the climate change policies, planning legislations, and information extracted from SEA experts further identifies opportunities and constraints which determine the potential of the SEA to integrate climate change related issues into the SEA of onshore wind energy plans of Scotland and Germany. Based on this analysis, a set of response actions are proposed that help to enhance climate change integration in SEA of onshore wind energy plans of both the countries. The tasks in this stage are conducted to achieve objective number four of this research.

2.3 Validity and Reliability

Validity and reliability are two important concepts to take into account when undertaking qualitative research since they help to assess the results of the qualitative information gathered and aid in determining the objectivity of the research. Validity in the context of qualitative research means whether or not the techniques of measurement are accurate, and whether the researcher is measuring what he or she is intending to measure (Golafshani, 2003). The reliability in qualitative research means "being thorough, careful and honest in carrying out the research" (Robson, 2002, p. 176). According to Leung (2015), qualitative research is a two-way interactive process between the researcher and the reader as well. Therefore, the validity and reliability should be maintained in such a way that it is not only evaluated by the researcher, but it should also be judged by the receiving end too. Careful attention to the establishment of validity and reliability is essential in producing high-quality case study research (Merriam 1998; Gibbert et al., 2008). Internal validity ensures the conclusions made by the researcher which reflect reality. Gibbert et al., (2008) suggests this can be accomplished by establishing a clear research framework by comparing results to other previous studies, and by ensuring the acknowledgment of the various theories and perspectives surrounding the topic of study. In this thesis, internal validity is demonstrated by completing a comprehensive literature review in order to gain an in-depth understanding of how my research topic fits into the broader research context. Construct validity ensures that observations in the field, reflect the reality of the case of interest (Gibbert et al., 2008). To demonstrate construct validity in this thesis, a clear chain of evidence is constructed showing the logical linkages between research purpose, objectives, data collection methods, analysis procedures and final conclusion.

In order to further ensure the consistency in validity and reliability of the data, triangulation is used in this research by gathering essential information through various sources. A multi-method strategy was adopted to allow triangulation in data collection and data analysis. As a result, for this research three different methodologies are combined to collect data, i.e. literature review, data obtained from expert's interviews, and document analysis of environmental statements as a way to confirm emerging patterns. The data collected from various SEA experts from Germany and Scotland provided supplementary evidence to complement data obtained from document analysis. Apart from that, evidences attained from qualitative investigation provide a deeper understanding of the information that is obtained in the conceptual phase of the research. In this research, the qualitative data gathered from SEA experts played a major role in adding confirmation to what information was extracted from document analysis. Nevertheless, SEA documents had a crucial role to play in the elaboration of the interview guide, which is another important consideration regarding the validity of this research. The interview guide was designed in such a way to achieve good quality information, which helped to ensure the enhanced validity of results obtained and proved the findings to be logical and consistent.

Reliability of data in research is as important as validity. According to Yin (2003), the aim of the reliability is to minimise errors and bias in research. Reliability thus deals with the transparency and the description of how the research and analysis are carried out. In addition, to increase reliability, the methodologies used for data collection as well as the approach to data analysis are described as clearly and transparently as possible in this chapter. This chapter itself attempts to communicate the reliability of this research through discussion and explanation of case study selection, the methods used, and also the approach to analysis of data. When carrying out the research there were instances where there was a need for multiple explanations and inclusion of crucial information in order to maximize the objectivity of the research. Not to mention, the subjective views and research bias are eliminated in this research by searching for ‘negative-cases’ (Robson, 2011) and by constantly and critically questioning the motives, methodologies, and opinions during the research. However, according to Robson (2011), the effects of the research bias could be minimised by adopting a systematic and documented approach but cannot be entirely eliminated, therefore it’s important to consider the human error. In qualitative research, acknowledging the probable biases is an essential part of maintaining validity and researchers’ integrity (Maxwell, 1996).

3 Environmental Assessment Conceptual Framework

This chapter presents the potential of environmental assessment in addressing complex issues of climate change in Germany and Scotland. Furthermore, it describes and discusses the legislative, regulatory and, climate change context of Strategic Environmental Assessment (SEA) in two different systems (Germany and Scotland). Beginning at the level of the European Union (EU), the chapter discusses the defining features of SEA. The chapter then highlights the development and status of the environmental assessment systems and SEA regimes in Germany and Scotland with respect to onshore wind energy. Due to separate planning systems, there is a variation in strategic assessment regulations in Germany and Scotland, therefore the purpose of this discussion is to give consideration to the wider political context surrounding the different systems for strategic assessment in terms of climate change perspective. It is considered crucial to give attention to the legislative, regulatory, and, climate change context of SEA in order to reflect on the possible influences this may have on individual practice.

3.1 Development of Strategic Environmental Assessment in the EU

The EU Directives on Environmental Assessments such as Directive 2011/92/EU (also known as 'Environmental Impact Assessment' – EIA Directive) and Directive 2001/42/EC (also known as 'Strategic Environmental Assessment' – SEA Directive) aim to contribute to the incorporation of environmental factors and to deliver high levels of protection to the environment. Furthermore, it plans to take these directives into consideration when working with programmes, plans, and projects so as to reduce the risk of impacting the environment.

Based on the European commission SEA Directive (2001/42/EC), Strategic Environmental Assessment (SEA) works by integrating considerations about the environment into policies, plans, and programmes (PPP). It has been described as the evaluation of the probable environmental effects of PPP which consists of the preparation and creation of a report on the environment and also consists of conducting public consultations and participation (UNECE, 2012). Partidário (2003), concludes that the SEA does not have any specific techniques or methods. Instead, it borrows techniques and methods from a variety of sources, which include policymaking, evaluation, planning, and project assessment. The methodologies and procedures that are adopted in the SEA and decision-making process are crucial elements for assessing the technical quality of the documents that are produced by the decision-makers and SEA actors (Sadler and Verheem, 1996). The most recognizable EIA-based SEA process is made up of seven procedural stages; screening, scoping, analysis of alternatives, report preparation and review, decision making, follow up and monitoring, and consultation and participation (Fischer, 2007; Sadler, 2001).

During more than half a century history of the EU, environmental policy has seen gradual implementation resulting in the EU having some of the most progressive environmental policies in the world (Jordan, 1999). According to Jordan (1999), through the EU's history, environmental policy has graduated from a series of incidental measures to a complex and unique system of policy making, shared between supranational, national and sub-national actors. Indeed, the environment and the climate change agenda have seen considerable integration into the formal rhetoric and policy of the EU, since negotiations began in 1991 at the climate change convention. The EU and its member countries participated in unified international efforts to fight against climate change whilst working under the UN climate convention, which was agreed in 1992. The UN framework convention on climate change (UNFCCC) positioned climate change as being a fundamental objective of the EU in order to prevent precarious anthropogenic interference within the global system of climate (UNFCCC, 2015). However, it is important to note that there exists a considerable implementation gap between the policies and legislation related to the environment and their enactment on the ground, leading to questions being asked about the effectiveness of EU policy at resolving environmental problems (Jordan et al., 1999; Treib, 2008). The EU still has much to achieve in order to ensure its leadership efforts to perform an adequate international response to the climate change challenge.

In addition to that, it is important to discuss the implementation of EU policy when considering the extent to which a policy represents a sufficient output to tackle the intended problem (Jordan et al., 1999). As Scharpf (1988) suggested, working to produce legislation in such a complex network of actors provides considerable space for so called 'joint decision-making traps', where contested policies are agreed upon only when reduced to their weakest form. However, Jordan et al., (1999) highlighted several other problems with directives adopted by the European Commission, including vague and possibly competing objectives borne from the need to reach consensus. Besides, there is often little consideration given to practical issues of implementation during negotiation processes, the legislation proponent is not substantially responsible for implementation, legislation is often poorly drafted, interest in environmental legislation is weak, and often geographically dispersed, consultation with experts is low, and enforcement is slow, secretive, inflexible, complex and dominated by individual states (Jordan et al., 1999).

3.2 The SEA Directive

As a function of the European Union's commitment to integrating the environment into the higher levels of decision-making, SEA Directive (2001/42/EC) was introduced. This directive obliges that the member states that make up the EU, conduct assessments that show how the environment is affected by certain plans and programmes. The goal of the SEA as stated in Article 1 of the SEA Directive is to: "provide for a high level of protection to the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that an environmental assessment is carried out of certain plans and programmes that are likely to have significant effects on the environment."

The scope of the SEA Directive is explained in Article 3. The article presents a list that shows which sectors are likely to be incorporated. This is like Article 1, which displays the association between noteworthy environmental effects and the SEA Directive (European Parliament and the Council of the European Union, 2001, p.32). The approach to strategic assessment advocated through the SEA Directive is described by Jackson and Illsley (2007), as EIA practice which is applied to programmes and plans and attempting to predict what changes have occurred to the environment to put it into its current state and is brought about by the implementation of a programme or a plan. The process of 'environmental assessment' is briefly defined in the SEA Directive. It defines environmental assessment as the preparation of a report on the environment, completing consultations, and then considering the environmental report and the results found during the consultation. This is then used when making a decision as well as the provision of information with regards to the decision. This must follow the accords set by Articles 4 and 9 (European Parliament and the Council of the European Union, 2001, p.32, Article 2 (b))

The SEA Directive includes requirements for early and effective consultation. It instructed that the consultation should be with statutory authorities, stipulated by the Member States and the public and that it should be before the formal plan or programme adoption (European Parliament and the Council of the European Union, 2001, Article 6, para. 2). The SEA Directive also necessitates the production of a report on the environment as a portion of environmental assessment and provides further information on the topics to be covered within the report in Annex I. Topics listed are biodiversity, fauna, flora, human health, populations, air, soil, water, cultural heritage and landscape, climatic factors, and material aspects. A final annex provides information on the determination of significance. To ensure the efficacy of the SEA Directive, the European Commission has published a study regarding the efficiency of the Directive in 2009 which was the foundation for the preparation of the first Commission Report about the effectiveness and suitability for application of the Directive as a prerequisite of the SEA Directive in Article 12(3).

In March 2013, two more guidance documents about biodiversity in SEA and EIA were published (EC, 2013). These guidance documents are based on the inclusion of climate change and biodiversity into the SEA system, across the Member States of the EU, which helps to enhance the consideration of these issues in the SEA. When taking energy into concern, the wind energy has become increasingly popular in the energy mix within the EU, for this reason, the commission has issued guidance to make sure that these developments are assessed with regard to Natura 2000 areas, with an explicit suggestion for EIA and SEA (EC, 2010). According to Theophilou (2007), the additional resources and efforts necessary to achieve the SEA tasks articled by the Directive could only be rationalized, when positive outcomes emerge from its application (Thérivel and Minas, 2002). Skepticism also persists over the potential of the SEA Directive because there were experiences in the past which showed that environmental integration is not guaranteed (Therivel and Minas, 2002). This argument can also be proved by a research done by Therivel and Walsh (2006), about post-Directive UK survey, which revealed that 18% of the SEAs carried out by the local government for plans and programmes did not influence the final plans, which caused considerable ambiguity about whether the Directive is truly making any difference in environmental assessment. Whereas, the competence of the SEA Directive and the potential of the SEA in general in integrating considerations for the environment into the process for decision making is widely recognized, and well defined. Several researchers and pioneers of SEA theory argue for its value-added contribution to the environmental assessment discourse (Sheate et al., 2003; Therivel, 2004; Dalal-Clayton and Sadler, 2005; Partidario and Clark, 2000).

3.3 Strategic Environmental Assessment in Germany

Germany introduced SEA for plans and programmes by transposing the EU SEA Directive (2001/42/EC) in 2004 and 2005 with amendments of the Federal Building Code, the Spatial

Planning Act and the Environmental Impact Assessment Act (EIA Act). Different from the SEA Directive (Article 1), the German EIA Act does not provide objectives but rather general principles for IA: “Impact assessments comprise the identification, description and assessment of the significant impacts of a project, plan or program on the environmental resources. They serve effective environmental precaution under consideration of existing laws and are carried out according to uniform principles and with participation of the public” (Art. 3. EIA Act). Considering the requirements of SEA Directive EC/2001/42, SEA was formally introduced in 2004 into German spatial planning through the Europarechts Anpassungs Gesetz (EAG Bau) also known as ‘Act to Accommodate EU Requirements in the Federal Construction Act’. On 25 June 2005, amendments were enacted through the ‘Act for Introducing SEA’ (UVPG, 2001). In Germany, the 16 Länder (federal states) had to enact their laws to implement SEA, because the EIA Act and the Federal Spatial Planning Act are only general frameworks. SEA in Germany is legally reliant on the amendment and development processes of plans and programmes. Due to the fact that, EIA Act does not stipulate the responsibilities of the agencies, the SEA is usually steered by the plan or programme developing agency. This has been criticised, due to lack of independence (see e.g. Köppel et al., 2018a).

Unlike Scotland, Germany does not store or archive the SEA documents centrally. When the planning process concludes, extensive documents are often no longer publicly available with a few exemptions (Odparlik 2015; Rehhausen et al., 2018). In accordance with the EIA Act, agencies are obliged to unveil negative screening decisions. However, as no central SEA archive exists, screening decisions could potentially be disregarded by the public and other agencies. Köppel and Geißler (2015), discuss the difficulties that arise due to omitted SEA activity reporting and documentation. As a result, complications occur when trying to create effectiveness research that is comprehensive, as well as for SEA related learning. Since no central archive exists, exact statistics of SEAs conducted in Germany are not obtainable (Rehhausen et al., 2018; Köppel et al., 2018b). However, research conducted by Geißler and Rehhausen (2014), acknowledged 440 SEAs that had been carried out between 2004 and 2014. Nevertheless, this figure does not incorporate SEAs for local land use and zoning plans, which are projected to interpret for the majority of the share of completed SEAs. Rehhausen et al. (2018), identified twenty-three SEAs that were being performed by federal agencies between 2004 and the end of 2017. The amount of SEAs conducted in the energy sector is increasing as the federal transmission grid plan is reformed within a two-year cycle and SEAs for distinctive transmission grid corridors have commenced. SEA is only infrequently carried out for plans and programmes that are subject to a conditional SEA.

Many substantive aspects of SEA in Germany are covered by the landscape as well as the regional planning system. According to the analysis of the German SEA system, Wagner (2012) discovered that redeveloping SEA from the ground up would be unnecessary. The study also highlighted that Germany's currently existing SEA approaches have been seen as good examples in certain EU projects that were conducted in order to validate the SEA Directive. However, according to a recent study by Geißler et al., (2019), where the researchers studied the effectiveness of SEA in Germany by conducting a meta-review of research published between 2004 and 2018 of German SEA effectiveness, concludes that the SEA in Germany is not able to reflect on issues related to screening, transparency, and quality management and also there is room and need for improvement in terms of SEA effectiveness in Germany. Similarly, with regard to climate change integration in SEA in Germany, Wende et al., (2012) illustrated deficiencies in the SEA system of Germany by concluding that in most of the case studies the climate change was only mentioned and not considered in more depth but only in one SEA. Repp and Dickhaut (2017), also reflected on the current status of German SEA system, concluding that there is a strong need for improvement in the German SEAs of local land-use plans. Several other recent studies also propose challenges in the SEA system of Germany and suggest for serious consideration and attention (BMU, 2018; Bunge, 2017; Geißler et al., 2019; Rehhausen et al., 2018; Rehhausen, 2019; Rehhausen and Stemmer, 2017; Schmidt and Zschiesche, 2018). The above studies conclude that in Germany, the SEA is not conducted to support strategic decisions, thus suggesting an improvement in the SEA system of Germany in various dimensions, including climate change. Therefore, this research provides a platform for future discussions and the decision making process regarding possible aspects where climate change is effectively addressed in the SEA of onshore wind energy plans in Germany.

In order to impart examples surrounding how to comprehend the best practices whilst using SEA, such as how practitioners are able to monitor the environmental impacts of programmes and plans, SEA guidance is used. This is a key direction and a response to issues that are arising as well as recent trends. Underneath the authority of the German Federal Environment Agency, general SEA guidance (Balla et al. 2010), and guidance regarding the reader-friendliness and the quality of information (Grimm et al. 2018) were developed. In addition, research surrounding the operationalization of the environmental objectives for SEA and EIA (Hartlik et al. 2019), has been performed. Furthermore, within subsequent levels of governance, some states have begun to publish recommendations or guidelines for SEA, for specific sectors (e.g. Brandenburg and Bavaria). In addition to that, recommendations or guidelines are published by certain agencies for SEA (e.g. the Federal Network Agency) (Geißler, 2019).

3.4 Environmental Assessment in the Context of Onshore Wind Energy Development in Germany

Germany is one of the most progressive countries in Europe when it comes to making the shift to renewable energy sources (Bruns et al., 2010; Büsgen and Dürrschmidt, 2009). Germany's leadership in the development of an infrastructure for renewable energy pathway have helped to trigger a lot of research in the field of renewable energy (Geißler et al., 2013b; Köppel et al., 2014; Phylip-Jones and Fischer, 2013; Phylip-Jones and Fischer, 2015; Portman et al., 2009). Germany primarily owes its success to policies put forward by the Renewable Energy Sources Act of 2017 (EEG), which also delineates the objective for the production of renewable energy through the promotion of hydropower, wind power, geothermal energy, solar power, landfill gas, and using biomass. Although wind energy is considered as a clean energy source, associated actions with regard to its development can give rise to some potential environmental effects. The onshore wind energy development in Germany undergoes a strict requirement for nature conservation when planning for suitable areas and when designating a specific location for wind farms through environmental assessment (EA) systems. EA practices provide an in-depth analysis of significant impacts and identify ways to minimize, mitigate or, compensate impacts of the proposed actions prior to making decisions and commitments (UNEP, 2015). Considering the EA in the onshore wind energy development, nature conservation legislation (Bundesnaturschutzgesetz) in Germany plays a significant role in defining guidelines regarding the development of wind energy projects in certain locations, therefore developers must meet the requirements of the German law by carrying out an Environmental Impact Assessment (EIA) for a wind energy project in a specific location. The EIA of onshore wind energy farms is carried under the requirements of the EIA Act of Germany, according to which an assessment is necessary for projects with at least 20 turbines. Along with the EIA Act, the developer has to adhere to the requirements of the German Impact Mitigation Regulations (Eingriffsregelung), EU Habitats Directive (Directive 92/43/EEC) and Birds Directive (Directive 79/409/EEC) (Geißler et al., 2013). In order to evaluate the effectiveness of the laws and regulations of EIA related to onshore wind energy developments, Phylip-Jones and Fischer (2013) conducted a research where they assessed whether or not these regulations are effectual in terms of what they mean to achieve which is to protect the environment with the likely impacts and help realize more informed and balanced decision making. Their study revealed that in Germany, the EIA of wind energy development had a major influence in the decision making stage and EIA have a significant role in altering wind farms developments.

Beyond the project-level EA of onshore wind energy parks, a strategic EA is conducted for the plans and programmes of the onshore wind energy parks at the regional land use planning level, known as Strategic Environmental Assessment (SEA). These regional plan SEAs deal with the priority areas of the onshore wind farms on the level of land use planning. The onshore wind farm development in Germany is conceded with certain privileges in spatial planning processes and follows a heavy environmental focus on the priority, exclusion and restriction zones of the wind farm development. According to the Regional Planning Ordinance (Raumordnungsverordnung - RoV) and German Federal Building Code (Baugesetzbuch – BauGB), the wind energy farms are considered to be privileged projects. BauGB is the key regulatory mechanism for finding suitable sites for wind farms, under this law (Art. 35 BauGB), the local planning authorities are obliged to allocate specific priority or preferential areas for wind farms in undesignated outskirt areas in order to concentrate the wind farm development and create space in outskirt regions of Germany. In this way, BauGB facilitates the wind farm development in areas with almost no conflicting public interests which in turn results in determinations of no conflicts in the EA of preparatory land use (Flächennutzungsplane) or landscape plans. The spatial implications of onshore wind energy development are taken very efficiently into consideration by the regional planning authorities. However, in terms of the procedural effectiveness of the SEA in the onshore wind energy sector, Phylip-Jones and Fischer (2015) found that in Germany, SEA did not have any influence on the PPP making process in the German regional plans. This is because the principles of environmental protection were already firmly established in the German regional planning. Therefore, SEA was thought to be a duplication of effort. Wende et al., (2012) also highlighted a few shortcomings in the regional development plans of SEA when achieving CO_2 savings. They also considered climate change impacts by stating, SEA failed to take in to account the impacts of climate change on scales that outsized the boundaries of spatial plans. This shows that there is a need to enhance the understanding of the spatial planning processes, especially in onshore wind energy planning processes and also in considering the climate change aspects in the EA processes.

3.5 Climate Change and Renewable Energy Policies of Germany

A primary goal set by the German government's climate policy has to do with the reduction of greenhouse gas emissions, where it provided itself with ambitious climate targets. To comply with the targets set by the Kyoto Protocol and the EU Emission Trading System (EU ETS), a national target to help reduce the emissions of greenhouse gas was adopted by Germany. Furthermore, the German Government's Climate Protection Programme 2005 was implemented in order to reduce the emissions caused by the greenhouse gasses by 21%, as compared to the 1990 levels from 2008 to 2012, thus accomplishing Germany´s Kyoto Protocol obligations. After the year 2012, the Integrated Energy and Climate Programme (Integriertes Energie- und Klimaprogramm) was implemented by Germany**.** This programme aims to decrease the amount of emissions by 40%, as parallel with the 1990 levels by 2020. The Climate Protection Plan 2050 (Klimaschutzprogramm 2050) was announced in 2016. This plan discusses the fact that there must be a reduction of emissions of greenhouse gases by at least 80% (preferably up to 95%), when compared to 1990 levels, by 2050.

In December 2008, the EU promised to decrease its GHG (greenhouse gas) emissions by 2020 to at least 20% of the levels in 1990. The EU set itself a binding target in so as to reduce the emissions of GHG to 40% of the levels that they were at in 1990. This was to be accomplished by 2030, as a part of the 2030 Climate and Energy Policy Framework. For the EU to instigate its 2030 Climate and Energy Policy Framework, it embraced a Clean Energy for all Europeans package that is made up of eight different acts of legislation. These acts incorporate updates to the governance of energy, to the legislation of energy networks, and the clean energy-related directives. This measure is believed to decrease emissions by 45% of their 1990 levels by 2030. When following the new framework for energy legislation, member states have to acquire an Integrated National Energy and Climate Plan for 2021 to 2030 (NECP).

In 2019, the government of Germany reintroduced its pledge to accomplish the climate goals that were delivered in the Climate Protection Plan 2050. It started something called a 'climate cabinet', which worked to scrutinize potential variations in the legal framework as it stands currently, in order to achieve the 2030 climate goals. In fact, a Climate Protection Act (Klimaschutzgesetz) has also been suggested which is meant to stipulate reductions of 95% of the 1990 levels by the year 2050. The Act on Renewable Energies 2014 (Erneuerbare-Energien-Gesetz 2014) was signed on the 1st of August 2014 (EEG 2014). This EEG 2014 reflects the changes and development over the last 14 years, within the renewable energies field. It also made several modifications to the legal framework. The EEG 2014 was amended significantly in 2017. The Act on Renewable Energies 2017 (Erneuerbare-Energien-Gesetz 2017) (EEG 2017) was written in order to allow for conceptual changes to the legal framework as it currently exists, which are provided by the EEG 2014.

The EEG 2017 offers a tendered process, with the maximum limits on new generation capacity (in megawatts (MW)) which are established for various technologies for renewable energy. For example, in both 2017 and 2018, 2,800 MW installations of new onshore wind energy were produced. In 2019, it is expected that 3,675 MW will be tendered. Then 4,100 MW in 2020 followed by 4,250 MW in 2021 and then 2,900 MW onwards from 2022.

Directive 2018/2001/EU, which promotes expending energy from primarily renewable sources (Renewable Energy Directive II) (RED II) was brought into effect December 2018. It specifies that the repeal of the old Renewable Energy Directive will occur, effective from the 1st of July, in the year 2021. However, it holds onto Germany's contribution to the EU-wide target of 18% by 2020. In Paragraph 1, Article 3 of RED II, a new obligatory renewable energy target is set for the EU of at least 32% of gross energy consumption by the year 2030. Germany must contribute to this EU-wide target by meeting 30%, by the year 2030 (National Energy and Climate Plan). Furthermore, RED II creates a responsibility for every EU state (which also includes Germany) in order to certify that a minimum of 14% of the consumption of transport fuel was produced by renewable sources by 2030 (10% by 2020). Due to strong activities in legislation, Germany over the course of the past 20 years, potently favours renewable energies, due to which there has been significant progress in the development of renewable energies in Germany. Along with other renewable energy sources, wind power is now well-established and is a type of renewable energy that can constitute a significant share of the production of clean electricity.

3.6 Strategic Environmental Assessment in Scotland

In Scotland initial, transposition of the SEA Directive worked via the Environmental Assessment of Plans and Programmes (Scotland) Regulations 2004. However, these were then later superseded by the Environmental Assessment (Scotland) Act 2005. In the process of developing this legislation to replace the initial set of regulations, the Scottish Executive Environment Group conducted consultations regarding the proposed Environmental Assessment (Scotland) Bill 2005 and included a question directly relating to the inclusion or exclusion of economic and social factors in SEA. The consultation document held that the

SEA Directive, which includes no requirement to consider socio-economic factors in assessment, "clearly intends that SEA should be predicated solely on environmental considerations" and stated that, "…the Scottish Executive intends for the Bill to have a clear environmental focus." (Scottish Executive Environment Group, 2003, p.32). As a result, there are no statutory provisions that allow for the enclosure of economic and social factors in SEA (Jackson and Illsley, 2007; Scottish Executive Environment Group, 2003).

The Scottish approach prescribes greater application of SEA with all programmes and plans (including the ones referred to as strategies) with a 'public character' requiring screening for their environmental effects to determine if they require SEA (Jackson and Illsley, 2007; Scottish Government, 2005, p.3). The desire to increase the application deadline of the SEA Directive was included in the Scottish Government's coalition statement, A Partnership for a Better Scotland: Partnership Agreement in 2003. Their coalition statement included the aim to introduce legislation for SEA of all plans and programmes, and public sector strategies during the next parliamentary term of the Scottish Parliament (Scottish Labour Party and Scottish Liberal Democrats, 2003). The Scottish SEA review, which considered the state of Scottish SEA practice after the introduction of the Environmental Assessment (Scotland) Act 2005 found that the incorporation of issues of the environment into plan preparation was considered by practitioners to be the most significant contribution of Scottish SEA practice (SEPA, 2011). The primary piece of legislation requiring SEA in Scotland is the Environmental Assessment (Scotland) Act 2005, that determines which strategies, programmes, and plans require SEA. Additional policy guidance comes from the Planning Advice Note 1/2010: Strategic Environmental Assessment of Development Plans.

The most recent review of SEA practice in Scotland highlighted some areas of practice which were found by the Scottish Environment Protection Agency - SEPA (2011) to be working well including embedding SEA into a policy-making culture, use of innovative methods of conducting SEA, engaging with stakeholders and SEA influence on policies, plans and strategies. However, problem areas were also identified including buy-in amongst senior policy and decision-makers, including elected members, SEA efficiency, integration between SEA and policy, plan and strategy formulation (particularly in the early stages), public consultation, and using SEA to consider the impacts of programmes, plans, and policies on climate change (SEPA, 2011). The main stages of SEA are shown alongside the preparation process for the current forms of development plans in Planning Advice Note 1/2010: Strategic Environmental Assessment of Development Plans. The process of SEA is described as including; pre-screening, screening, scoping, assessment, consultation, post-adoption and monitoring (Scottish Executive, 2006; Scottish Government, 2009a).

Guidance on SEA in Scotland is primarily provided through the Strategic Environmental Assessment Tool Kit, though additional guidance is also provided through the document "A basic introduction to Strategic Environmental Assessment" (Scottish Government, 2009a). Further advice is also given in Planning Advice Note 1/2010: Strategic Environmental Assessment of Development Plans. The SEA Tool Kit states the purpose of the SEA more comprehensively. It provides information on the stated objectives of the SEA. In addition, the SEA Tool Kit highlights several objectives for SEA directly related to consideration of environmental effects. According to the Scottish government environmental policy on the assessment of the environment, SEA aims to aid in protecting the environment, increase public participation with regards to decision-making, and to ensure that any development is sustainable. This ensures that expert views can be sought at several different points during the preparation process from consultation authorities and the public, who are listed below:

- Scottish Natural Heritage (SNH)
- Scottish Environmental Protection Agency (SEPA)
- Historic Environment Scotland (HES)

These consultation authorities produce several guidance documents on specific topics of SEA. Among which guidance on the consideration of the factors of the climate in Strategic Environmental Assessment is one of them prepared by SEPA. The Scottish government launched the SEA Gateway in order to manage formal correspondence of the consultation authorities (SEPA, SNH, and HES) and the strategy, programme, or plan that was developed. This allows for information to be properly recorded and for it to become available publicly on the SEA database. The SEA Database holds all Scottish SEA documents from July 2004 to date.

3.7 Environmental Assessment in the Context of Onshore Wind Energy Development in Scotland

The EA of Scotland for ensuring long-term protection of its environment requires the assessment of development projects (EIA), the assessment of plans, programmes and strategies (SEA) and the assessment of plans that have a significant effect on Natura 2000 site (HRA- Habitats Regulations Appraisal) (Scottish Parliament, 2005). The EIA process in Scotland is executed under the requirements set in the amended Environmental Impact

Assessment (EIA) Directive (2014/52/EU), which is enacted via the Town and Country Planning Regulations 2017. Onshore wind energy has always been an important part of Scotland's current and future low carbon energy mix. Wind farms developments in Scotland that are over 50MW, require planning permission from the planning authority under Section 36 of the Electricity Act 1989, which are typically bound by EIA regulations (Scottish Government, 2017). The Scottish government legalized the application of SEA under the environmental assessment (Scotland) Act 2005 (Scottish Parliament, 2005), for the consideration of environmental impacts of all statutory Scottish public sector plans, strategies, and policies, which are subject to substantial environmental impacts (Scottish Executive, 2004). According to the Environment Assessment Bill (Scotland), SEA was mandatory for all public sector plans, strategies, and policies that were expected to affect the environment significantly (Fischer, 2007). The Scottish government has set up a SEA gateway, which helps in advising on the preparation of SEAs to key authorities (SEPA, 2011). The consultation authorities e.g., the Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), and Historic Environment Scotland (HES) provide environmental advice to other public sector organisations in terms of producing plans, programmes, or strategies to conduct SEA for onshore wind energy development. The Scottish SEA gateway produces guidance documents for the application of SEA and helps to resolve potential areas of conflicts between the consultation bodies and the responsible authority (Scottish Government, 2013).

In order to review the robustness of the SEA system, the Scottish government published a thorough review of SEA legislation's performance after five years of SEA implementation (SEPA, 2011). After one year of SEA implementation, the Scottish government introduced its planning act, Scotland Act (Planning Act), 2006 (Scottish Parliament, 2006) which reflected a modernised spatial planning system, that paralleled the developments of SEA. All of the local planning authorities set up in Scotland are obligated to consider the National Planning Framework (NPF) while developing a local development plan. Along with National policy frameworks which set Scotland's long-term plans for spatial development, the Scottish Planning Policy (SPP) is another important component of Scotland's planning framework which outlines Scotland's nationally significant land use planning matters, by focussing on planning decisions, making plans, and development designs of significant infrastructure. For onshore wind energy farms the SPP outlines spatial framework. This then helps the planning authorities to identify the most appropriate areas to use for onshore wind energy parks (Scottish Government, 2014). Additionally, it outlines a range of impacts that should be considered while planning for onshore wind developments. It also directs the attention of the local authorities to consider matters related to extensions and the re-powering of the onshore wind farms. Along with that, the Scottish government requires the planning authorities to consider the onshore wind turbines planning advice, which highlights the important components of planning systems for onshore wind farms by setting out the framework for wind energy development plans, and consideration to make in planning applications of onshore wind farms in Scotland (LGCD, 2014).

3.8 Climate Change and Renewable Energy Policies in Scotland

The level of ambition in their climate action plan shows that Scotland seeks to exceed the UK's climate goals (Royles & McEwen, 2015; McEwen & Bomberg, 2014) due to which over the past ten years, GHG emissions in Scotland have decreased a significant amount. Besides, the production of renewable energy has increased at a rapid pace, even with the continuation of gas and oil extraction within the North Sea. Scotland’s Climate Act of 2009 set its target for 2020 of a 42% decrease in GHG emissions (CCC, 2018). This is on top of the UK’s target of an 80% reduction by 2050. The Act created a Scottish Committee on Climate Change (CCC), which must be headed by the Scottish Executive, in addition to the mandates of the UK’s Committee on Climate Change. Scotland’s key plan to aid them in reducing GHG emissions includes, but is not limited to, a plan that is energy efficient (Scottish Government, 2010b), and a target for 2020 of 80% of electricity generated being renewable (Scottish Government, 2010a). In order to ensure, that this objective would be achieved, a 2020 ‘route map’ was developed. This ‘route map’ provided details that were related to getting rid of nuclear energy, trained the needed workforce, investing in the grid, supporting innovation, and identifying actions based on sector (Scottish Government, 2011; Scottish Government, 2015). As part of its new Climate Change Plan, Scotland would then set an objective for 2030 that they would acquire 50% of their total energy from renewable energy sources, in order to provide heat, transportation, and electricity (Scottish Government, 2018a). This low-carbon strategy for the economy will then look to create upwards of 60,000 green jobs as a government investment into the area of the production of renewable energy, and therefore having it become readily available (Scottish Government, 2010a).
In contrast to the British government, the government in Scotland decided to continue to support onshore wind projects. At the same time, they opposed using nuclear power to make up any portion of the portfolio (Scottish Government, 2017). In May 2018, the government of

Scotland proposed a bill that provided a goal to reduce emissions by 90%, by 2050, and then by 100%, 'as soon as possible' (Scottish Parliament, 2018). Even though the Scottish bill exceeds the UK government's target, there has been criticism of the bill from several environmental organizations, as they do not believe it to be ambitious enough (Keane, 2018). The Environment Committee of the Scottish Parliament and other organizations such as WWF-Scotland and the Church of Scotland support the government promising to reach net-zero emissions (Carrell, 2019). The 2018 Committee on Climate Change report that discussed the plans to decrease emissions in Scotland noted that there has been a significant reduction in emission in the waste and power sectors. However, in other sectors, there has only been a small amount of progress. These sectors include agriculture, heating of non-residential buildings, and transportation (CCC, 2017; CCC, 2018). The government of Scotland has also been looking into how state enterprises could potentially work in the energy sector (Ostfeld and Reiner, 2019).

3.9 Necessity of Addressing Climate Change into SEA

As a direct result of developmental activities, climate change has become one of the foremost trials that the world is facing today; therefore, many countries are implementing CO_2 emission targets in order to achieve the +2° C global warming limit. According to EEA (2008), there is the potential for climate change to affect the world in a multitude of different ways, that may vary in effects and intensity, depending on region and sector. Among these impacts, most are negative and are expected to grow worse over time (Rannow et al., 2010). As seen in the recent projections, climate change can pose a constant, significant danger to nature and the world as a whole (IPCC, 2013; Schellnhuber et al., 2013). In order to reduce this anticipated hazard, it is important to stop, or at the very least, reduce the source of the problem, which in this case is GHG. This can be done by a combination of methods, such as long and short-term mitigation to gain complementary advantages, and also to reduce risks posed by climate change (IPCC, 2014; Shakil and Ananya, 2014). To accomplish this, SEA is used as it is a well-grounded, and a more appropriate device to systematically promote climate change mitigation and adaptation in planning and development (Larsen et al., 2012). SEA is a significant tool to deal with the impacts of climate change, as climate change is inevitably connected to SEA objectives such as the sustainability of development, as well as noting the cumulative, long-term effects that are principal examples of climate change (Posas, 2011b). In EU member countries, including Germany, SEA under the EU SEA Directive

2001/42/EC is legally obligated to reflect upon the potential major effects of climate change (EC, 2001).

Moreover, according to Kørnøv and Wejs (2013), the SEA Directive presents an opportunity to integrate climate change issues into programmes and plans in every sector. In addition, the SEA Directive ensures that specific plans are made with a methodical analysis of the effects, in the context of the environment as a whole (Shakil and Ananya, 2014). According to Posas (2011a), it is crucial to address the climate change issue in SEA, because planning decisions and PPP have great potential to exacerbate the climate change issues. She further explains that it is of equal importance to address climate change in SEA and that it should be done at a very early stage. It also ought to be supported and complemented by simultaneous efforts at different levels, so that the adaptation and mitigation measures used to address climate change are increasingly mainstreamed into societal activities.

These complementary measures include GHG emission taxes, regulatory standards, awareness and education programs, tradable permit systems, incentives and subsidies, research and development, etc. (Gupta and Tirpak, 2007). These measures would be complementary to SEA, but they also play an essential part in reducing the amount of GHG emissions and achieve targets (Posas, 2011a). The international literature on the state-of-the-art of SEA has strengthened the need for proper inclusion of climate change in decision making, concerning planning, supported by SEA (Hanusch and Tetlow, 2012; Helbron et al., 2011; Kørnøv and Wejs, 2013; Larsen et al., 2012; Larsen et al., 2013; Posas, 2011a; Posas, 2011b; Rannow et al., 2010; Wende et al., 2012). As stated by Lobos and Partidario (2014), SEA has been contemplated to be the most appropriate tool for taking environmental issues into account, and promoting sustainability in decision making at the planning level, and also for the proper inclusion of climate change issues into SEA (Kørnøv and Wejs, 2013; Larsen and Kørnøv, 2009). On the contrary, there are also illustrations of practical guidance for integrating climate change in the SEA (EC, 2013; Levett-Therivel Sustainability Consultants, 2007; OECD, 2010). According to Weiland (2010), in which the author studies the German SEA experiences, states that the questions of addressing climate change issues in SEAs are not typically raised in the German SEAs. Wilson (2010) also examined the UKs sustainability appraisals (SA) and concluded that they do address the climate change issues, but that there is a great need for the development of the approach in their SA system in order to address climate change issues. This ensures the importance of climate change in SEA and as a developing concern in research, as well as in practice. However, there are challenges associated with it, amongst them is the understanding of the necessity to include the climate change problems in SEAs (Larsen et al., 2013).

3.10 Reviewing Climate Change Aspects in SEA

Climate change will heighten the severity of current risks, as well as create new dangers to the environment, if not effectively addressed. Willekens et al., (2011) suggests that SEA is an advantageous tool that can enable better decision making on issues regarding climate change. SEA ensures that climate change issues are effectively integrated into mid and long term development planning (Susilowardhani, 2014). The importance of evaluating the impacts of climate change during the planning stage was also illustrated by Parry et al. (2007) in which the author states: "One way of increasing adaptive capacity is by introducing the consideration of climate change impacts in development planning, for example, by including adaptation measures in land use planning and infrastructure design," (Parry et al., 2007, p. 20). However, Biesbroek et al., (2009) concluded that, although there is evidence that reveals the necessity of developing adaptive strategies for climate change, scientific and political considerations were mainly inclined towards damage-control measures intended to reduce GHG emissions, though there is a growing portion of the population that understands that mitigation by itself will not be sufficient to avoid the effects caused by climate change. Therefore, it should be clarified how mitigation and adaptation measures influence each other. The following sections highlight the importance of climate change mitigation and adaptation in SEA.

3.10.1 Climate Change Mitigation in SEA

The Intergovernmental Panel on Climate Change has confirmed that significant climate change is occurring right now and is certain to affect the environment and all life on Earth. Additionally, it also notes the unfortunate fact that we now have an even larger base of scientific evidence regarding climate change, along with a higher probability of climate change impacts being caused by human influence (IPCC, 2014). To tackle the human-induced climate change impacts in the environment, different countries have planned effective mitigating measures, which include actions to limit the rate of anthropogenic emissions of GHG. According to Wende et al. (2012), sectors that contribute a considerable share of CO_2 emissions into the environment are transport, energy, commercial development, and housing/built-up areas. For instance in the UK, in the year 2016, 31.6% of the CO_2

emissions came from energy supply, 31% of the emissions came from transportations, 16.7% from the business sector, 16.4% from the residential and commercial developments, and 3.8% from the public and other sectors (DBEIS, 2016). In Europe, all the above-mentioned sectors are generally integrated with the spatial planning system, for which SEA is required in order to be executed according to the terms of the European union SEA Directive (Directive 2001/42/EC). This integration of the sectors within the spatial planning system aids in strengthening the linkages and the cooperation between different sectors, as well as the interconnection among policies (Ran and Nedovic-Budic, 2016). Several researchers have highlighted the fact that indeed SEA is acknowledged as a medium for the performance of climate protection measures found within spatial planning (Blanco et al., 2009), thus they can be recognized as the appropriate vehicle for climate-proofing (Fröde and Kloss, 2011), disaster mitigation (Djalante et al., 2013; Sutanta et al., 2010), addressing issues of the environment (Stead, 2008; Weber and Driessen, 2010), and promoting how to develop sustainability (Olazabal et al., 2010; Serageldin and Steer, 1994; Van Oosterzee et al., 2014; Wende et al., 2012). The European Commission also ensures that climate change effects are considered when instigating the spatial planning policies, and SEA Directives (EC, 2009). Thus tools for spatial control, such as land-use planning and regional planning (Fischer, 2010; Hoechstetter et al., 2010; Rannow et al., 2010) play crucial roles alongside the SEA, in meeting CO_2 emission reduction targets (Birkmann and Fleischhauer, 2009; Wende et al., 2012).

3.10.2 Climate Change Adaptation in SEA

According to IPCC (2013), all countries and their inhabitants will be influenced by the impacts caused by climate change. Therefore, nearly all governments recognize the need to adapt to the anticipated climate change impacts. OECD (2009) considers the SEA to be the appropriate tool to integrate and adapt to climate change. Although the inclusion of adaptation consideration into the SEA process is not specifically included in the SEA Directive, yet the plan maker needs to be considerate of the impacts of climate change when creating the plan or the program since not considering climate change can result in mal-adaptation practices. These do not fall in line with the original purpose of the SEA-Directive, which is to enhance sustainable development. Adaptation includes several types of actions that can be executed in several different sectors (agriculture, energy, water, infrastructural development, transportation, etc.) which are connected to different climate-related challenges, depending on geography (mountains, coastal, urban areas, etc.) and the use of widely varied tools and instruments (Hallegatte et al., 2011; IPCC, 2007). To minimize climate change impacts on the environment and humans, a fully incorporated analysis of adaptation options is therefore essential. In this respect, the incorporation of the adaptation measures into the plans must have the support of adequate environmental evaluation tools, which will eventually help in robust decisions regarding climate change impacts (Ogbonna and Albrecht, 2014). According to OECD (2008) and (2009), SEA is seen to be an appropriate and crucial tool in making effective and robust decisions at the very early stages before the implementation of such programmes, plans, and policies. "The integration of climate change into strategic planning through the application of SEA leads to better informed, evidence-based policies, plans, and programs that more sustainable concerning climate change and more capable of delivering progress on human development," (OECD, 2010, p. 4). On highlighting the need to incorporate the adaptation to climate change into SEA, Larsen and Kørnøv (2009) and Larsen et al., (2012) illustrated that it is very important to predict the future of climate change impacts, which can only be achieved by SEA because of the limited amount of knowledge regarding future climate change. This is one of the challenges that are specific to the future and current ability to adapt to climate change. The consideration of SEA, with regard to regional land use and development plans, can heighten the potential of SEA to be used for adaptation, and make the decisions that constrain adaptation options more clear (Helbron et al., 2011; Ogbonna and Albrecht, 2014). On highlighting the presence of the adaptation of climate change consideration into the SEA process, Willekens et al., (2011) argue that the incorporation of climate change adaptation into the process of SEA could alter established routines, by encouraging participation in a systematic and transparent process, by identifying programmes and plans which are susceptible to climate change, by taking relevant programmes and plans such as sectoral adaptation plans or adaptation strategies into account, and also by improving governance and the level of public trust in governmental policy making, with regards to climate change, which will ultimately lead to amplified awareness of the effects of climate change on the environment.

4 Analysis of Spatial Planning in the Wind Energy Sector

This chapter draws upon literature from two main themes relevant to the research topic, onshore wind energy and, spatial planning. The literature from each theme is critically reviewed in the context of the research objectives (see chapter 1). Moreover, this chapter evaluates the energy policies and spatial planning regulations as they apply to onshore wind energy plans in Scotland and then compares them to Germany in order to understand the effect that these policies have on wind energy generation and explains how environmental problems regarding wind power development are confronted using relevant planning measures.

4.1 Relation between Spatial Planning and Wind Energy Parks

The EU's policies regarding climate protection and energy share, includes the goal of reducing GHG emissions by 20%, until 2020, and then by 80%–95%, until 2050 (RED 2018). This can only be made possible by simultaneously raising energy efficiency and using renewable sources of energy more extensively. Wind-generated energy creates a much smaller ecological footprint than other forms of electricity generation and is widely available without requiring sacrificing land that could be used for other things such as farming (Stoeglehner and Narodoslawsky 2012). The environmental benefits that occur when wind energy sources are compared and contrasted with conventional sources of energy are well-known (Cullen 2013). Nonetheless, the operation and installation of wind farms also present environmental and social impacts that necessitate further contemplation. Some surveys have even reported on how the biota, specifically birds and bats, are impacted by wind farms (e.g., Bernard et al., 2014; Wang et al., 2015). Others looked at how the landscape can be impacted (e.g., Mirasgedis et al., 2014), electromagnetic interference - such as those found within telecommunication networks (e.g., Angulo et al., 2014), the noises produced when wind turbines are operational (e.g., Kikuchi 2008), and the modification of a species natural habitat (e.g., Saidur et al., 2011). Despite these problems, onshore wind is still considered to be a cost-effective and mature technology, which can often be supported by generous public subsidies and also entices significant investment in the market. Therefore, it is sometimes believed by many of the EU member states, that they must only offer the most realistic technological option used for binding national targets, for the production of renewable energy within an ever decreasing frame of time (Cowell, 2010).

The negative effects regarding the onshore wind energy increase along with the size of the turbines, which can currently reach up to 200 meters. This may lead to local people's resistance to the use of wind turbines and may raise concerns over the impact on nature and tourism (Bürger et al., 2008). The impact on nearby housing, with shading, noise, as well as the altered landscape, may all be considered as important factors. For this reason, environmental and spatial planning regulations will be required in order to dictate the size, distribution, and amount of wind power plants. Recent research conducted on the comparison of the legal and spatial analysis of the concentration zone planning for wind turbines that would be constructed in a forested area in Germany shows, that regional law and planning law respectively, have a powerful and visible steering effect on terrestrial wind energy development (Bunzel et al., 2019). Consequently, the development of wind energy is now being marketed as a 'clean' alternative. However, this perspective can often overlook the ever-increasing impacts of the development of energy on the landscape, which has been labeled as energy sprawl (McDonald et al., 2009). Like gas and oil, wind energy requires a transmission line, a network of roads, and associated infrastructure in order to capture and transport the power (Jones, 2015). Therefore, competition for space has become a delicate issue for the energy industry and its sustainable development. The development of this activity should therefore be addressed in an inclusive way, through considering environments, spatial planning instruments, and considering the social and legal aspects that have to do with more than a technical factor of energy reduction. The combination of these evaluations favors the production of cheaper energy, and its associated lower social conflicts and fewer environmental impacts (Jannuzzi and Swisher, 1997). Selecting a suitable site is the first step in wind energy planning, and it's crucial to the success of wind farms. Generally, the legality and siting of wind power plants are under the jurisdiction of regional and local planning measures. At the regional level, certain spaces can be prioritized as wind energy areas, or even forbidden from being used in that way, based on predefined planning guidelines and criteria for eligibility. Finally, the specific legal preconditions for devoting pieces of land for specific uses can be formulated and signed into law at the local level. Despite the unprecedented development, the private and public investment into onshore wind energy, and the associated infrastructure of the grid, to date, the spatial implications of such a huge technological deployment have not been thoroughly scrutinized in academic literature. Reviewing the correlation between terrestrial wind energy development and spatial planning helps to understand whether the planning system obstructs the sustainable development of the onshore wind energy development, and whether or not the planning system is a hindrance for

Germany and Scotland to achieve its climate change targets, and goals set together with the EU.

4.2 Integration of Environmental Considerations into Energy Policies

4.2.1 Germany

Over the last few years, climate change and environmental effects have been the main paradigm leading Germany's energy policies towards a more sustainable energy system (Sohre, 2014). The German energy transition (Energiewende) is one of the examples in Germany when considering the environmental concerns of energy policies. Energiewende, founded in 2011, is long-haul energy and climate strategy, which aims towards a low carbon energy system, based on promoting renewable energy and enhancing energy efficiency. Its main objectives include: to phase out nuclear power, combat climate change, improve energy security, and ensure competitiveness and growth (Agora Energiewende 2015).

It is no doubt that Germany has committed to GHG reductions by 2020, as part of the European Union energy and climate policy. This has resulted in the portion of nuclear energy in the generation mix to trend downward over the past two decades, punctuated by the shutdown of eight nuclear reactors in Germany in 2011 (Weiß, 2016). Since 2010, the ration of renewable energy has increased significantly, while the share of nuclear energy plants has been reduced at the same time (Renn and Dreyer, 2013). Germany has increased its potential for wind power generation since 2008 and this significant increase in the wind power capacity helped Germany to reach 59,420 megawatts by 2018 (Fraunhofer IWES, 2019), which helped Germany to reach its climate protection goals. This dramatic intensification was mostly due to onshore wind energy installations in different regions of Germany. Figure 4.1 shows the total installed capacity of wind energy in Germany from the year 2008 until 2018.

The climate protection goals are often part of the environmental policies of Germany for combating climate change impacts. The environmental policies that relate to the energy sector; are controlled by the Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety. Policy measures in Germany are carried out at the state and the local levels (BMU, 2015). Additionally, several special committees have been created, such as the Committee for Sustainable Development in 2001, and the Council of Sustainable Development Promotion, which includes representatives from all of the interest groups relevant to the areas of the energy and climate change policy (Jänicke et al., 2001).

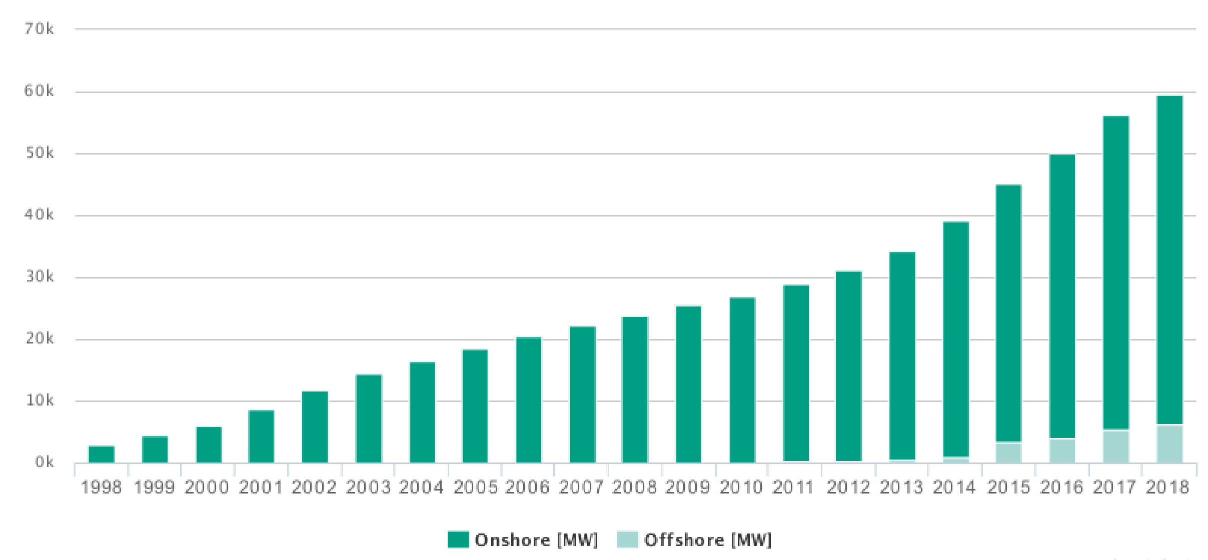


Figure 4.1 Germany´s total installed wind power capacity (On – and offshore) in megawatts from 1998 to 2018

Source: Fraunhofer IWES (2019)

The German government enacted a National Strategy for Sustainable Development in aiming for modernization, which carries incredible potential for positive transformation in the economy, the environment, and society (Dalal-Clayton and Bass, 2002). The key focus points of this strategy were: using energy efficiently in order to effectively protect the climate, allowing for mobility while protecting the environment, producing and eating healthy foods, directing demographic change, altering old structures while coming up with new ideas, innovative new enterprises that will promote a prosperous economy, and reducing land use (Swanson et al., 2004). A new version of the Sustainable Development Strategy was approved by the federal government, with aims of concrete targets and measures, that had been discussed previously since its adoption in 2002 (GSDS, 2018). The preferment of energy conservation and promoting environmentally sound energy is spearheaded by the German Energy Agency (Deutsche Energie-Agentur-DENA), where policies regarding energy efficiency are at the nexus of activities carried out by DENA since 2000 (Renn and Marshall, 2016).

The DENA was created by the government, in tandem with the German Reconstruction Bank, Kreditanstalt für Wiederaufbau (KfW), with the aim of uniting the different players working in the energy sector, and helping to enforce and enact energy efficiency policy, to promote the use of renewable sources of energy, sustainable development, and climate change mitigation (Renn and Marshall, 2016). Erneuerbare-Energien-Gesetz (EEG), or the Renewable Energy Sources Act, is one of the reasons for the growing significance of renewable energy sources in Germany's power sector. This is because the Renewable Energy Sources Act encourages the use of renewable sources to generate electricity. As a result, the German energy supply is becoming greener every year (BMWi, 2019).

4.2.2 Scotland

Addressing environmental challenges will require significant levels of emission reductions from all the sectors of the economy (Ang et al., 2016). This includes efficiently using the energy, as well as decarbonisation of the energy supply (IPCC, 2014). To follow this, the UK is one of the countries that have enacted policies to achieve such targets and aims. The climate change act in the UK, which came into force in 2008, commits to reducing its emissions of greenhouse gas by at least 80% by 2050, as compared to the level of 1990 (Climate Change Act, 2008). Scotland, on the other hand, has a separate climate change policy to the UK. For instance, The Climate Change (Scotland) Act 2009 commits Scotland to a 56% reduction in emissions by 2020, and a 90% reduction by 2050 (compared with 1990 levels) (Scottish Government, 2018). To better integrate the environmental issues into their energy policies, and to encourage investment in low carbon and energy-efficient technology, the UK government sets implicit and explicit prices on carbon emissions, and inefficient energy use, and also provides subsidies or tax breaks (Ang et al., 2016). Scotland's renewable energy goals are equally ambitious, aiming to increase renewable energy to 100% for the year 2020 (Scottish Government 2011).

Scotland has adopted a leadership role when it comes to the promotion of electric and low-emission vehicles and aims to phase out petrol and diesel cars by 2032. As a constituent of the UK, Scotland has set its targets regarding climate change and renewable energy. It has mitigation objectives, which are even more ambitious than the UK's, and GHG emission reduction targets. The robustness of Scotland in producing clean energy is shown in figure 4.2. The statistic illustrates a significant increase in Scotland´s cumulative wind power installation from the year 2008 until 2018. In the year 2011, the onshore and offshore wind energy generated about 3,088 megawatts of clean energy. Since then, its capacity has been doubled in order to generate 8,423 megawatts of a clean source of energy (DBEIS, 2019).

The Scottish Government, and the UK Committee on Climate Change, have each stated that Scotland's GHG emission reduction goal of 42% is 'ambitious,' as compared to the UK's overall goal of 34% (Scottish Government, 2017b, CCC, 2018).

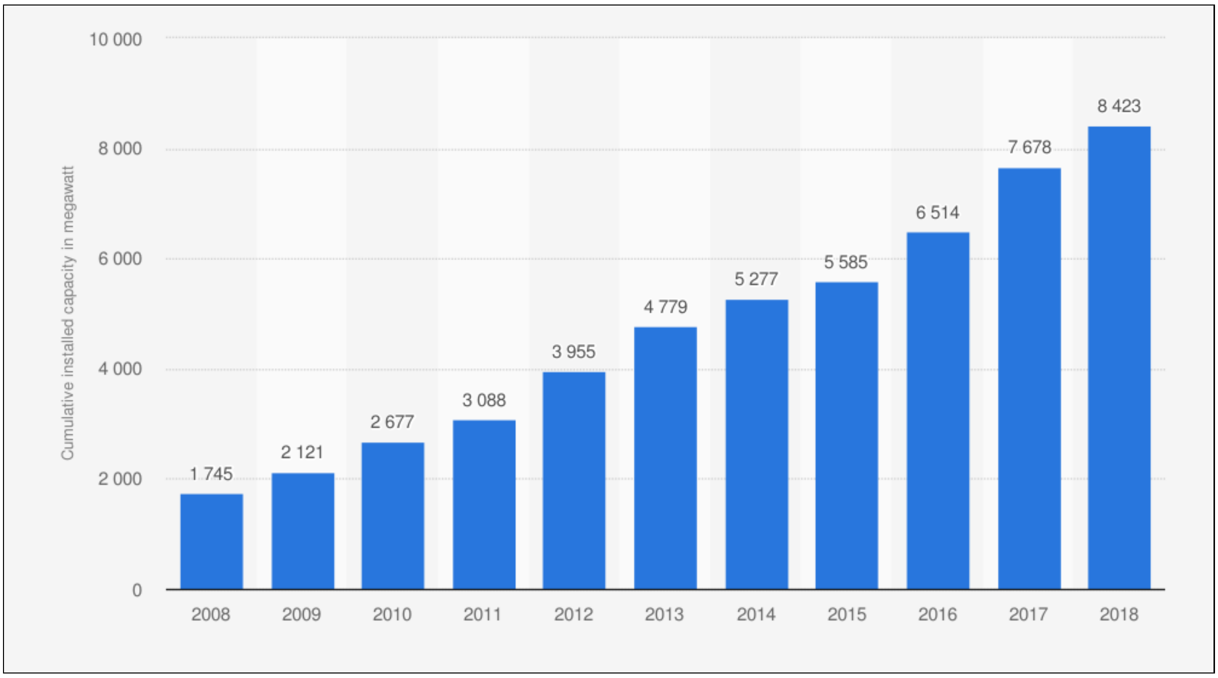


Figure 4.2 Cumulative Installed capacity of wind power in Scotland for the last 10 years
Source: (DBEIS, 2019)

While it is obvious, that Scotland's goals are loftier than the UK's, the primary reasoning behind pursuing such an ambitious target is carbon reductions. To further strengthen the emission targets set by the Scottish government, the Scottish parliament recently passed a bill Climate Change (Emissions Reduction Targets) (Scotland) Bill 2019, which aims to increase the ambitious goal of the reduction target for greenhouse gas emission, that is laid out in the Climate Change (Scotland) Act 2009. The Bill sets a legally-binding 'net-zero' target for all greenhouse gases by 2045. Moreover, to reduce the GHG emissions reduction targets, the policymakers lend their support to renewables for other reasons as well, such as lessening other environmental impacts, expanding energy supplies, and the hope that current investments in renewable energy could lead to exportable technology (Scottish Government 2017b; DBEIS, 2019).

4.3 Spatial Planning Regulations for Onshore Wind Energy

4.3.1 Wind Energy Planning: Legislations & Policies in Germany

The German Government, due to its climate and energy policy, has set ambitious targets to get more of its total energy consumption from renewable energy. In order to meet these targets, the government has created a series of regulations directed at promoting and regulating the expansion of renewable energy sources, including wind energy. Achieving the target requires institutional and governmental commitment, a high rate of acceptance by citizens for renewable energy projects, and a framework for regulation (Langer et al., 2017). Onshore wind energy development holds considerable potential in Germany. Currently, over 27,000 wind turbines are operating in different regions of Germany, and their numbers will continue their rapid growth (Bunzel et al., 2019). Wind energy is important in Germany, concerning energy transition (Agora Energiewende, 2015; Alle et al., 2016). The primary reasons are the short amortization of wind turbines, the relatively low costs associated with producing electricity from onshore wind energy, and the higher yield per unit of land (Bund für Umwelt and Naturschutz Deutschland e.V. 2011). Despite the advantages provided by wind energy, this renewable energy technology faces wider use, as well as opposition from a social point of view. According to Langer et al., (2016), when the primary factors that influence wind energy are analysed, opponents typically cite impact to the local environment, such as visual landscape degradation, as their main reason for opposing wind turbines (Langer et al., 2017). In Germany the renewable energy development and its spatial distribution is promoted with the newly amended Renewable Energy Act – Energieeinspeisegesetz (EEG), which is one of the many important milestones of Germany´s renewable energy policy that promotes electricity from renewable energy sources, and has a great influence on the onshore wind energy development (EEG, 2017). The spatial framework for wind energy development in Germany is built within the spatial planning law (Raumordnung-und–planungsrecht) and zoning law (Bauplanungsrecht) (Götzke and Rave, 2016). These regulations help in guiding the planning and controlling of the wind energy development, across the country, by identifying appropriate areas for onshore wind energy generation. Within Germany, the system for land-use policy is vertically integrated. It works with a multi-level governance structure that has subsidiaries and principals for spatial planning that are counter-current (AEE, 2012). The national level only determines the regulatory framework, such as requiring that developments in wind power should only be used in undeveloped areas (this is a direct contrast to the majority of other developments). The competencies that are the strongest are then assigned to the planning regions of the federal states. Each federal state is able to determine the minimum share of its land area that needs to be reserved for wind power. Furthermore, federal states, issue guidelines regarding permitting and planning procedures for the lower levels of governance. Planning regions (which consist of several different municipalities), that are found within the federal states; translate the guidelines into priority areas for wind power that are spatially explicit. When deciding where to put the priority areas, features of nature conservation (e.g. pre-existing protection areas for nature), and emission control (e.g. how far apart human settlements are) need to be considered. Municipalities, such as towns or districts, are individually accountable for setting up even more specific development plans at the municipal level, as well as permitting individual developments to occur. Their decisions must agree with the superordinate plans. For example, a German municipality will typically only permit the development of wind power, when it is located within a specific area of priority - as is defined by the regional plan (BBSR, 2014). As a result, the evaluation of land-use policy in Germany cannot be limited to just the municipal level – instead, it must account for any decisions that are made at the federal state and regional planning level. The below section presents a brief introduction of the key aspects of the onshore wind energy planning process in Germany.

4.3.1.1 Planning Process

Until the 1990s, the placing of wind turbines was primarily a bilateral process and involved the communication between private and commercial wind power operators, as well as local municipality approval authorities. As a direct result, the placement of wind farms became dispersed (Becker and Thrän, 2017). In 1997, § 35 of the German Federal Building Code (BauGB) was revised, pronouncing that wind turbines were now 'privileged projects' in undesignated outlying areas (Außenbereich). Since that point, the installing of wind turbines has typically been permitted in specific areas, unless the interest of the public opposes it. As a counteractive measure, municipalities and regional planning authorities are able to direct wind turbine construction based on the designation of wind energy concentration zones (§ 35 III 3 BauGB) (Köck, 2015; Bovet, 2015). In those cases, wind turbines are only able to be erected within those zones. Therefore, the distribution of wind energy farms is done according to designated areas within certain plans, such as regional plans and land use plans (zoning plan and local development plan) (Ministerium für Bauen und Verkehr et al. 2005, Ministerium für Umwelt, Gesundheit und Verbraucherschutz 2011). However, the planning and permitting process of the wind energy farms are not the same in every state or Länder in Germany, therefore specific regulations and laws exist between states, and within states (Bruns et al., 2010; Einig and Zaspel-Heisters, 2014). For the terrestrial development of wind power, the land is essentially categorized as an area of priority (Vorranggebiet), an area of suitability (Eignungsgebiet), or as an amalgamation of them both such as a designation describing priority areas that could impact suitability (Vorrang- und Eignungsgebiet) (Bruns et al., 2010). The process of planning for projects of wind energy is influenced strongly by criteria that have been developed judicially, as well as the guidelines put forth by each federal state. Fulfilling these criteria has been seen to bring balance between different planning authorities. For example, it is required to distinguish between soft and hard taboo criteria, as case law requires it. However, the distinction is not clear-cut. It is not immediately obvious how to make room for wind energy and how to do it in a 'substantial way' as there is no definitive quota or uniform that must be fulfilled (Bunzel, 2019). In the first step of wind energy planning, the "taboo zones" related to wind energy usage are acknowledged. The taboo zones are then further subdivided into 'hard' and 'soft' zones. The hard-taboo zones are made up of areas that, for legal or practical reasons, are not found to be fit for wind energy use - for example, settlements areas, water, or nature conservation areas that work to protect bat species. The soft taboo zones are typically areas where it would be best not to build a wind turbine, as a result of the intent of the planning design (e.g. insufficient wind conditions, the maintenance of green corridors, or having to consider protection due to heritage). The areas of potential left behind, following the interpretation of the soft and hard taboo zones, must therefore, be connected in an upcoming step to the competing uses, (i.e. the concerns of the public that could oppose how a zone is designated), which must then be compared and contrasted to the interest of providing wind energy in a location with wind conditions that are adequate (Bunzel, 2019). According to Goetzke and Rave (2016), the legal framework of the wind energy plans is used to aid the effective utilization of land, and in the planning of urban land-use. In addition, the last permitting process -which is actually based on the stipulations of the Federal Immission Control Act - where the wind farm developer, planning and permitting bodies, landowners, and other various stakeholders interact locally to decide where it would be economically viable to place wind turbines. However, in reality, this process slows down, or sometimes completely prevents the development of wind energy farms. To make the installation of onshore wind energy as practicable and efficient as possible, it is important to have an established planning and permission system in order to make onshore wind energy competitive with other conventional energy generation methods, such as fossil fuels and nuclear power.

4.3.1.2 Regional Planning

Understanding the role of regional planning in onshore wind energy development, and how it takes into account the land availability is indispensable. In one way, it is a measure to integrate the regional, environmental, and social impacts into wind energy sitting decisions. However, in another way, it also has the potential to constitute a significant constrain in wind energy development and, as a result, jeopardize the ability to meet ambitious climate change targets. Several studies have been conducted to investigate how regional planning influences wind energy development in Germany (Chezel and Labussière, 2018; Leibenath, and Lintz, 2018; Goetzke and Rave, 2016; Lauf et al., 2019). Overall, the results of these studies show how critical it is to understand the role of land-use policies for future wind energy development in Germany. According to the Raumordnungsgesetz (ROG), the wind energy projects are categorized as regionally significant projects, which means that the spatial development is affected by the project (§3 Nr. 6 ROG) (ROG, 2009). The basic criteria for grouping the wind energy project as a regionally significant project is the height of the windmills (Ministerium für Bauen und Verkehr et al. 2005). It is expected that the projects with windmills above 50 meters are considered as regionally significant, and require special authorisation, but this shall also be analysed on a case by case basis. As per Bartels et al., (2006), the regional planning bodies assign priority areas (Vorranggebiete) and suitability areas (Vorbehaltsgebiete) in collaboration with the authorities in charge of nature conservation. The designation of the priority areas for wind farms are known as 'Positivauswahl,' which then characterizes all the rest of the areas as ´areas of exclusion´ such as protected areas and areas of cultural or historical value (Ministerium für Bauen und Verkehr et al. 2005). In this way, a comprehensive planning concept for each concentration zone is developed, which defines the choice of criteria for selecting the priority areas, and the areas of exclusion for wind farms. From all the renewable energy generation in Germany, most of the electricity produced is from onshore wind power (Hansen et al., 2019). The country has assigned 2% of its land area as 'concentration zones' for wind energy production (Guan, 2018), which are designated as priority areas for the construction of wind farms. These will have legal effect only after the endorsement of their comprehensive planning. Any other areas are deemed to be suitable areas, or even restricted areas, based on the adjustable assessment criterion that is used for future development. Since regional planning policies and land availability for the onshore wind generation vary between different regions in Germany, therefore, it is crucial to understand whether new priority areas are needed, by expanding the priority areas and considering repowering and/or reassessing the taboo zones for onshore wind generation. To reach climate protection goals, an increase in the priority areas and issues related to repowering are possible instruments that must be considered in regional planning in order to reach GHG reduction targets.

4.3.1.3 Local Land Use Plans for Wind Energy Development

The local land use plans for wind energy in Germany contain information about onshore wind energy as it is developed at the local level (§5 BauGB). Designations of special building zones for wind turbines comes under local planning, and local plans are made by local councils. However, later they have to be adjusted into the regional plan (Geißler et al., 2013). The local authorities control and manage space in their localities by the local land use plans, which are used as a mechanism to manage space in the undesignated outskirts regions of Germany, where energy is scarcer. It is implemented through the priority areas for wind energy development, in order to concentrate the windmills and create energy generation spaces in the outskirts regions of Germany (Seht, 2011). In this research, most of the empirical findings for the case study analysis from Germany´s perspective are taken from the Teilflächennutzungsplane of onshore wind energy development, from different regions of Germany. The study mostly focuses on the municipality, or the local level, because the municipalities in Germany hold strong constitutional positions in all levels of administrations, political and otherwise. As a result, they have the right to enact regulations that are specific to their local zones (Frank et al., 2018). Therefore, the municipalities have the potential to accelerate the approval procedures, and land use plan, for new onshore wind energy development, and could adapt mitigation and compensation strategies that aim to focus upon the challenges of the effects of climate change. The other reason why the focus of the research is mostly inclined towards analysing local land use plans is that it is the level where the projects are implemented, and it is where the climate change impacts are most felt. Therefore, this research understands the need to investigate climate change integration in the German onshore wind energy plans at the local level. However, along with the Teilflächenutzungsplane, this research also slightly centres on the Teilregionalplan of wind energy development, as one of the case studies chosen for the analysis is a Teilregionalplan of Lausitz Spreewald. In this way, the importance of spatial planning is emphasized in optimizing wind energy expansion and improving wind energy production efficiency in order to address the impacts of climate change in onshore wind energy planning.

4.3.1.4 Permission Process

In Germany, wind farms are subject to approval if the turbines are at least 50 meters higher (BImSchG, 2010). Turbines, which are lower than 50 meters of height, require approval permission from state building law. During the planning process of major projects (above 50 meters), federal emission control act (BundesImmissionsschutzgesetz), and building regulation book/rules (Baugesetzbuch - BauGB) are involved (Goetzke and Rave, 2016). The applicant must submit a request for authorization, with a detailed construction plan, along with an environmental impact assessment of the project (FA Wind, 2016). It must include the rules considering the nearest town, airport, or any main road. The application will be assessed by the local environmental and building authorities. The submitted application is next analysed under the regional plans which have incorporated the actual facts of the area such as; residential area, environmentally protected area, airport, monuments, and industrial area (FA Wind, 2016). To keep the planning process transparent, several stakeholders are involved such as; local people, politicians, and local authorities. They are also involved in the planning process so that they can share their opinions about the project (Langer et al., 2017). The final authorization for any project is only given after feedbacks have been received from all stakeholders. Apparently, it is a lengthy process, but it assures long term safe operation of wind energy units in the region. After getting authorization, the applicant is allowed to carry out the construction of windmills and network as per agreed, and as laid out in the plan. According to WindEurope (2019), the onshore wind energy industry in Germany is collapsing, due to its long permitting process, which used to take only 10 months, but now takes up to two years for a new project in order to complete permitting process. As a result, it is questionable how Germany is going to reach its 65% renewable target for the year 2030. Therefore, a strong urgent need is required to expedite the permitting process for the onshore wind energy development to reach the German and EU renewable targets, so as to cope with climate change impacts of the country.

4.3.2 Wind Energy Planning: Legislations & Policies in Scotland

According to a survey conducted in 2018 by the UK government, regarding the renewable energy generation in the country, it was revealed that from the final figures of 2017, almost half of the UK´s revenue from onshore wind generation came from Scotland (ONS, 2017). These figures prove that in the UK, most of the largest wind farms are located in Scotland. In order to formulate the spatial framework of these large capacity wind farms, there are several national, regional, and local level plans and policies regarding the planning of onshore wind energy development. The National Planning Framework 3 (Scottish Government, 2014) contemplates at Scottish investment and development that will occur over the next 20 to 30 years. The created framework is a statement of policy and a statutory document that has a major goal of realising the renewable potential of Scotland. The Scottish Government has also set out policies regarding where wind farms are located in its Planning Policy (Scottish Government, 2014). It lays out that the planning authorities are required to carefully consider the qualities of each individual proposal, and then carefully consider that against other factors such as community, the environment, and cumulative impacts.

The local development plans which are created by the authorities at the local level also look at local areas strategically that could indicate particular sites that might be suitable for the development of a wind farm. Therefore, the Scottish Government and the local level authorities must consider applications for onshore wind development by sorting the applications into one of the three main groups, as are summarised in table 4.1. In its Planning Policy Statement, the Scottish Government also outlines its policy regarding suitable wind farm locations (Scottish Government, 2017).

Group 1 – Areas where wind farms will not be acceptable		
National Parks and National Scenic Areas		
Group 2 – Areas of significant protection		
The areas below are recognized as needing significant protection but wind farms may be appropriate in some circumstances		
National and international designations:	**Other nationally mapped environmental interests:**	**Community consideration of visual impact:**
• World Heritage Sites; • Natura 2000 and Ramsar sites; • Sites of Special Scientific Interest; • National Nature Reserves; • Sites identified in the Inventory of Gardens and Designed Landscapes; • Sites identified in the Inventory of Historic Battlefields	• Areas of wild land as shown on the SNH 2014 wild land map; • Carbon-rich soils, deep peat and priority peat land habitat.	• An area not exceeding 2 km around cities, towns and villages identified on the local development plan with an identified settlement envelope or edge. The extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement.
Group 3: Areas with potential for wind farm development		
Areas that do not fall within groups 1 and 2 are areas where wind farms are likely to be acceptable.		

Table 4.1 Spatial framework for onshore wind energy parks in Scotland

Source: Scottish Government, 2013

There are two distinct authorizations systems that are responsible for the development of onshore wind projects in Scotland. The approval system that is then applied is contingent on what the generating capacity could be of the proposed development (Commin et al., 2017). Large scale development proposals, that have an installed capacity that is in excess of 50 MW, are carefully considered and then approved by the Scottish Ministers under provisions that are set out by Section 36 of the Electricity Act 1989 (UK Government, 1989). Any proposals that fall under the 50 MW threshold are also carefully reflected upon and then consented by the relevant planning authority based upon the Town and County Planning (Scotland) Act 1997 (UK Government, 1997). The following section illustrates the key aspects of the Scotland wind energy planning process in more detail.

4.3.2.1 The Planning Process

Onshore wind energy in Scotland provides an important contribution to the renewables mix, and to achieving the country's target of meeting 100% of its electricity demand from renewable sources by 2020 (Scottish Government, 2014). Onshore wind energy makes up more than two-thirds of the total renewable energy in Scotland, as well as 60% of total UK renewable energy (DECC, 2016). The Planning etc. (Scotland) Act 2006 (Scottish Parliament, 2006) sets up a hierarchy of planning, with national projects (projects which have long-term national significance), major projects (including power generation plants with a capacity >20 MW), local projects (<20 MW capacity), and minor projects (allowed or at least allowed to begin planning). Scottish Ministers have the potential to strongly influence any projects that reside on the three lower tiers: they can designate national-level developments via the National Planning Framework, the ability to work with national and major projects in order to speed up the decision making process, and can force particular local developments to be dealt with the same urgency of major projects (Wood, 2010). Scottish Ministers also have a role to play in the processing of appeals for both major projects and local ones. Between 2007 and December 2014, 39% of appeals regarding wind turbines went to the government after they were rejected by local planning authorities (Scottish Government, 2014). At the level of local planning, the Scottish Government has also used its authority to allocate specific areas for the installation of onshore wind farms. Decisions concerning the development and locations of wind farms in Scotland are affected by several plans and policies and made on regional, national, and local levels. The next section describes these plans and policies, in addition to the ways they interact.

4.3.2.2 Scottish Planning Policy

The Scottish Planning Policy (SPP) outlines the Scottish Government's policies and priorities regarding land use planning, with an expectation of an effective and efficient planning system that complements the spatial strategy from the third National Planning Framework (NPF3)

(Scottish Government, 2014). The NPF3 contextualizes development plans across Scotland and creates a new framework for spatial developments, by guiding future planning decisions. The SPP sets out policies that will aid in delivering the objectives of the NPF3 (Scottish Government, 2014). The framework is a statutory document identifying strategically important development opportunities and is a policy statement with a major goal of realizing Scotland´s renewable energy potential. NPF3 together with SPP is applied at all levels of planning and outlines policies regarding the suitable locations of onshore wind energy development, which helps the planning authorities consider a wide range of environmental, social, and cumulative impacts of an individual proposal. With this research, it is important to understand the role of SPP and NPF3 in onshore wind energy development because both SPP and NPF3 help to ease the transition to a low-carbon economy by promoting and reinforcing the expansion of renewable energy development. According to the NPF3 onshore wind energy generation, there should not be any development of wind farms in designated scenic areas or in the national parks of Scotland. The SPP includes a section about the development of onshore wind farms, which states; "Planning authorities should set out in the development plan a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms as a guide for developers and communities," (SPP, 2014 p.38). The Scottish Government also gives online guidance to local authorities regarding onshore wind turbines and the process for preparing spatial frameworks for wind farms (Scottish Government, 2013; 2014). Spatial frameworks in the SPP are created, and then further developed by planning authorities to assist their development plans. They also have the goal of guiding wind farm developments to suitable areas, in order to maximize potential renewable energy and to minimize the time, effort, and resources that are wasted on unsuitably located development proposals.

4.3.2.3 Strategic and Local Development Plans

Strategic Development Plans (SDP), together with the SPP, outlines the long-term goals and plans for the potential long-term development of Scotland´s four main city regions: Dundee, Aberdeen, Glasgow, and Edinburgh. In addition, it focuses on spatial strategies to facilitate renewable energy development in suitable locations (Scottish Government, 2013). A plan for strategic development is written by a Strategic Development Planning Authority (SDPA), in order to highlight appropriate locations for wind energy development. Strategic Development Plans can, (if the SPDA sees it as wise or necessary), outline the broad strokes of the policy and spatial framework regarding wind farm development in a region (SPDA, 2008). The spatial strategy outlined in the SDP addresses issues related to peat-rich and carbon-rich soils, flood risks, water environment, and deforestation to facilitate renewable energy development. Moreover, it also reflects the ways that land-use proposals for neighbouring areas will influence the strategic development plan area.

On the other hand, Local Development Plans (LDP) apply to the entirety of Scotland and mark out sites that are appropriate for new developments, as well as enact policies that direct decision-making for planning applications (SBC, 2016). Every planning authority (i.e. national or local park authorities) is obligated to publish, and continually update, the local development plan(s) for their area every five years, at minimum. Concerning the plans for local development, if the relevant planning authorities think they should, will set out more in-depth policies regarding wind farm development, and can mark specific locations that may be acceptable for the development of wind farms. The local and strategic development planning authorities collaborate and recognize the areas with the best potential for onshore wind energy development, keeping the cross-boundary opportunities and constraints into consideration (Scottish Government, 2014).

4.3.2.4 Supplementary Planning Guidance

In addition to the above development plans, the Scottish planning authorities created Supplementary Planning Guidance (SPG), which can be a piece of the development plan when it meets legal requirements. SPG is then associated with the approved development plan in order to supply certainty and policy directions to local planning authorities with regards to location, type, and siting of onshore wind energy. Councils in Scotland also prepare other types of SPG too, such as master plans or development briefs, which then are able to provide a detailed explanation of how the council would prefer to see specific sites or small areas develop. Other than that, the council also prepares an SPG on the design of the new development plan. For onshore wind energy plans, the council produces SPGs, such as strategies or frameworks for guidance, on the locations of large wind farm developments (Scottish Government, 2009). Planning authorities are also allowed to publish non-statutory guidance that is not a part of the plans for development, but is adopted by authorities for the purposes of development management, even though it does not carry the same weight. The supplementary guidance and/or development plans make sure that the areas considered suitable for the development of wind farms reflect on issues related to carbon balance, carbon-rich soils and peatlands, flood risk, water, environment, and forestry, or clearance of land for onshore wind energy development. The supplementary planning guidance are developed according to the requirements sets in the third National Planning Framework, Scottish Planning Policy, the Strategic Development Plan 2013, and the Local Development Plans (SBC, 2018). The supplementary planning guidance also refers to other documents, which are considered as useful guidance for the development of onshore wind energy. Wind farms are a frequent topic of supplementary guidance (SG), especially because of the developments outpacing the progress being made, and because SG can be more detailed on this topic than the broader development plan (SBC, 2018). This is the main rationale in this research, for choosing supplementary planning guidance for onshore wind energy development for case study analysis, from Scotland´s perspective. A more detailed analysis of supplementary planning guidance of onshore wind energy is mentioned in chapter six of this dissertation, which are then used as case studies analysis for onshore wind energy development in Scotland.

4.4 Potential Barriers in Spatial Planning for Wind Energy

While there are several renewable energy technologies that are obtainable, one of the most well established, and one of the cheapest options is onshore wind energy. The economic viability of onshore wind is linked with high resource availability, with Germany and Scotland each having large exploitable wind resources. However, despite its strengths, the wide-scale deployment of onshore wind technology has been restricted due to the national and local consent processes (Harper et al., 2019). Onshore wind proposals are often faced with local opposition that cite the following reasons as primary objections: noise, visual impact, ecological impact, and site access (Wolsink, 2000; Langer et al., 2016). These are barriers to spatial planning for wind energy, as it points to the obstacles and hindrances in the way of wind energy developments, and their usage, which can be overcome or reduced by means of introducing new policies, programmes, or technological advancements (IPCC, 2007; Verbruggen et al., 2010; Sen and Ganguly, 2017). A domineering concern that often arises from the wind energy sector is that, with planning efficiency (BWEA, 2004; 2008), suggesting that it is too slow in coming to a decision, as well as too unreliable with regards to obtaining consent. This frustrates not just developers, but also international and national objectives surrounding climate change. Significantly, while articulating their dissatisfaction with the planning and development process, the wind sector managed to find a sympathetic ear in government, as they had views that aligned themselves. Broader attempts were made, in order to reduce the burden of the bureaucracy of planning on the development industry (Ellis et al., 2009). Many of these issues were addressed within the modernised, broader planning agenda (Cowell & Owens, 2006), the Barker Review (Barker, 2006), as well as recent legislation regarding accelerating any consent decisions that are for major facilities including, but not limited to, the establishment of the infrastructure planning commission.

On one hand, wind energy is a very preferable form of renewable energy, due to the energy efficiency of the technology. To produce a wind power plant, the energy requirements can be fully regenerated within 18 months (Bazilian and Roques, 2008). Taking this into consideration, wind energy has a small ecological footprint, as compared to other forms of electricity generation, and does not often conflict with other potential uses for the land such as agriculture and food production (Beck, 1995). However, wind energy also has some on-site environmental effects which cannot be ignored. These problems include noise emissions, visual impacts, shadow flickering, ice falling, accidents from strong wind or extreme weather, displacement, or disturbance to certain species of bats and birds, and lastly, it may also lead to a change in the landscapes. These on-site environmental effects increase along with the size of the wind turbines, such as wind turbines up to 200 meters, which may lead to constraints resulting in poor wind power usage, and decreased nature protection (Brookes, 2000).

In a time where there is an ever-rising number of wind turbines being installed, the public acceptance of any further expansion is decreasing (Köck, 2017; Rodi, 2017; Liebe and Dobers, 2019). This is especially true at the local level, as aspects such as shadow flicker, visual impact, noise emission, and the property value decrease due to onshore wind, since these impacts are found to be very negative, and can cause resistance amongst the local population (Scherhaufer et al., 2017; Jobert et al., 2007; Enevoldsen and Sovacool, 2016; Rand and Hoen, 2017). Establishing a setback distance from residential areas is one way to deal with the problems of acceptance (Masurowski et al., 2016; Watson et al., 2012). In Germany, each of the sixteen federal states finds itself responsible for putting together their individual requirements or guidelines that determine the siting of wind turbines, and any setbacks. As an example, in Bavaria, which is the state of Germany that has the most strict setback distance regulations. The wind turbines there must be at a minimum distance away from housing that is residential, and at a measurement that is the total height of the wind turbine, times ten, (the so-called H10 regulation), as a result, there are not many areas that that are open for wind farm development (Hehn and Miosga, 2015).

Similarly, in Scotland, there are several wind energy developments that have a social backdrop. For instance, the area with the highest concentrations of wind farms is south Scotland and in the Highlands. These places also have the lowest support ratings for onshore wind in all of Scotland (Commin et al., 2017). At the same time as Scotland is steamrolling development in order to meet its targets for climate change, there has been a growing uneasiness about the cumulative effects that onshore wind could have on the landscapes. (Cowell, 2007). As a result, while social acceptance plays an important role in where to develop wind power, the decisions for planning can often become a focus of the opposition. This can cause problems when trying to meet GHG emission reduction targets and trying to implement wind power.

4.5 Overcoming the Barriers in Spatial Planning for Wind Energy

As a result of the negative impacts discussed earlier, which could be very common in both the regions including disturbing noise emissions, accidents, shadow problem, visual impacts, ice falling, displacement of birds and bats, and changing the landscape sceneries (Wang and Smith, 2015; Wang and Wang, 2015), a need was felt to use spatial planning to overcome or mitigate these environmental effects. All these impacts are categorized into two sections for instance; (i) nature protection related impacts (disturbance to birds and bats, alteration of landscape sceneries), (ii) impacts on housing areas and quality of living for local residents (shadow problem, noise, visual impacts, accidents due to extreme weather, and ice falling) (Felber and Stoeglehner, 2014). In order to overcome these regional-level barriers with spatial planning for wind energy, priority zones can be determined in accordance with certain requirements for admission. Depending on the conservation objective and the protection purpose, the restrictions on the use of land can vary depending on the type of protected areas. From a nature conservation perspective, nature conservation areas (§ 23 BNatSchG) and national parks (§ 24 BNatSchG) are some of the strictest types of land as they permit little to no human intervention at all (Bunzel, 2019). In addition, installing wind turbines is not allowed in these types of land, as they are excluded from the spatial planning framing. According to Felber and Stoeglehner (2014), all the impacts related to wind energy farms are assessed on the bases of spatial planning, nature conservation, landscape scenery, and in few cases tourism as well. Generally, on a regional and local level, with the spatial planning process, certain criteria are determined for the zoning of wind parks. In particular, it is important to consider the distance between wind power projects and housing zones. This is important for legal acceptability because certain limits for shadow flickering and noise have to be adhered to (Felber and Stoeglehner, 2014). Studies have also highlighted the fact that the collaboration between local communities and the developers is a major player in gaining a positive planning approval outcome (Toke et al., 2008; Devine-Wright, 2005; Wüstenhagen et al., 2007). When a project seeks community interaction and greater consultation, as opposed to being set prior to consulting with the local population, people tend to be more supportive. A recent study by Harper et al., (2019) highlights that geospatial modelling has been extensively used in order to identify suitable sites that wind turbines can be installed at, with an exploitable resource being available. However, there are fears that approaches such as this, are not able to accurately reflect upon the social issues that surround such projects, which can, therefore, result in huge numbers of projects at the planning permission stage being subsequently rejected. Therefore, the findings of this study suggest that if an onshore wind developer is able to address the opposition locally, then geospatial conditions are not likely to have a negative influence on social acceptance. Therefore, public participation can also play a part in the planning process of wind power, as it further helps in improving the public's acceptance of wind power projects (BWE, 2015).

5 Comparative Framework and Case Studies

This chapter discusses the basis for the the comparative framework and the background information of the documents reviewed for case studies of Germany and Scotland. Furthermore, it gives a detailed insight into the area of the plan, how the plan was formulated, and its environmental assessment process, aiding in the interpretation of the results. By providing this contextual information, the chapter is able to highlight the benefit the plan receives from this clean energy source for tackling the climate change impacts in that area.

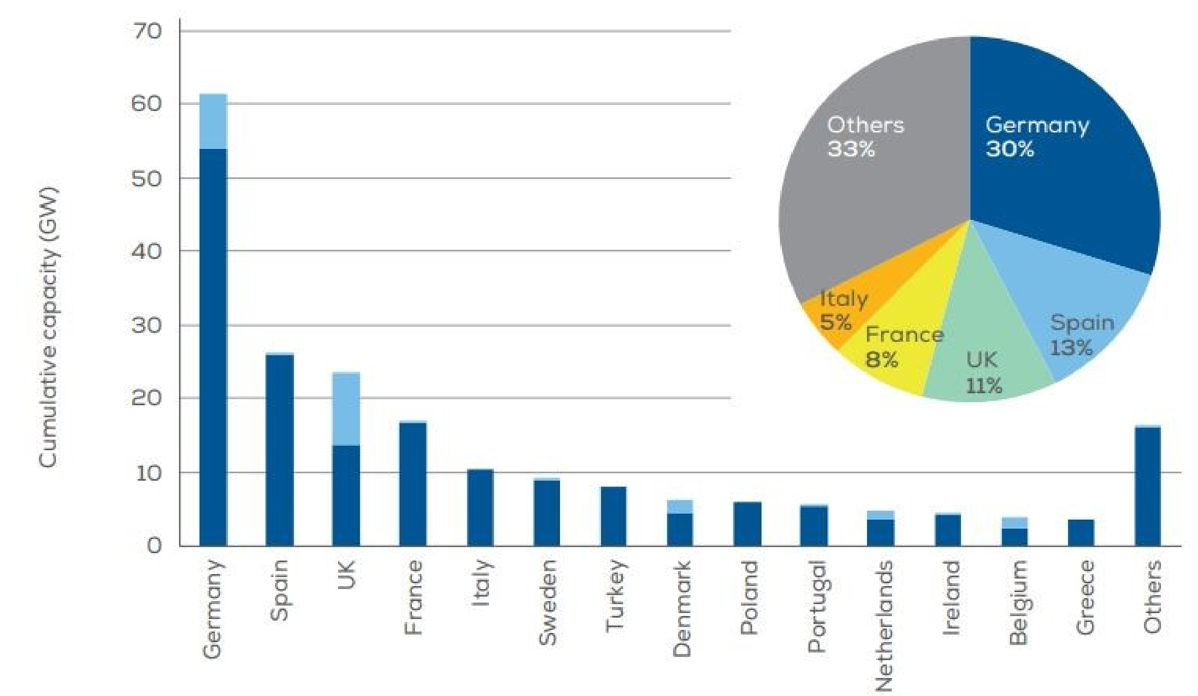
5.1 Comparative Framework: Germany and Scotland

This research follows a case-study design for the evaluation of onshore wind energy plans, with an in-depth analysis of how the climate change considerations are accounted for Germany and Scotland. The comparative analysis of Germany and Scotland, in terms of environmental assessment regulation and substantive effectiveness in onshore development of wind energy, provides a broader basis for achieving the main goal of this research. Both the countries being the forerunners in the onshore wind energy industry are compared and have been chosen as case studies in this research due to their Environmental Assessment (EA) system, onshore wind energy development, and their planning structures in terms of onshore wind energy. A detailed description of the criteria used for the selection of these case studies is presented below.

a) ***Environmental Assessment System:*** Both Germany and Scotland have a stable environmental assessment regime in onshore wind energy planning. In general, both have several years of experience with impact assessment. However, the UK has long practical experience of impact assessment, in contrast to Germany. Germany introduced its environmental assessment legislation in 1990 (Wende et al., 2012a), after the adoption of the European Union directives in 1985 for EIA, and SEA in 2001 respectively. Thus, for EIA, Germany has about three decades of experience, and SEA has been applied for about almost twenty years now. However, before the adoption of the Environmental Impact Assessment Act in 1990, Germany already had strong national nature conservation legislation with the 'Bundesnaturschutzgesetz; (Federal Nature Conservation Act) which was adopted in 1976. Strict nature preservation conditions are accounted for, both during the planning of dedicated wind power areas, and during the approval of specific locations for specific turbines.

With regard to Scotland, the Environmental Impact Assessment (EIA) of particular projects has been present in Scots Law since 1988, when EC Directive 85/337/EEC was enacted in the UK. The current requirement for Scotland's EIA is from the Environmental Impact Assessment (EIA) Directive (2014/52/EU), which is enacted via the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, which became law on the 16 May 2017. The Environmental Assessment (Scotland) Act 2005 expanded SEA past just the requirements of the first original directive. As a result, every qualifying strategy, public plan, and programme in Scotland is evaluated for its probable impacts on the environment. Where it is likely to be important, opportunities to avoid negative impacts are sought out, as well as opportunities to improve already positive effects. The environmental decrees, and environmental assessment system, of Germany and Scotland, are compared and analysed to understand the similarities and differences in the EA system that is used, particularly in onshore wind energy developments, when considering the climate change impacts. Differences exist in the law system and the policy styles of both countries, aspects which might be relevant for environmental assessment regulations and practices in integrating climate change into the environmental assessment. This comparison of the Environmental Assessment (EA) also helps to analyse if different EA regulations regarding climate change aspects and longer experience with the EA, result in a more advanced state of EA practice in Germany and Scotland.

b) Onshore wind energy development: Both countries are amongst the leading countries in terms of onshore wind energy development. Figure 5.1 shows the gross annual onshore and offshore wind installation in Germany and the UK. Onshore wind power is a crucial support pillar of Germany's evolution as a low-carbon electricity generation**.** Wind energy makes up an increasingly large portion of Germany's electricity generation. The below figure displays that Germany has the largest wind power capacity in Europe. The basic reasoning behind this shift is the desire to avoid the consequences of traditional forms of electricity generation, as well as the waste that results from nuclear energy. Over the last 20 years, the German national parliament has signed a set of innovative laws that promotes renewable energy, and that has allowed wind energy to expand at amazing rates.



	Germany	Spain	UK	France	Italy	Sweden	Turkey	Denmark	Poland	Portugal	Netherlands	Ireland	Belgium	Greece	Others
Offshore	7	-	10	-	-	-	-	2	-	-	1	-	2	-	-
Onshore	54	26	14	17	11	9	8	4	6	5	3	4	2	4	16
Total	**61**	**26**	**24**	**17**	**11**	**9**	**8**	**6**	**6**	**5**	**4**	**4**	**4**	**4**	**16**

Figure 5.1 Total installed wind power capacity in Germany and UK in year 2019
Source: Wind Europe, 2019

In 2017, it represented the second-largest share of German electricity production for the first time. It was thus ahead of nuclear energy and hard coal. By the end of 2017, there were a total of 28,675 onshore wind turbines in Germany (BWE, 2018). Besides the ambitious renewable energy policy targets, the supporting and recently amended “Erneuerbare Energien Gesetz (EEG)” (Renewable Energy Sources Act) has been decisive for the development of renewable energy in Germany (Büsgen & Dürrschmidt, 2009; Lauber and Mez, 2004). This regulation established a uniform system of reimbursing electricity generated with renewable means and with fixed minimum tariffs (Jordan-Korte, 2011). Even after decades of experience in implementing wind farms in Germany, the process is long and complicated. Obstacles like opposition from local communities, and the lengthy process that must be undergone to get a permit, prolong the process of planning and constructing wind farms. This eventually is an obstacle in achieving its climate protection target.

On the other hand, in Scotland, the Scottish Government and its agencies promote renewable energy developments as a crucial step toward fighting climate change, and this includes wind farms. A significant amount of knowledge and experience has been gleaned from the construction and operation of wind farms in Scotland, currently with a capacity of over 7500

Megawatts (MW). At the same time, Scotland is one of the best onshore wind locations in the UK (Wizelius, 2015), due to the constant high wind speeds (Manwell et al., 2010). Scotland is preparing for a sustainable future and is making great strides toward limiting its contributions to climate change, by developing in an environmentally sustainable way, and reaping the economic benefits of renewable energy and a low-carbon economy. In comparison to Scotland, Germany began its wind programme later than the UK, but now has around 59,311 MW of wind capacity in place, whilst the UK as a whole only has just over 20,970 MW of cumulative capacity of onshore wind energy in 2018 (WindEurope, 2018). The long experience in Germany in terms of wind power installation might have already triggered changes in the regulations for environmental assessment and practice for integrating climate change impacts. Therefore, this difference between the two cases provides another reason for choosing them as case studies in this research.

c) Planning context: Spatial planning regarding onshore wind development in Germany mostly happens at the regional and local levels. Taking into consideration the wind energy expansion policy in Germany and the effects of its widespread use, the wind energy expansion planning regulation is key in wind energy's level of public acceptance. The Federal Regional Planning Act and the Federal Building Code outline a broad framework for local regions, which are largely responsible for planning, to work within regarding wind park development. The determination of wind energy exclusion and priority areas, according to functional criteria, is crucial to this planning approach. By marking wind park priority areas in regional plans, or marking preference zones in plans for land use, local and regional authorities can clearly define how important it is to meet climate change targets by lowering the amount of GHG emissions.

In Scotland, several national, regional, and local -level policies and plans are in place to deal with onshore wind development planning. The National Planning Framework 3 (Scottish Government, 2014) evaluates Scottish investment and development over the next two or three decades. The Framework is a policy statement, as well as a statutory document with the main goal of realising Scotland's full renewable energy potential. The Scottish Government has also made known its policies regarding wind farm locations in its Planning Policy (Scottish Government, 2014), which states that planning authorities should think about the merits of each proposal, and then carefully weigh those merits against the cumulative, environmental, and community impacts. Local development plans that have been drawn up by local

authorities also mark local areas that are appropriate for the development of wind farms. The comparison of the planning structures of onshore wind energy development of Scotland and Germany is done in the hopes of gaining a better grasp of the ways in which spatial planning can aid in combating the impacts of climate change.
This research is concerned with the analysis of onshore wind energy plans in Germany and Scotland, within the context of climate change aspects; therefore, it presents case studies from the spatial plans of onshore wind energy development in these two countries. Detailed evaluation and analyses of the case studies listed below are presented in chapter six of this dissertation.

5.2 Case Study Profiles

As discussed earlier, this research is concerned with the strategic assessment of onshore wind energy in Germany and Scotland, within the context of climate change aspects. Therefore, it presents case studies from the spatial planning of onshore wind energy development in these two countries. Case study selection criteria are already described earlier in this chapter and also in chapter two of this dissertation. Table 5.1 present the onshore wind energy plans of Germany and table 5.2 displays the onshore wind energy plans of Scotland that are selected for case study analysis in this research.

No.	**Onshore wind energy plans (case studies) of Germany**
1.	Teilflächennutzungsplan Windenergie der Stadt Büren, 2015
2.	Teilflächennutzungsplan Windenergie Emden-Ost, 2016
3.	Sachlicher Teilregionalplan Windenergienutzung Lausitz-Spreewald, 2016
4.	Sachlicher Teilflächennutzungsplan Windenergie VVG (Vereinbarte Verwaltungsgemeinschaften) Gottmadingen, 2014

Table 5.1 Onshore Wind energy plans of Germany

No.	**Onshore wind energy plans (case studies) of Scotland**
1.	East Renfrewshire Supplementary Planning Guidance: Renewable Energy Strategic Environmental Assessment, 2016
2.	Stirling Supplementary planning Guidance: Wind Energy Strategic environmental assessment, 2015
3.	Highland Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2016
4.	Moray Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2015

Table 5.2 Onshore wind energy plans of Scotland

The following section briefly summaries the preparation of the plan formulation and processes of a strategic assessment of the onshore wind energy plans in Germany and Scotland.

5.2.1 Onshore Wind Energy Plans – Germany

5.2.1.1 Teilflächennutzungsplan "Windenergie" der Stadt Büren, 2015

The city of Büren lies at the North Rhine-Westphalia region of Germany. According to DWG (2018), North Rhine-Westphalia (NRW) is ranked as third in terms of wind power capacity across the 16 German states, with a number of 3,708 wind turbines and with an installed cumulative capacity of 5,703 MW in the first half of 2018. The region has very ambitious plans in reducing GHG emissions. As a result, it has introduced its own climate protection act in 2013 (MFK, 2013), which outlines how NRW is able to achieve its GHG emission reduction targets by at least 25%, compared to the level of 1990 by the year 2020. The Teilflächennutzungsplan of Büren is a legally independent land-use plan. It has an independent procedure for urban land use planning and does not consider the total land use of Büren. However, it can consider parts of municipalities for the production of onshore wind energy in the area. According to the Teilflächennutzungsplan of Büren, it is considered as one of the highest favoured regions for wind energy development. The area already drafted plans in 1995 to generate energy, but due to the ruling of the higher administrative court of the North Rhine-Westphalia, these plans were declared as ineffective. As a result, currently the area does not have any concentration zone regulation with Baugesetzbuch (BauGB). Therefore, the Teilflächennutzungsplan of Büren is considered a suitable planning instrument for the generation of clean energy through onshore wind energy development.

The Teilflächennutzungsplan of Büren was produced by the city council Büren under § 5 Abs. 2b (BauGB - Baugesetzbuch). The plan conducts an in-depth evaluation and analysis of the significant impacts on the environment. It illustrates detailed description of the current status of the environment in the area, including the climate and air, baseline conditions of the planned wind turbine zones. The Teilflächennutzungsplan of Büren focuses on the most compatible or suitable locations for wind energy use in the region. The main objective of this plan is the representation of the concentration zone for wind energy utilization in the municipality. In order to determine these suitable sites for wind energy concentration zones, a potential area analysis was conducted. This takes into account the suitable areas of priority for the utilization of wind energy. The determination of suitable sites for the concentration of wind energy utilization in Büren takes place by conducting a detailed analysis of the potential areas for wind farms. Therefore, this Teilflächennutzungsplan helps to represent the concentration zone for wind energy use by excluding the rest of the municipality.

5.2.1.1.1 Area Description

Büren is located in the eastern part of North Rhine-Westphalia. It is located 190-360 m above sea level in the extreme southwest of the district of Paderborn (administrative district Detmold) in a central location in Germany. It is spread out over an area of 171 square kilometres and situated on the rivers of Alme and Aftetals, which means that extensive flood plains dominate the nature, as these two rivers unite in Büren. The city is based on 12 villages with a total of 22,000 inhabitants. The 171 square kilometres large urban area borders the district of Soest in the northwest, and the Hochsauerlandkreis in the south. The city of Büren consists of more than 60 wind turbines, distributed among eight concentration zones in order to fulfil the energy demand of its population. This gives impressive evidence that the city belongs to one of the environmentally favourable regions of Germany. The main goal of the current planning is to exclude the areas of wind energy development from the rest of the municipality, by showing concentration zones. For this purpose, a "potential area analysis" was carried out within an overall urban planning concept, which led to the selection of eight planned wind power concentration zones. Table 5.3 presents the list of the concentration zones in the city of Büren, and figure 5.2 shows the selected concentration zones for onshore wind energy development in Büren.

No.	Wind energy concentration zones	Size of the concentration zones	No. of onshore wind energy plants
1	Steinhausen	44,8 hectares	10
2	Wünne / Strautefeld	107,6 hectares	11
3	Wulfeshagen Nord/Süd	86,3 hectares	10
4	Gahenberg	25,9 hectares	4
5	Haiperfeld	31,0 hectares	5
6	Barkhausen	141,5 hectares	14
7	Oberfeld	34,4 hectares	5
8	Molmsche	16,2 hectares	(Not mentioned)

Table 5.3: Onshore wind energy concentration zones of Büren
Source: Umweltbericht zum Teilflächennutzungsplan "Windenergie" der Stadt Büren, 2015

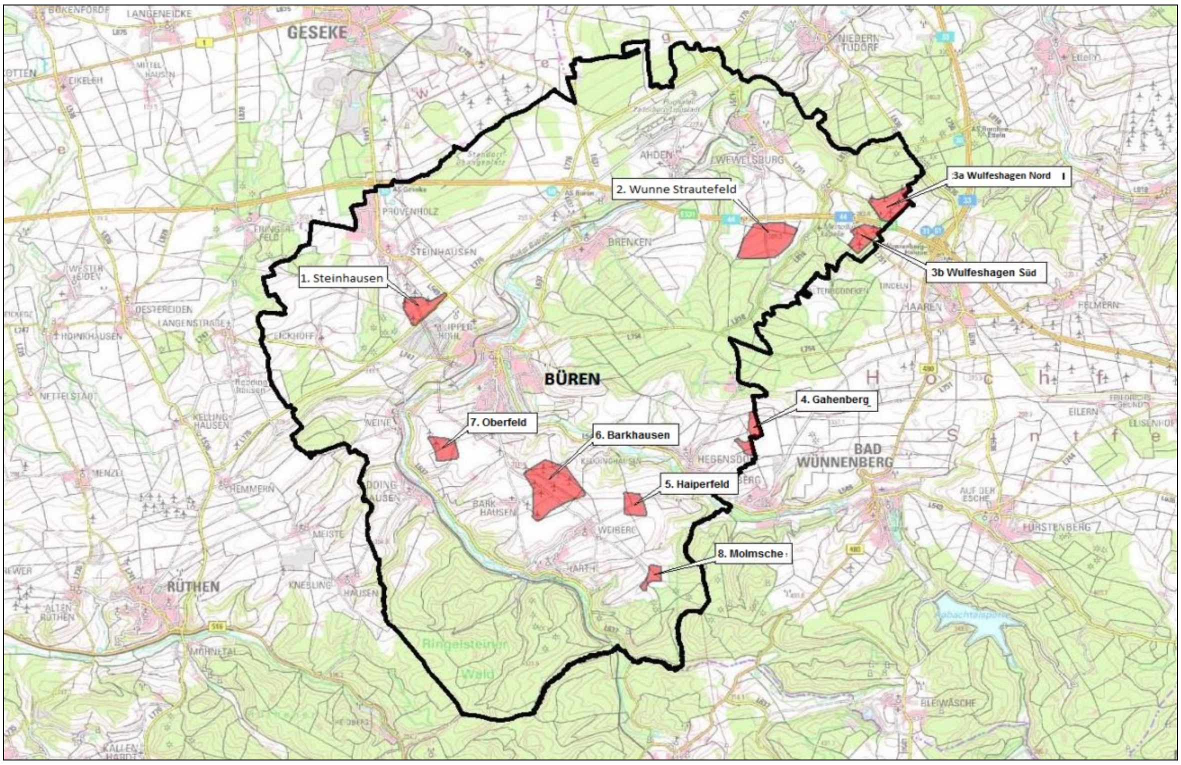


Figure 5.2 Planned Wind concentration zones (red) in the municipality of the city of Buren.
Source: Umweltbericht zum Teilflächennutzungsplan "Windenergie" der Stadt Büren, 2015

5.2.1.1.2 EA Process

Teilflächennutzungsplan Windenergie incorporates the requirement of § 2 Abs. 4 BauGB into its SEA report. This includes relevant laws and regulations used for the formulation of the report on the environment. The Teilflächennutzungsplan describes the purpose of the SEA as a way to find concentration zones in order to use wind energy in the city of Büren in its most appropriate locations. The planning for the concentration zones, for the use of wind energy in the city of Büren, is done in accordance with the requirements of § 35 Abs. 3 Satz 3. The planning is based on a potential analysis of the area, for the concentration zones for wind energy use, in which those areas were determined to not be suitable for wind energy development. This analysis is done by distinguishing the hard and soft taboo criteria. The taboo areas are then generally defined and analysed for conflict prevention. The plan also considers the existing wind parks already present in that area. The consideration of environmental concerns in the SEA report is done in a very comprehensive manner. In terms of climate change, the report includes information regarding the baseline condition, and the assessment of the climate and air of the city of Büren, including evaluation of the condition of the climate and the air after the implementation of the plan.

5.2.1.2 Teilflächennutzungsplan Windenergie Emden-Ost, 2016

As stated by the DWG (2018), Lower Saxony is ranked as number one in terms of the highest capacity of wind energy development. Over the course of the first six months of 2018, a total of 130 wind turbines with an overall capacity of 465 MW were installed. This makes Germany a leading wind power state, with a total capacity of 10,981 MW from 6277 wind turbine generators. Due to increased wind energy demand in the city of Emden, a spatial land use plan was created. This aims to create additional space for the use of wind energy in the east side of the Emden city. The Teilflächennutzungsplan represents ambitious goals for climate protection, according to the requirements set in Baugesetzbuch (BauGB), which entails that the urban development plans should contribute to promote climate protection and climate adaptation. Therefore, the Teilflächennutzungsplan of Emden-Ost also comprehends the requirements of the Building Code (BauGB), since climate change mitigation and adaptation measures are represented in the land-use plan as a coordinating/special function with regards to climate protection, and energy concepts. Keeping climate protection measures into consideration, the city of Emden majorly contributed to expanding its renewable energy resources through wind and solar energy. The city of Emden, along with the integrated municipal climate protection concept formally sets a target to increase its renewable energy efficiency as a part of an active climate change reduction policy, aiming to reduce CO_2 emissions significantly by 2020. In 2008, the city of Emden linked up with Climate-Alliance (Klima-Bündnis) and thus made a commitment every five years to achieve a 10% CO_2 emission reduction by 2030, compared to the level of 1990. Teilflächennutzungsplan of Emden-Ost sets out seven objectives and the objectives stated with regards to climate change include:

- The development plans should help to promote climate adaptation and protection, with regards to the impacts of climate change, particularly in urban development;
- To protect air and climate through measures of nature conservation and landscape management;
- Protection of the public and neighbourhood against harmful environmental effects of air pollutants, and their provision to achieve an elevated level of defense for the whole environment.

The state of Lower Saxony aims to convert its energy supply gradually to 100% renewable energy sources (Ohlhorst, 2015). In May 2015, the draft “Planning and approval of onshore wind turbines in Lower Saxony, during the objective and application wind energy adoption" has been submitted, which aims at Niedersachsen to build wind power capacity of at least 20 gigawatts by 2050.

5.2.1.2.1 Area Description

The city of Emden is located on the northwest side of Lower Saxony. Due to its location near Ems River, it is also called the Seaport city and is considered as an ideal location for both the offshore and onshore development of wind energy. Emden is one of the main cities of eastern Friesland and lies at the western side of the East Frisia. The estimated land area for Emden is 357,022 square kilometres. With regard to the area for the wind energy utilization, Emden-Ost follows the guidance of the surface potential analysis, according to which four special areas for utilization of wind energy are proposed and considered suitable for onshore wind energy generation. Table 5.4 presents the concentration zones designated for the development of onshore wind energy in the city of Emden-Ost.

No.	Special areas for wind energy utilization	Area of the wind energy development
1	Nördlich A 31	ca. 39,7 hectares
2	Südlich A 31	ca. 25,0 hectares
3	Östlich Borßumer Hammrich	ca. 18,5 hectares
4	Nördlich Borßumer Hammrich	ca. 18,2 hectares

Table 5.4 Special areas for onshore wind energy utilization in Emden-Ost
Source: Teilflächennutzungsplan „Windenergie Emden-Ost", 2016

The surface area of the wind energy development in these special areas for wind energy utilization is approximately 101 hectares with motorways on both sides of the proposed area. The geographic locations for the wind energy use in Emden-Ost are shown in figure 5.3, presenting areas that are the part of Teilflächennutzungsplan.

Figure 5.3 Suitable areas (orange) for wind energy use in Emden – Ost
Source: Teilflächennutzungsplan "Windenergie Emden-Ost“ (2016)

5.2.1.2.2 EA Process

The main purpose of the EA, as described in the Teilflächennutzungsplan of Emden-Ost, is to create additional space for use by wind energy in the area of the city of Emden. The additional areas are created due to increased demand for applications in the context of renewable energy policy. However, the Teilflächennutzungsplan is only limited to the east of the urban area, of the city of Emden. The environmental report of the Teilflächennutzungsplan Windenergie is prepared under the requirements of the Federal Building Code (BauGB), according to which nature conservation and landscape impacts need to be considered when implementing the development plans (BauGB, 2017). The environmental report of the Emden Ost Teilflächennutzungsplan also outlines the baseline condition of climatic factors of the area, following with analysing the impacts of the plan on climate and air.

5.2.1.3 Sachlicher Teilregionalplan Windenergienutzung Lausitz-Spreewald, 2016

Lausitz-Spreewald is situated in the state of Brandenburg, which has always been a frontrunner with regard to tackling issues of climate change. In order to reach its climate policy targets, the state government of Berlin and Brandenburg collaborated and formed a joint spatial planning concept for energy and climate (GL, 2012). The aim of this joint venture is to achieve a massive rise in the sources of renewable energy in energy consumption for climate protection and to reduce GHG emissions by the year 2020. Region Lausitz Spreewald also plays a major role in producing clean energy through renewables, especially from wind energy. The region has a capacity of 857 wind turbines producing approximately 1.7 GW of clean energy through the wind. One of the primary objectives of this plan is to increase the share of renewable energy in the mix, due to the Brandenburgs "Energy strategy 2020" and region's commitment to raising the share of renewables to 20%, by the year 2020. This would require additional land for the production of clean energy. On this account, the purpose of the Teilregionalplan Windenergienutzung is to reduce the dependency on fossil fuel, increase energy efficiency, reduce CO_2 emissions, and expand the land to amplify the share of renewable energy in the region.

5.2.1.3.1 Area Description

Lausitz Spreewald lays to the south of the Brandenburg state of Germany. In terms of installed wind energy capacity, Brandenburg is currently ranked as second only to Lower Saxony among the German states, for the highest capacity for wind energy, with a total of 6.9 GW from more than 3,700 wind turbines generator (DWG, 2018). The Teilregionalplan area includes the planning region Lausitz-Spreewald consisting of districts Elbe-Elster, Spree-Neisse, Dahme-Spreewald, Oberspreewald-Lausitz, and the independent city of Cottbus. It lies to the southeast of the state Brandenburg, ranging from the southern outskirts of Berlin, up to the border with the state of Saxony. In the east, it borders the Republic of Poland, and in the west borders the state of Saxony Anhalt. The planning region covers approximately 7,181 square kilometres, making it the largest in terms of the area planning region of Brandenburg. Figure 5.4 presents the planned wind energy concentration zones of Lausitz Spreewald.

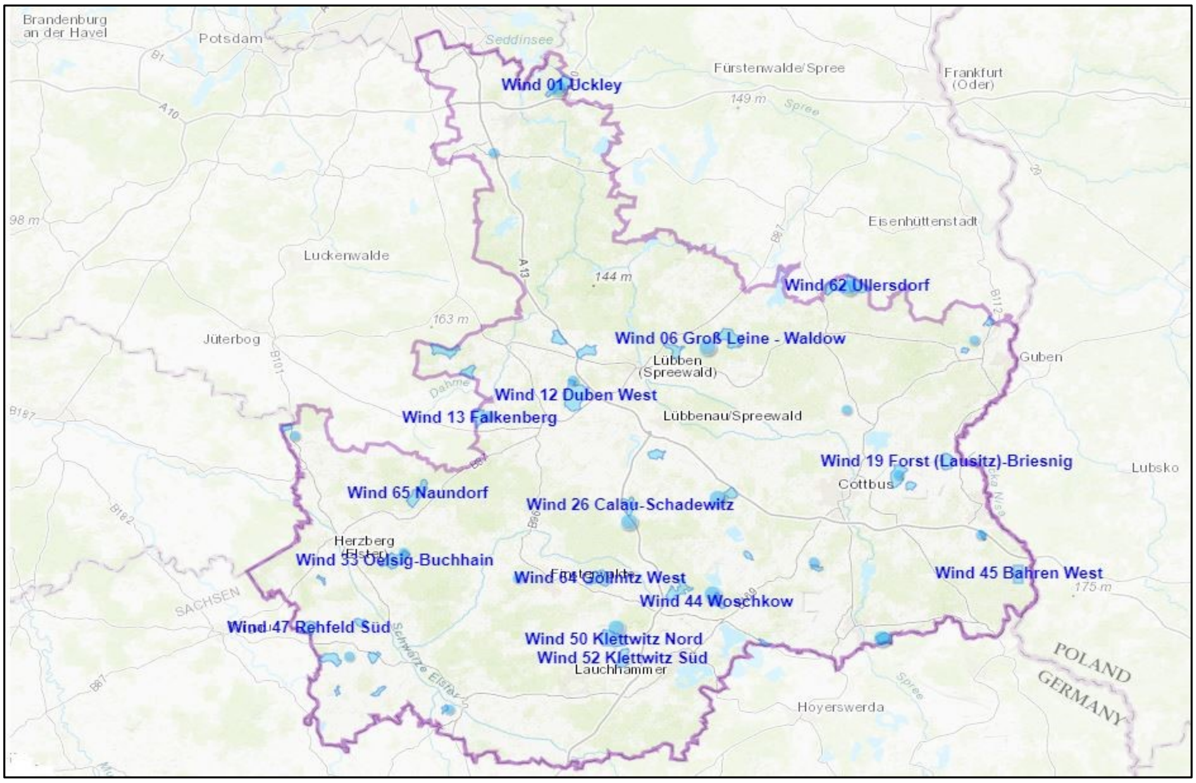


Figure 5.4 Wind energy concentration zones (blue) in Lausitz Spreewald

Source: Sachlicher Teilregionalplan Windenergienutzung Lausitz-Spreewald, 2016

5.2.1.3.2 EA Process

In order to complete the EA, an environmental report was prepared for the Teilregionalplan of Lausitz Spreewald to assess the probable significant environmental impacts of the plan including the climate and the air. The structure of the strategic environmental assessment report is based upon the Annex 1 of the Raumordnungsgesetz (ROG). This ensures that the environmental report contains all the required information in comprehensive detail. The SEA report of the Teilregionalplan of Lausitz Spreewald addresses the likely significant environmental impacts of the entire planning area. In addition to that, the strategic environmental assessment of the Teilregionalplan of Lausitz Spreewald deals with the likely significant environmental effects related to:

- people, - including human health, biodiversity, fauna, and flora,
- water, soil, landscape, air, and climate,
- cultural heritage and other additional material assets and,
- the collaboration between the above-mentioned protective materials.

The planning objective, described in the Teilregionalplan, is to designate suitable areas for wind turbines where other regionally significant requirements are also met. The area has a huge potential for wind energy development. Therefore, the suitable sites are selected in a two-stage process: first, the taboo areas are identified and excluded, then in the second stage the remaining areas are individually assessed for the most favourable site for wind energy development.

5.2.1.4 Sachlicher Teilflächennutzungsplan Windenergie VVG Gottmadingen, 2014

VVG (Vereinbarte Verwaltungsgemeinschaften) Gottmadingen is situated in the state of Baden-Württemberg, which is located in the southwest of Germany, bordering Switzerland and France. The area consists of two types of administrative communities, such as municipal administrative unions (Gemeindeverwaltungsverbände) and agreed administrative communities (Vereinbarte Verwaltungsgemeinschaften). Gottmadingen lies in the agreed administrative communities of Baden-Württemberg, hence called as VVG Gottmadingen. To promote the expansion of renewable energies, especially wind energy, the legislative framework that was written in terms of spatial planning was revised in 2012 by Baden-Württemberg's federal state government (Jäger et al., 2016). In the same year, the state initiated a study on the climate change consequences in Baden-Württemberg, focussing on every region of the state. In 2013, the state parliament passed a law necessitating itself to reduce GHG emissions by 25%, by 2020, and 90%, by 2050 - in comparison to 1990 levels. To achieve these targets for GHG emissions, an action plan was prepared, which included expansion targets for different renewables. For onshore wind energy, highly ambitious plans were set up. These plans set a target to produce 6.7 TWh of electricity production in 2020 (IEKK, 2018). According to DWG (2018), the cumulative capacity for onshore wind turbines in Baden-Württemberg is 719 WTG, producing 1.5 GW of clean energy. To achieve these targets VVG Gottmadingen is playing its role in CO_2 emission reduction, by expanding renewable energy in the municipality. The main purpose of this Teilflächennutzungsplan is to designate suitable sites for wind turbines. The document also shows how significant environmental impacts of the wind energy concentration zones have been avoided or reduced.

5.2.1.4.1 Area Description

VVG Gottmadingen lies in the southwest of Germany; it is a municipality in the district of Konstanz in the state of Baden-Württemberg. The potential wind energy concentration zones in Gottmadingen have been designated in Fronberg, Ruahenberg, and Kapf. Table 5.5 presents the concentration zones designated for onshore wind energy development in VVG Gottmadingen. Fronberg is located in the greenway of the region, which is a green strip of land that has not been developed near an urban area, set aside for environmental protection or recreational use.

No.	Wind energy concentration zones	Size of the concentration zones
1	Fronberg	101 hectares
2	Rauhenberg	77.2 hectares
3	Kapf	10.2 hectares

Table 5.5 Onshore wind energy concentration zones in VVG Gottmadingen
Source: Sachlicher Teilflächennutzungsplan Windenergie VVG Gottmadingen , 2014

The northern part consists of woodland areas and the southern part borders with the FFH areas. Therefore, due to the withdrawal of the northern areas and reduction in the southern part of the area, significant impacts on the species can be avoided. Figure 5.5 shows the planned concentration zone for wind energy development in VVG Gottmadingen.

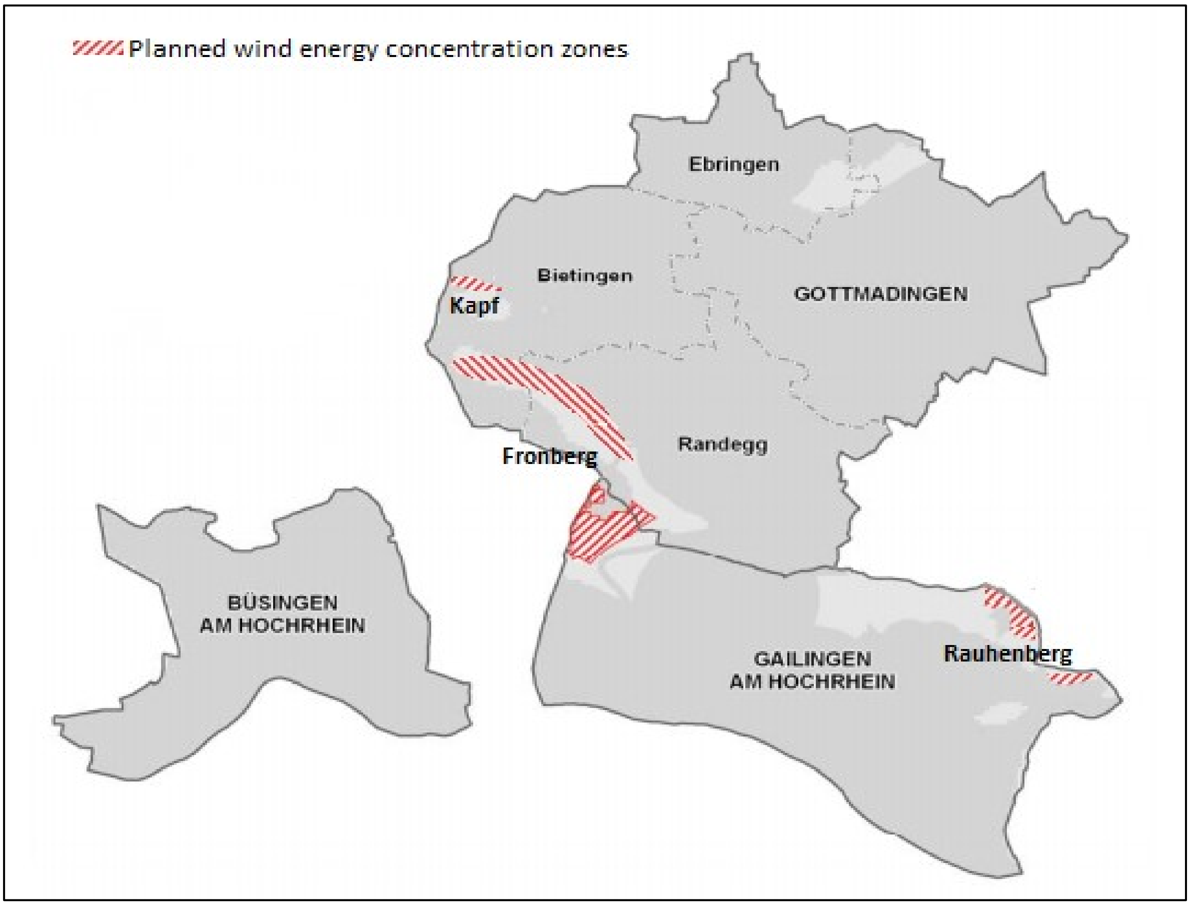


Figure 5.5 Onshore wind energy concentration zones in VVG Gottmadingen
Source: Sachlicher Teilflächennutzungsplan Windenergie VVG Gottmadingen , 2014

Furthermore, significant adverse effects of the environment are avoided by the withdrawal of the northern part of the concentration zone in Fronberg. The second concentration zone planned for wind energy utilization lies in Rauhenberg, which is situated in the eastern part of Gailingen. The area consists of important cultural monuments such as vineyards and castles. The area also lies at 140 m from the FFH zone. However, due to habitat types and the characteristic of species, significant adverse effects cannot be completely avoided. The third concentration zone lies in Kapf. The planned concentration zone is situated in the woodland area. This part of the area is surrounded by cultural monuments. The area poses significant negative effects on species protection. Therefore, the plan suggests that by withdrawing from the territory, a significant threat to species conservation can be avoided.

5.2.1.4.2 EA Process

The aim of the environmental assessment is to identify, describe and evaluate significant environmental impacts of the plan at an early stage so that the impacts can be taken into account in the planning and consideration process for effective environmental protection.
The environmental assessment of Teilflächennutzungsplan of wind energy outlines how significant negative environmental effects have been avoided or reduced during the planning phase. The contents of the environmental report are based in accordance with the Annex 1 of the BauGB. The impacts are identified in a broad context and are based on the following three stages:

1. First, adopted land use plan development is assessed with regard to its conflict-avoiding effects of environmental impacts.
2. Secondly, all the concentration zones for wind energy are assessed in more detail concerning significant adverse environmental impacts.
3. Finally, the environmental impacts of the concentration zones for wind turbines are holistically assessed and consider cumulative effects along with other interactions.

5.2.2 Onshore Wind Energy Plans – Scotland

5.2.2.1 East Renfrewshire Supplementary Planning Guidance: Renewable Energy Strategic Environmental Assessment, 2016

East Renfrewshire Supplementary Planning Guidance was produced by East Renfrewshire council. The council constructed a Local Development Plan (LDP) for the entire region under The Planning etc (Scotland) Act 2006, which sets out provisions for the protection, use, and development of land within the East Renfrewshire. The Renewable Energy Supplementary Planning Guidance (SPG) provides additional information on Policy E1 (renewable energy) of the LDP of the East Renfrewshire and reflects the requirement of the Scottish planning policy SPP (2014). The document includes information on spatial framework identifying areas where there is a potential for wind energy development, areas where wind farms will not be acceptable, areas of significant protection, and areas with wind energy development potential. The SPG is subject to SEA and will be adopted through the development plan process. The local development plan was adopted on 25th June 2015 by the East Renfrewshire council and the SPG renewable energy as part of this plan. The SPG Renewable energy is prepared according to the policies set in Policy E1: Renewable Energy. The SPG provides comprehensive guidance on the spatial framework for onshore wind, along with potential developments in the local area. There is also a consideration of alternative renewable energy technologies. However, the majority of the SPG will focus on the dissemination of further onshore wind developments within East Renfrewshire and the potential issues related to onshore wind energy in the area. The following sections provide additional detail on area description and on the preparation of the supplementary planning guidance and the SEA and how these processes were formally assembled

5.2.2.1.1 Area Description

The area of East Renfrewshire comes under the East Renfrewshire administrative authority. It is situated to the south of the city of Glasgow in Scotland. East Renfrewshire is spread over an area of 174.2 square kilometres. The northern part of the area is mostly urban, with widespread rural neighbourhoods - one to the west and one to the south. The urban area makes up approximately 15%, while the other 85% is predominantly rural. The urbanized part of the East Renfrewshire is very densely populated, as it has one of the highest population densities within a settlement run by any local authority outside of Edinburgh and Glasgow. This raises issues regarding addressing and protecting the characteristics and the green spaces of urban areas. Figure 5.6 shows the spatial framework map of East Renfrewshire, identifying areas that are expected to be the most appropriate for onshore wind energy development.

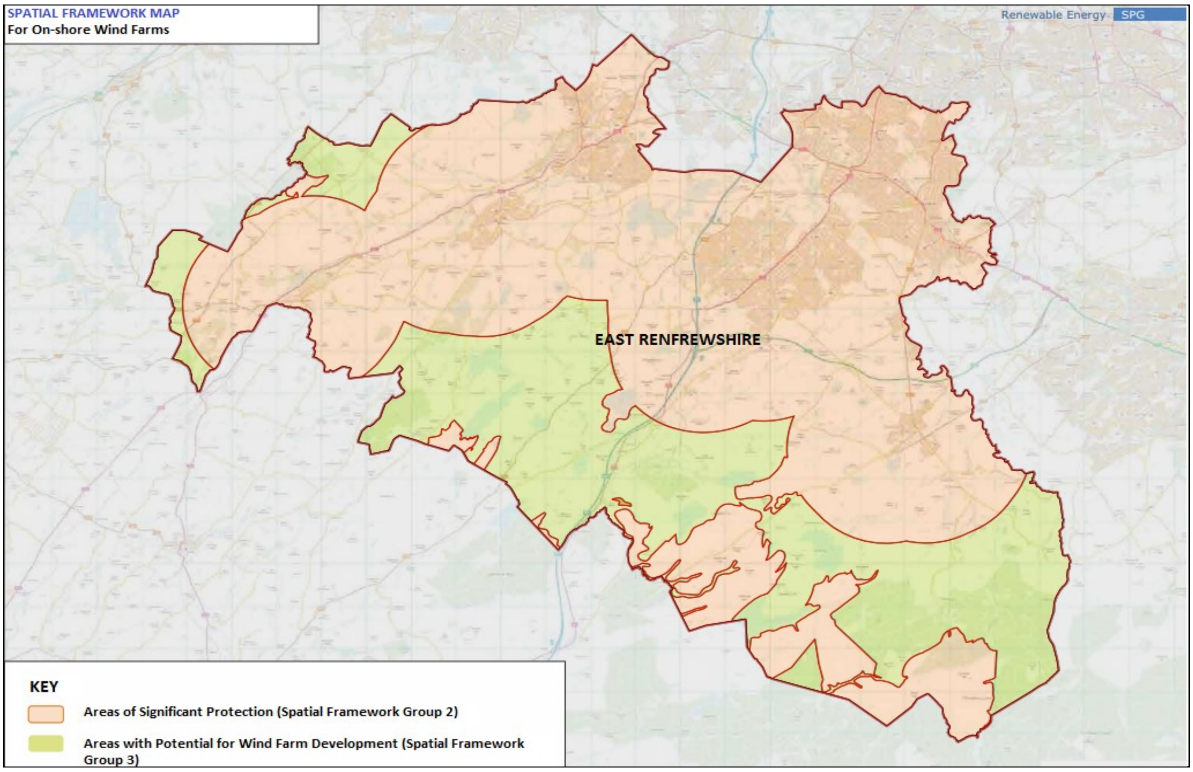


Figure 5.6 Areas of greatest potential for wind farm development in East Renfrewshire
Source: East Renfrewshire, SPG Renewable Energy SEA, 2016

The pink highlighted region shown in figure 5.6, come under the spatial framework group 2, presenting the areas of significant protection regarding the onshore wind energy development (See table 5.6). Similarly, the green highlighted regions shown in figure 5.6 come under the spatial framework group 3, which represent the areas with potential for onshore wind energy development in the region of East Renfrewshire. The Scottish government has classified areas by their suitability for the development of onshore wind energy, falling into one of three groups. Table 5.6 present the spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms.

Group 1: Areas where wind farms will not be acceptable such as: National Parks and National Scenic Areas
Group 2: Areas of significant protection such as: Natura 2000 sites; Inventory Battlefields and Designed Landscapes; SSSI's; Wild Land; Peat and Carbon Rich Soils and Community Separation (2.0 km maximum subject to local topography).
Group 3: Areas with potential for wind farm development such as: Areas with potential for wind farm development Beyond Groups 1 and 2 wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.

Table 5.6 Spatial framework for onshore wind energy parks in Scotland
Source: Scottish Planning Policy, 2014

5.2.2.1.2 EA Process

SPG Renewable Energy EA was prepared by the East Renfrewshire Council, which is updated every five years. The report is prepared according to the Environmental Assessment (Scotland) Act 2005. Since the SPG is the type of a plan, which lies in accordance with section 5(3) of the 2005 Act, therefore, a SEA was mandatory. The purpose of the SPG Renewable Energy as described in the report is as follows:

> 3.4.1. The purpose of this Environmental Report is to:
>
> - Provide information on the Renewable Energy SPG and its SEA process;
> - Identify, describe and evaluate the likely significant effects of the guidance and reasonable alternatives;
> - Provide an early and effective opportunity for the Consultation Authorities and the public to offer views on any aspect of this Environmental Report.
>
> (East Renfrewshire, SPG Renewable Energy SEA, 2016, p.6)

The first part of the SPG (Part 1) focuses on the establishment of a spatial framework for onshore wind farms. The assessment presented in the report, therefore, takes into consideration the spatial framework and wind energy technology.

The second part of the SPG (Part 2), presents assistance and guidance to developers and development management regarding identifying significant effects of wind energy development and their mitigation measures. In this section, the report addresses any adverse environmental impacts caused by the development proposal and provides mitigation measures against them. The third part of the SPG (Part 3), outlines additional alternative renewable energy projects. It states that;

> "..further studies may be commissioned by the Council to determine areas of greatest potential for alternative energy sources, with a focus on locational/environmental considerations such as scale, visual impact, landscape features, carbon rich soils etc. Any results of these potential studies will features in subsequent versions of this SPG"
>
> (East Renfrewshire, SPG Renewable Energy SEA, 2016, p.7)

5.2.2.2 Stirling Supplementary Planning Guidance: Wind Energy Strategic Environmental Assessment, 2016

Stirling Supplementary Guidance: Wind Energy Strategic Environmental Assessment is produced by Stirling Council. This report lays out the findings from the SEA of the Stirling Council´s Supplementary Guidance –Wind Energy Developments Spatial Framework and Supplementary Advice and Guidance (SFSAG). The Local Development Plan (LDP) is produced by the Stirling Council, under the Scottish Planning Policy. This plan includes wind energy development spatial framework, as illustrated in Policy 12.1 Wind Energy Developments. Policy 12.1 comprises a map showing areas divided into three major groups; (see table 5.6). Stirling supplementary guidance of wind energy SEA is produced by the Stirling Council based on the Environmental Assessment (Scotland) Act 2005. According to this act, the council considers all policies, plans and programmes for SEA, along with alterations and reviews of existing plans. The Stirling council adopted the Supplementary Guidance in February 2016. It supports the policies within the Stirling local development plan together with relevant policies in the plan, particularly Policy 12.1 – Wind Energy Development, which will be used to determine the planning merits of the planning application. The supplementary guidance is composed of two sections. The first part consists of the spatial framework which is set out according to the requirement of the Scottish Planning Policy (SPP, 2014) and identifies wind energy development based on three major groups; Group 1: areas where wind farms will not be acceptable, Group 2: areas of significant protection, Group 3: areas with potential for wind farm development. The second section is the supplementary advice and guidance, which intends to identify advice and guidance on different kinds of planning and environmental factors relevant to wind energy development in the Stirling LDP area. This includes effects on landscape and visual impacts, natural heritage, carbon-rich soils, the historic environment, the water environment, and cumulative effects.

5.2.2.2.1 Area Description

Stirling lies in central Scotland. The area is covered by the SFSAG which extends to approximately 1,073 square kilometres. In the northern part, it is comprised of slightly populated land of lochs, mountains, and glen (c.221 square kilometres). In the south, there are more settled lowlands (c.852 square kilometres) fenced by elevated moorlands and low hills. As recognised by a range of European, national and local designations, the area is rich in natural and cultural heritage and is of high landscape value. The geographic area of SFSAG is shown in figure 5.7 below and comprises the part of the administrative area of Stirling Council covered by the adopted Stirling Local Development Plan (SLDP), i.e. excluding that part of the Stirling Council area in the Loch Lomond and the Trossachs National Park. Figure 5.7 shows the Stirling Council area with planned concentration zones for onshore wind energy development.

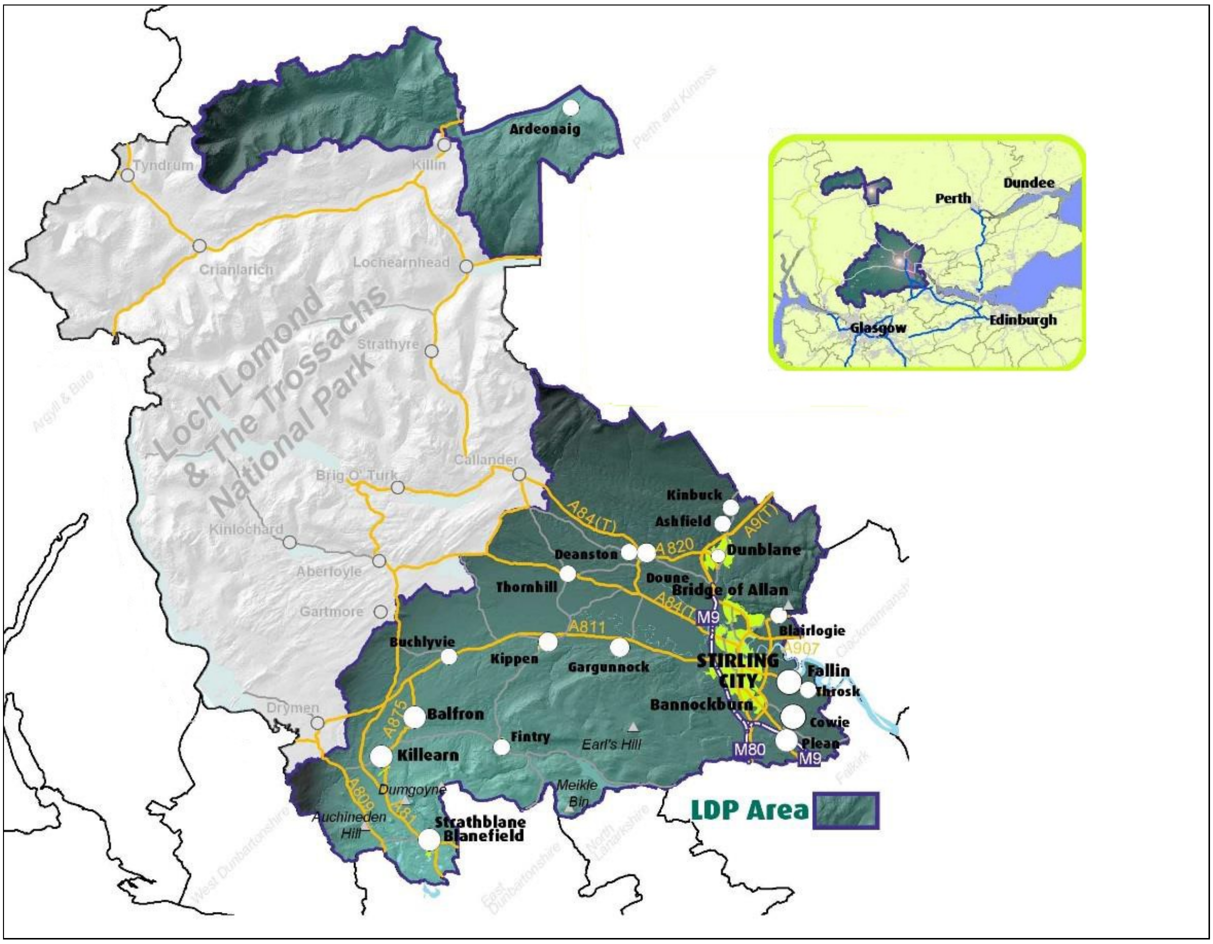


Figure 5.7 Area of SFSAG (and SLDP)

Source: Stirling Supplementary Guidance: Wind Energy SEA, 2015

5.2.2.2.2 EA process

The SEA report is prepared in accordance with the Environmental Assessment (Scotland) Act 2005 by the Stirling Council. The main aim of the report is to first analyse and then address the condition of significant aspects of the environment of the Stirling region. The environmental report of the Stirling wind energy determines the findings from the Strategic Environmental Assessment of the Stirling Council's Supplementary Guidance –Wind Energy Developments Spatial Framework and Supplementary Advice and Guidance (SFSAG). The two main objectives of the SFSAG as described in the report are as follows;

> A) To set out a map based Spatial Framework for wind energy development that complies with criteria set out in Scottish Planning Policy (SPP).
>
> B) To set out Supplementary Guidance for wind energy development that will incorporate advice on a range of planning and environmental considerations relevant to wind energy development in the SLDP Area, including impacts on: landscape and visual impacts, natural heritage, carbon

rich soils, the historic environment, the water environment, and cumulative effects.

(Stirling Supplementary Guidance: wind energy SEA, 2015, p.3)

It is to be noted that Stirling Council has produced a separate report for the state of the environment where the significant aspect of the environment of the Stirling area are identified and assessed, yet the SEA report includes a summary of the relevant aspects of the current state of the environment. The SEA report outlines a summary of assessment for each SEA topic, for instance, biodiversity, flora & fauna, population & human health, soil, water, air, climatic factors, material assets, cultural heritage, landscape, and cumulative effects.

5.2.2.3 Highland Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2016

Highland onshore wind energy supplementary guidance is produced by The Highland Council (THC). The onshore wind energy Supplementary Guidance (SG) was prepared according to the policies set in the Scottish Planning Policy (SPP 2014), which states that "planning authorities should set out a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms…," and that "development plans should also set out criteria that will be considered in deciding all applications for wind farms of different scales" (SPP, 2014, p.38). The SG is updated every five years in correspondence with the Highland-wide Local Development Plan. The Highland-wide Local development Plan (HwLDP) outlines the strategic planning policy framework for the development of renewable energy. The purpose of the Onshore Wind Energy: Supplementary Guidance is to ensure that the policy is well documented and is consistently applied across Highland. It aims to guide the development of onshore wind energy to the most suitable locations according to the spatial framework set out in Scottish Planning Policy. The onshore wind energy supplementary guidance replaces the previous Highland Renewable Energy Strategy (HRES) that relates to onshore wind energy. The council decided that HRES would no longer be used for the consideration of onshore wind energy proposals. The SG helps to provide a spatial framework and guidance for assessing onshore wind energy development applications. It supports the policies within the Highland-wide Local Development Plan (HwLDP), together with relevant policies in the plan, particularly Renewable Energy Policy. The SG experienced many changes during its development. Certain variations were made in the SG, which occurred due to changes made in national policy, and suggestions that were taken into account on more than one occasion during the preparation of the SG. Furthermore, significant efforts were made by Highland Council to collaborate with Scottish Natural Heritage (SNH), consultants and other stakeholders to address issues related to landscape, visual, cumulative effects and most recently, to identify the strategic capacity for wind farms and areas that have the potential for wind energy development.

5.2.2.3.1 Area Description

Highland covers some of the finest landscapes of Scotland. It comprises over a quarter of Scotland's National Scenic Areas, and approximately 40% of Scotland's wildland areas. On the western side of Highlands and the island, there are rocky mountains and valleys which are bordered with a coastline of sea lochs. The east coast is mostly dominated by several sandy beaches and coastal edges with agricultural farmlands. The northern Caithness and Sutherland areas of the plan contain a sprawling coastline with cliffs, beaches and, sea lochs. All these features of the Highland landscape make it an ideal location for wind energy generation. Figure 5.8 provides information on wind energy developments across Highland.

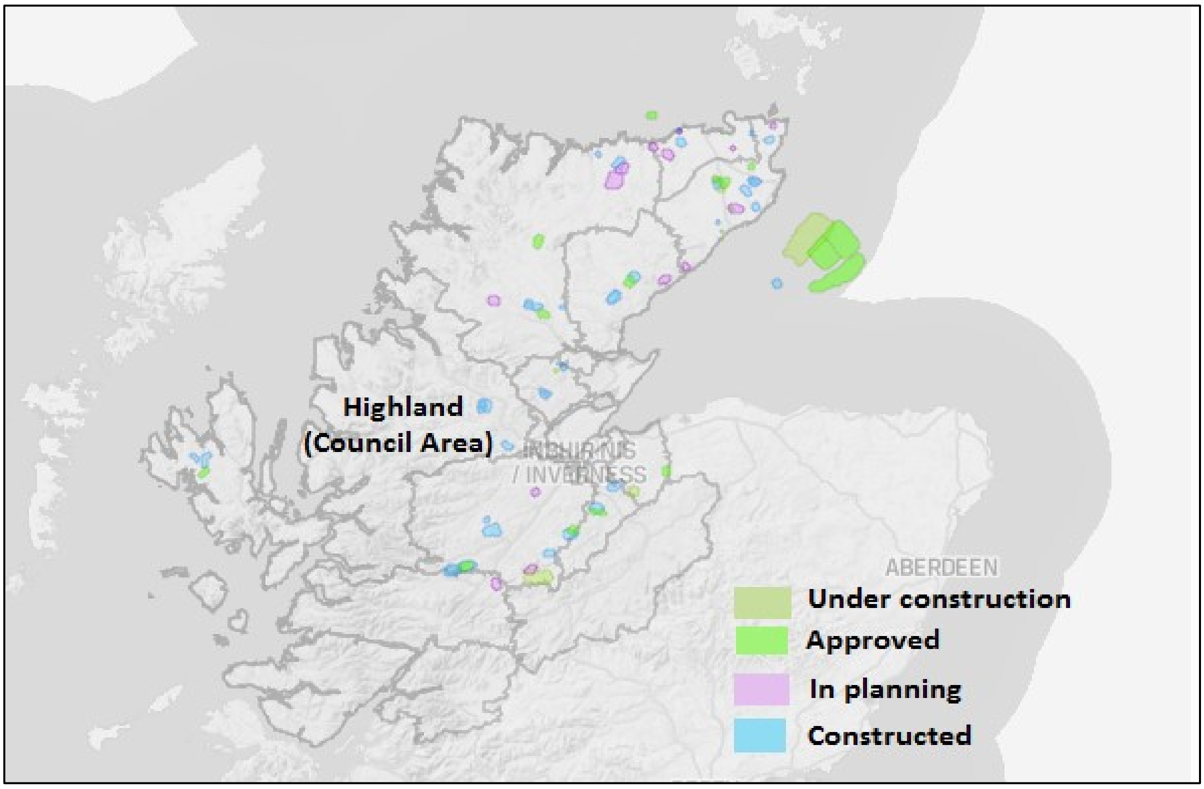


Figure 5.8 Wind energy development across Highland council
Source: Highland Supplementary Guidance: Wind Energy SEA, 2016

5.2.2.3.2 EA Process

An SEA is conducted by the Highland Council as a part of the preparation of onshore wind energy: Supplementary Guidance. The Environmental Assessment (Scotland) Act 2005 made it mandatory to carry out a SEA for considering the likely environmental effects of the proposal. The purpose of the SEA report as described in the document is as follows;

> - provide information on the On-shore Wind Energy: Supplementary Guidance;
> - identify, describe and evaluate the likely significant effects of the On-shore Wind Energy: Supplementary Guidance and its reasonable alternatives;
> - provide an early and effective opportunity for the Consultation Authorities and the public to offer views on any aspect of (the earlier versions of) this Environmental Report.
>
> (Highland Supplementary Guidance: Wind Energy SEA, 2016, p.6)

The SEA has been subject to consultation at several stages. Detailed information on how the Highland Council addressed those comments is presented in the SEA post-adoption statement report. According to the requirement of schedule 3 of the Environmental Assessment (Scotland) Act 2005, the environmental report includes an outline of the Planning Policy Statements (PPS) with other relevant PPS along with taking environmental protection objectives into consideration.

5.2.2.4 Moray Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2016

The Moray Council commissioned a Supplementary Guidance (SG) to assess the development of wind energy in the area. The SG serves as the Moray Council's response to the national encouragement of renewable energy developments. According to the Environmental Assessment (Scotland) Act 2005, the guidance is subject to strategic environmental assessment. The Moray SG was prepared based on the policies set in the Scottish Planning Policy (SPP, 2014), which prompted the council to create a very strategic indication of the opportunities that exist for wind energy development. The Guidance addresses the Moray LDP area for wind energy development excluding the Cairngorms National Park. One of the main reasons that lead the Moray Council in preparation for this supplementary guidance for onshore wind energy development is its commitment to support the objective of the Scottish government, which is to upsurge the amount of electricity produced from renewable energy resources. According to the national climate change delivery plan, Scotland is set out to generate more than 50% of its energy from renewables by the year 2020. Currently, the Scottish government has raised this target to 100% and aims to produce 100% of Scotland's gross annual energy consumption by the year 2020. In order to reach these targets, Moray is already contributing to achieve these goals mainly through large scale wind farms in the area. Moray supplementary guidance for onshore wind energy is used as a material consideration in assessing the wind energy proposals. The guidance mentions that the spatial framework for wind energy development in the area is formulated according to the Scottish Planning Policy (SPP), which requires the council to identify areas under three discrete groups. Group 1: Areas where wind farms are prohibited due to designated national parks and national scenic areas, Group 2: Areas with considerable protection due to national and international designations, important national zones mapped with environmental interest and zones with visual impact consideration, and Group 3: Areas with wind farm development potential. The SG highlights that The Moray Council along with Scottish Natural Heritage (SNH), carried out a Moray Wind Energy Landscape Capacity Study, to identify areas of local landscape sensitivity. This study enabled the council to designate areas of greatest potential for wind energy, based on landscape characters along with the different typologies identified in the Moray Supplementary Guidance.

5.2.2.4.1 Area Description

Moray is one of Scotland's thirty-two local government council areas. It shares borders with Aberdeenshire and Highland council area and has a coastline on the Moray Firth. The area for the onshore wind energy development comes under the Moray Local Development Plan Area, excluding the Cairngorms National Park. The moray local development plan outlines the framework for onshore wind energy parks according to the Scottish planning policy (SPP). Figure 5.9 present the designated zones (pink highlighted areas) for the onshore wind energy parks in Moray Local Development Plan. For large scale onshore wind farms, the council granted the consent for wind energy development at Hill of Towie, Dorenell, Meikle Hill, Rothes, Kellas, Paul's Hill , Berryburn, Edintore, and Hill of Glaschyle. Public inquiries were against Dorenell and Drummuir but they were approved by the Scottish Government after the appeal.

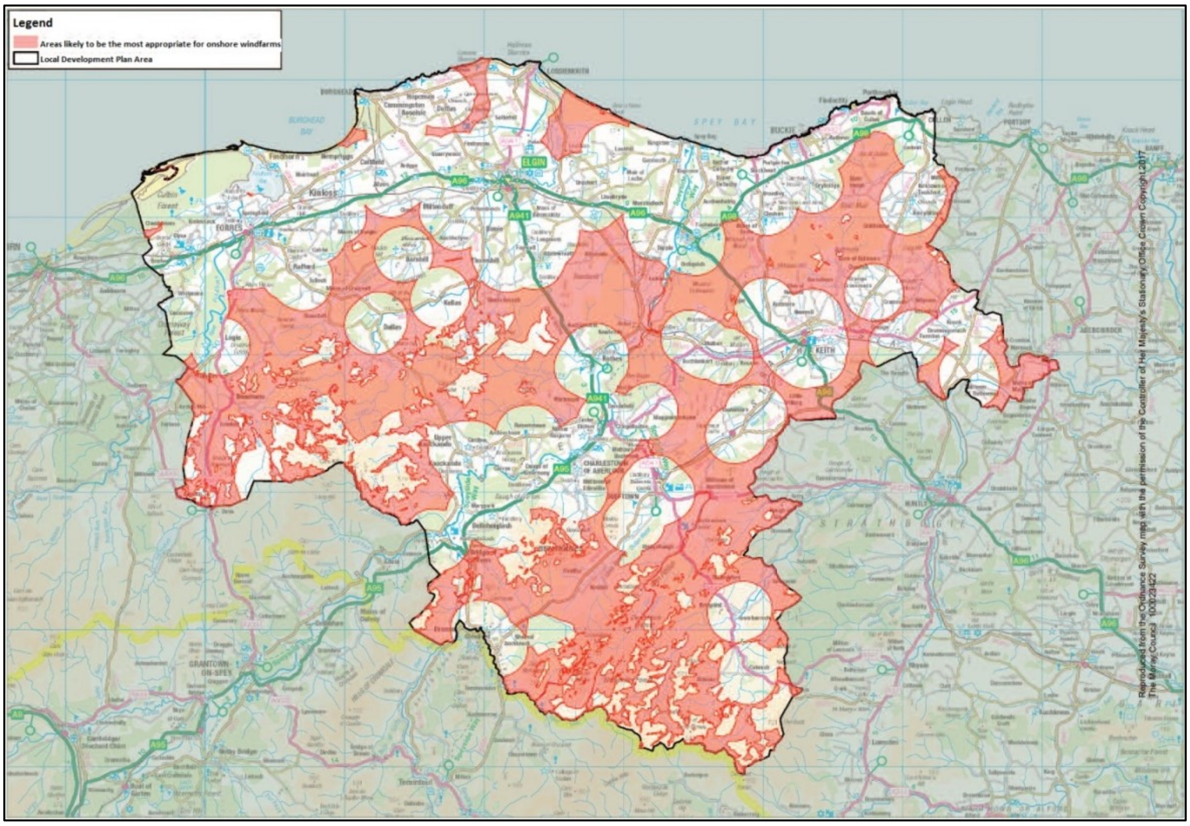


Figure 5.9 Moray map showing areas likely to be appropriate for onshore wind energy parks
Source: Moray wind energy Supplementary guidance, 2016

5.2.2.4.2 EA Process

According to the requirements set in EC Directive 2001/42/EC, it is mandatory to carry out SEA for LDP and supplementary guidance documents. In Scotland, the EC directive was implemented through the Environmental Assessment (Scotland) Act 2005. The SEA report prepared by the Moray Council aims to provide information on Moray onshore wind energy guidance. The council ensured that the SEA process is based on three key principles of Planning Advice Note (PAN) 1/2010 Strategic Environmental Assessment of Development Plans (PAN, 2010). PAN was published in March 2010 and outlines guidance for planning authorities to help focus and streamline the process. The three key principles of PAN as described in the SEA report are as follow:

> The three key principles are:
>
> - Integration – the SEA should form an integral part of the development plan process and not duplicate work undertaken and explore opportunities for efficiency.
> - Proportionality – SEA should be streamlined and fit for purpose, clear and succinct, focussing on significant environmental effects.
> - Efficiency – reduce duplication and complexity within the process.
>
> (Moray Wind Energy Supplementary Guidance, 2016, p.3)

The SEA is aimed at providing information on Moray onshore wind energy guidance. In the report, the environmental effects were evaluated by using an assessment matrix. The assessment matrix helped to evaluate the Supplementary Guidance against each of the SEA individual objectives. To ensure there is a correspondence between the Moray local development plan SEA 2015, and Moray onshore wind energy SEA, the same SEA objectives were used only with slight modifications.

6 Findings of the Onshore Wind Energy Plans by Quality Review Package

The intend of this chapter is to illustrate the notion of climate change integration into SEA of onshore wind energy plans of Germany and Scotland through empirically analysing the SEA documents of both the countries, which is done by carrying out quality review analysis of the onshore wind energy plans of Germany and Scotland. The analysis is done with the help of an adapted review quality package developed by Lee and Colley (Lee and Colley, 1992; Lee et al., 1999) which is modified according to the research task.

6.1 Analysis of Onshore Wind Energy Plans

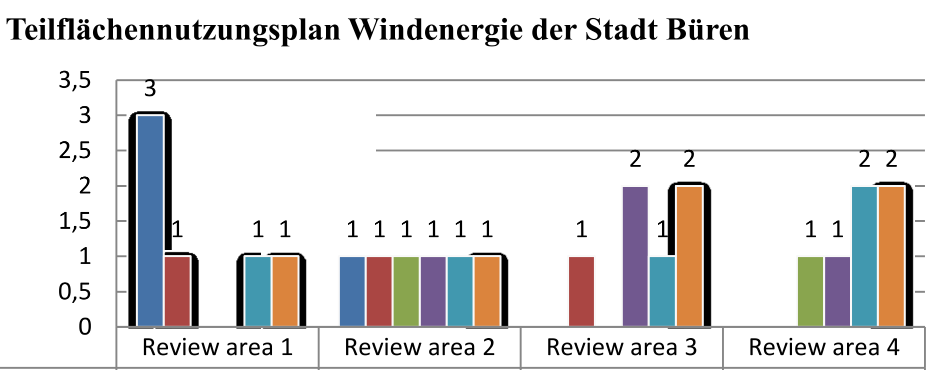
The approach used to analyse the onshore wind energy plans of Germany and Scotland is the (modified) Lee and Colley review package (Lee and Colley, 1992; Lee et al., 1999). It consists of review areas followed by review categories and subcategories. The modified review package (elaborated by the author), used for this study consist of twenty-four sub-review categories, six review categories and, four review areas that broadly correspond to categories (see chapter two, table 2.1).
A detailed description of how these review areas are adapted is presented in chapter two of this dissertation, along with a comprehensive explanation of the adoption of Lee and Colley review package for onshore wind energy plans in Germany and Scotland. Within each of these modified review areas, several review category questions are established by the author (see table 2.1). The assessment begins with the review category questions. Each sub review category is assigned with a grade. These are combined to give a grade for each review category and then to each review area which is finally combined to get an overall grade for the environmental statement.

6.1.1 Analysis of Onshore Wind Energy Plans of Germany

The goal of developing the review package was to establish a sufficiently high, yet practically achievable standard for SEA reports to encourage a change towards better quality SEAs. The review package was applied to four SEA reports selected from different regions of Germany. Detail information of these case studies from Germany is presented in chapter five of this dissertation. The adapted Lee and Colley review package (Lee and Colley, 1992; Lee et al., 1999) consists of four broad review areas, and below such review, areas are two review categories, which are subsequently divided further into three review sub-categories. Making use of the assessment collation sheet depicted in appendix B, every review area and subsequent review categories for each case study were assessed for their level of quality, and the data generated was quantified by means of bar graphs. The following section presents the results of applying the package to all the four selected case studies of Germany with reference to its adequacy as a tool for evaluating environmental statements and the quality of the SEA reports.

6.1.1.1 Teilflächennutzungsplan Windenergie der Stadt Büren, 2015

According to the task performed in Teilflächennutzungsplan of Büren, the analysis seems to suggest that the overall quality of the document is inclined towards the assessment scale of D, which indicates that tasks in the document are a bit well attempted but as a whole is considered just unsatisfactory because of omissions or inadequacies. Based on the analysis of four review areas it is concluded that out of four review areas three were evaluated in the range of unsatisfactory and only one review area is considered as just satisfactory due to which the overall quality of the review package for this case study is projected as D. Figure 6.1 present the summary of all the review areas and the allotment of grades in each review area. The figure also shows the assessment symbols (A-F) and the meanings of the grades. More details about the assessment symbols and their explanation are presented in chapter two of this dissertation.



	Review area 1	Review area 2	Review area 3	Review area 4
A- Well performed	3	1	0	0
B- Satisfactory	1	1	1	0
C- Just satisfactory	0	1	0	1
D- Just unsatisfactory	0	1	2	1
E- Not satisfactory	1	1	1	2
F- Very unsatisfactoy	1	1	2	2

Figure 6.1 Individual performance of review areas Teilflächennutzungsplan of Büren

Table 6.1 show all the corresponding grades in each sub review categories of all the review areas of Teilflächennutzungsplan of Büren. As shown in the below table the frequency of unsatisfactory symbols/grades are higher than the satisfactory ones, which ultimately gave the final score of this case study as D, which means that parts of the tasks in the plan are well attempted but must, as a whole, be considered just unsatisfactory due to omissions and deficiencies.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	A	12	0	0	0	2	0	14	4.7	C	Just satisfactory	C	Just satisfactory	4.3	3.1	D	Just unsatisfactory
		SRC 1.1.2	A																
		SRC 1.1.3	E																
	RC - 1.2	SRC 1.2.1	B	6	5	0	0	0	1	12	4	D	Just unsatisfactory						
		SRC 1.2.2	A																
		SRC 1.2.3	F																
RA 2	RC - 2.1	SRC 2.1.1	B	0	5	4	3	0	0	12	4.0	C	Just satisfactory	D	Just unsatisfactory	3.5			
		SRC 2.1.2	C																
		SRC 2.1.3	D																
	RC - 2.2	SRC 2.2.1	A	6	0	0	0	2	1	9	3.0	D	Just unsatisfactory						
		SRC 2.2.2	F																
		SRC 2.2.3	E																
RA 3	RC - 3.1	SRC 3.1.1	D	0	5	0	3	0	1	9	3.0	D	Just unsatisfactory	E	Not satisfactory	2.5			
		SRC 3.1.2	F																
		SRC 3.1.3	B																
	RC - 3.2	SRC 3.2.1	E	0	0	0	3	2	1	5	2.0	E	Not satisfactory						
		SRC 3.2.2	F																
		SRC 3.2.3	D																
RA 4	RC - 4.1	SRC 4.1.1	F	0	0	4	0	2	1	7	2.3	E	Not satisfactory	E	Not satisfactory	2.2			
		SRC 4.1.2	E																
		SRC 4.1.3	C																
	RC - 4.2	SRC 4.2.1	E	0	0	0	3	2	1	6	2.0	E	Not satisfactory						
		SRC 4.2.2	F																
		SRC 4.2.3	D																

Table 6.1 Assessment scores in Teilflächennutzungsplan Windenergie der Stadt Büren, 2015

The below table (6.2) shows the analysis of the degree of satisfactoriness in all the four review areas and then eventually showing the overall quality of the SEA document of Teilflächennutzungsplan of Büren.

Teilflächennutzungsplan of Büren	**Assessment Scores**						**Degree of Satisfactoriness**		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of Key issues	3	1	0	0	1	1	67%	0%	33%
Review area 2- Identification and evaluation of alternatives and impact analysis	1	1	1	1	1	1	33%	33%	33%
Review Area 3 – Assessment of mitigation & adaption measures	0	1	0	2	1	2	17%	33%	50%
Review Area 4 – Stakeholder Involvement & Follow up	0	0	1	1	2	2	0%	33%	67%
Cumulative Score of all Review Areas	4	3	2	4	5	6	29%	25%	46%

Table 6.2 Degree of Satisfactoriness of Teilflächennutzungsplan of Büren

Figure 6.2 shows the visual representation of the degree of satisfactoriness of Teilflächennutzungsplan of Büren which demonstrate that based on the task performed in the document in terms of integrating climate change impacts, 29% of the document could be described as satisfactory (A-B%) since there was no omission or inadequacies in attempting the tasks listed in review package. While 25% were graded as average (C-D%), where the tasks were not satisfactory nor unsatisfactory and 46% of the tasks in the document related to integrate climate change impacts are poorly attempted (E-F%). The degree of satisfactoriness mainly shows the strengths and weaknesses of the document in terms of percentages.

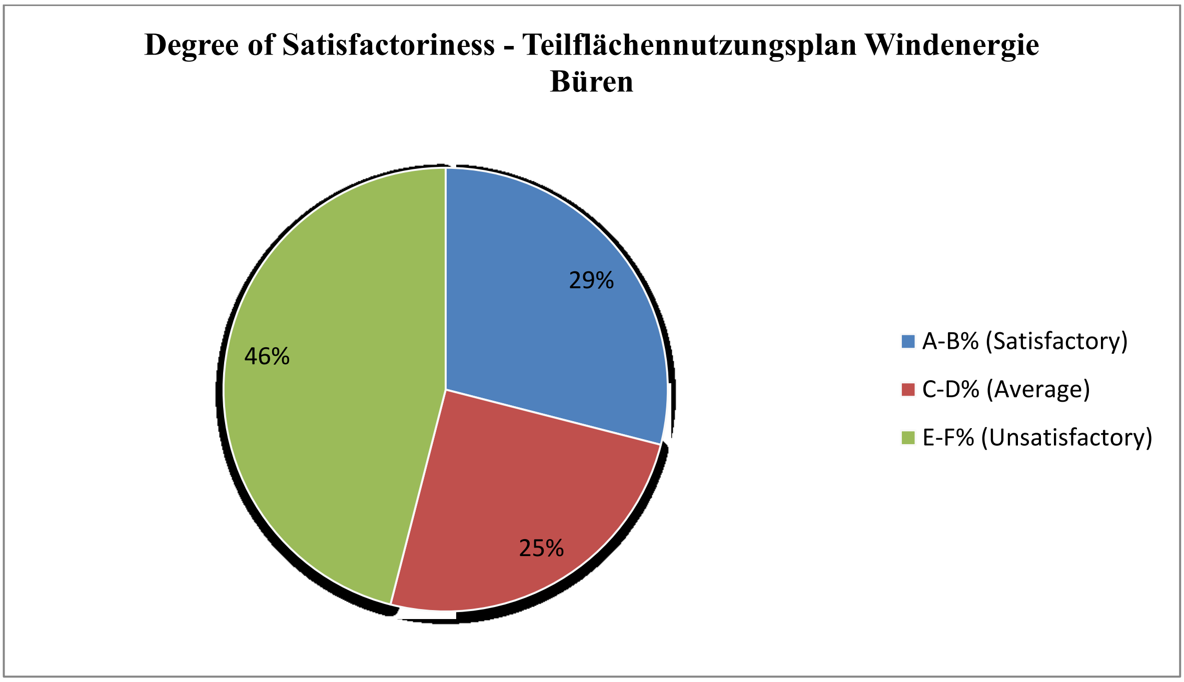
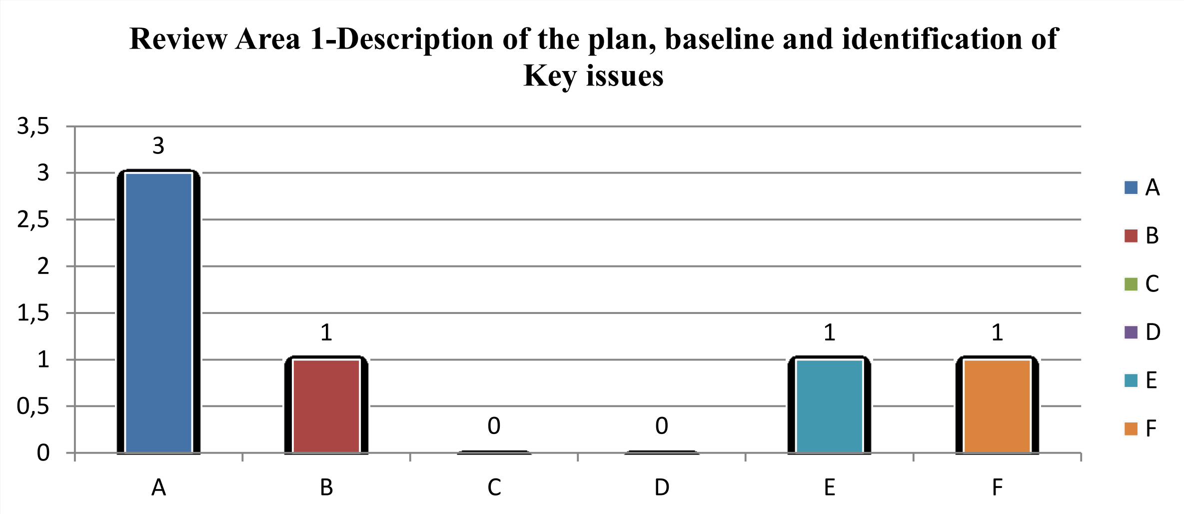


Figure 6.2 Degree of Satisfactoriness of Teilflächennutzungsplan of Büren

Despite weaknesses and inadequacies the case study also had few strengths which are discussed in the following section which gives a comprehensive analysis of all the four review areas as applied in Teilflächennutzungsplan of Büren, 2015.

6.1.1.1.1 Review Area 1 - Description of the Plan, Baseline & Identification of Key Issues

Review area 1 is based on the description of the plan, its baseline, and identification of key issues in the Teilflächennutzungsplan of Büren. The purpose of this review area is to obtain a holistic picture of the proposed wind energy development within an existing environment and baseline conditions so as to identify, analyse, and assess all possible key issues efficiently. The overall analysis of this review area in Teilflächennutzungsplan of Büren showed that the document provided a good description of the plan, its baseline conditions are well portrayed and the key issues related to climate change are displayed effectively in the Teilflächennutzungsplan. However, the document depicted few weaknesses due to which the overall assessment score of review area 1 for Teilflächennutzungsplan of Büren was calculated as grade C, which means the document in review area 1 is just satisfactory, despite omissions and/or inadequacies. Figure 6.3 illustrates the overall analysis result of review area 1 of Teilflächennutzungsplan of Büren.

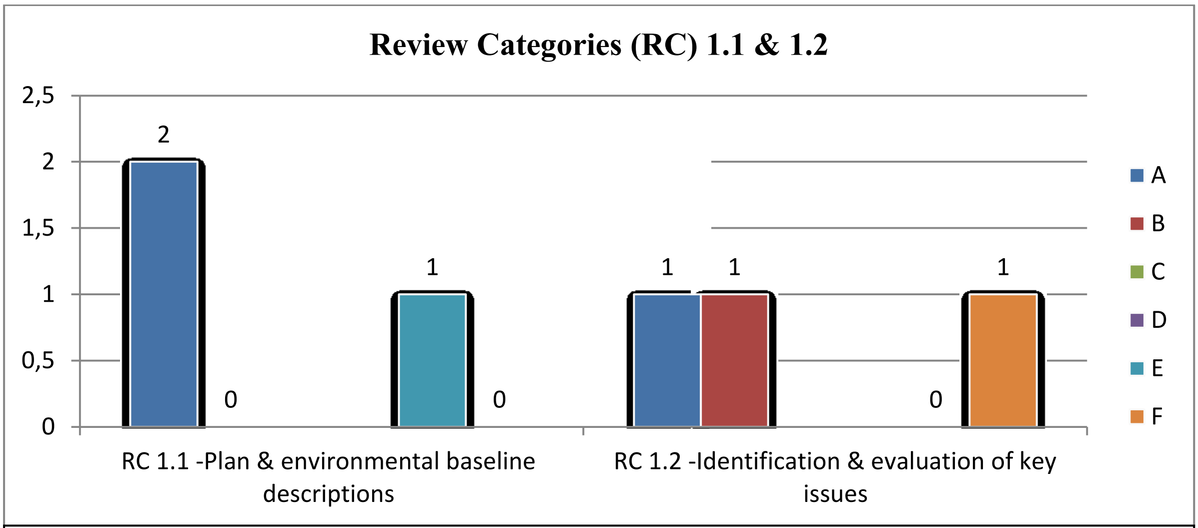


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.3 Results of review area 1 of Teilflächennutzungsplan of Büren

The review area 1 is further divided into two sub review categories, such as sub review category 1.1- Plan and environmental baseline descriptions and 1.2- Identification and evaluation of key issues. The results of the review category 1.1 and 1.2 are shown in figure 6.4, which shows that in review category 1.1- Plan and environmental baseline descriptions, the document obtained 2As and 1D, which means that the document´s contents, SEA process, and main environmental objectives of the plan were mentioned very clearly, however, the document does not include information regarding the vulnerability of the proposed plan to the impacts of the climate change due to which it received a D assessment grade in sub review category of review area 1 (see table 6.1).

Review category 1.2 – belongs to the "Identification and evaluation of key issues". The results of review category 1.2 are also displayed in figure 6.4 which shows that this review category obtained 1A, 1B, and 1F. The results of this review category show that the Teilflächennutzungsplan of Büren provides adequate information regarding the state of climate and air of Büren city by mentioning climate parameters of that area such as temperature, rainfall and wind speed of Büren.



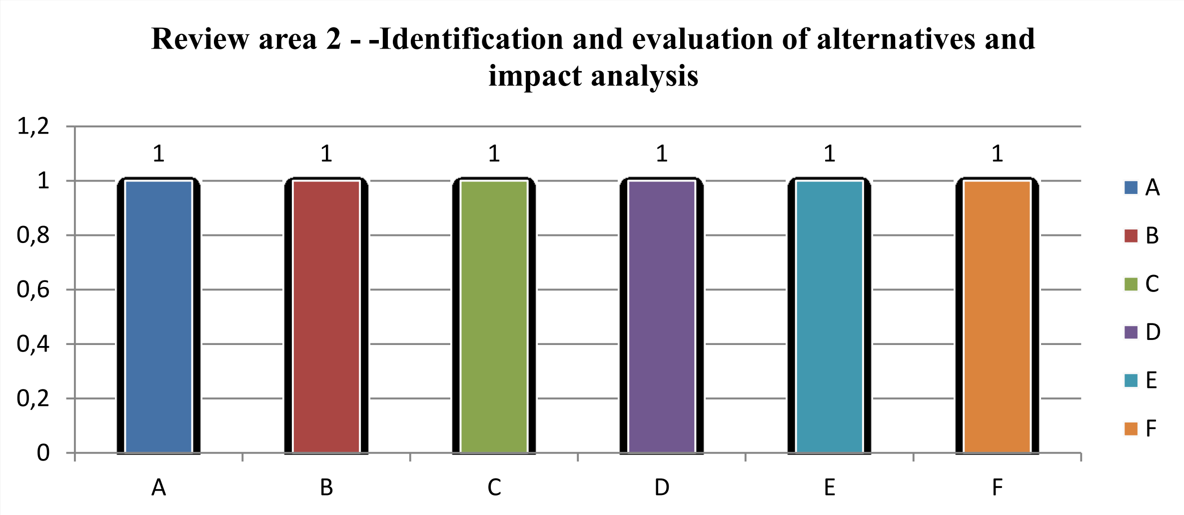
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.4 Performance of review category 1.1 and 1.2 of review area 1 of Teilflächennutzungsplan of Büren

Moreover, the document displayed that the climatic parameters of the municipality are well explained under separate headings in much detail. However, the document failed to identify direct threats of climate change to wind turbines such as effects of extreme weather events on the wind energy infrastructure, due to which it received an F grade which means that this part in this sub review category was attempted very unsatisfactorily by not attempting the important task.

6.1.1.1.2 Review Area 2 - Identification & Evaluation of Alternatives & Impact Analysis

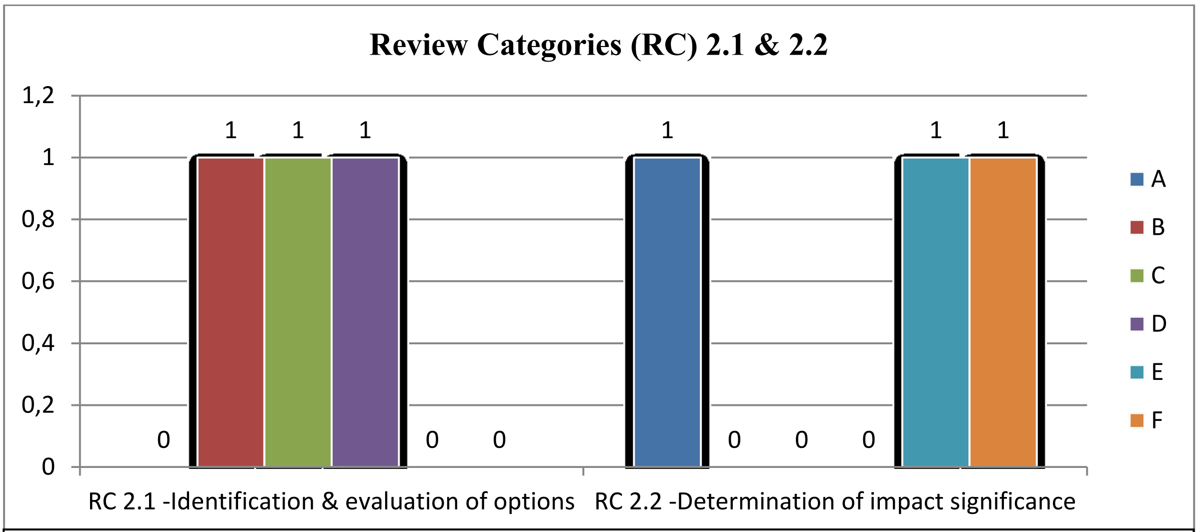
Review area 2 is based on identification and evaluation of alternatives and impact analysis in the Teilflächennutzungsplan of Büren. The inclusive analysis of this review area in Teilflächennutzungsplan of Büren revealed that the on one hand, the document performed well in certain tasks, on the other hand, it showed a considerable amount of limitations and inadequacies due to which the overall assessment score of the review area 2 (Identification and evaluation of alternatives and impact analysis) for Teilflächennutzungsplan of Büren was calculated as grade D, which means the document in review area 2 is considered unsatisfactory because of omissions and inadequacies in the tasks performed. Figure 6.5 illustrates the overall analysis result of review area 2 of Teilflächennutzungsplan of Büren.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.5 Results of review area 2 of Teilflächennutzungsplan of Büren

The review area 2 is further divided into two review categories, such as review category 2.1- Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are shown in figure 6.6, which shows that in review category 2.1- Identification and evaluation of options, the document obtained 1B, 1C and 1D, which means that the document efficiently identified a wide range of alternative options in terms of suitable zones for onshore wind energy development. While the identification of options, the climate change implications of the alternatives were assessed just averagely, giving the document a C grade in the performance of this task. The document also showed omissions and deficiencies in describing any methodology about how reasonable alternatives were identified considering objectives, sustainability, and geographical scope, thus giving the document D grade in this area, which depicts that the task is considered unsatisfactory because of omissions and inadequacies.



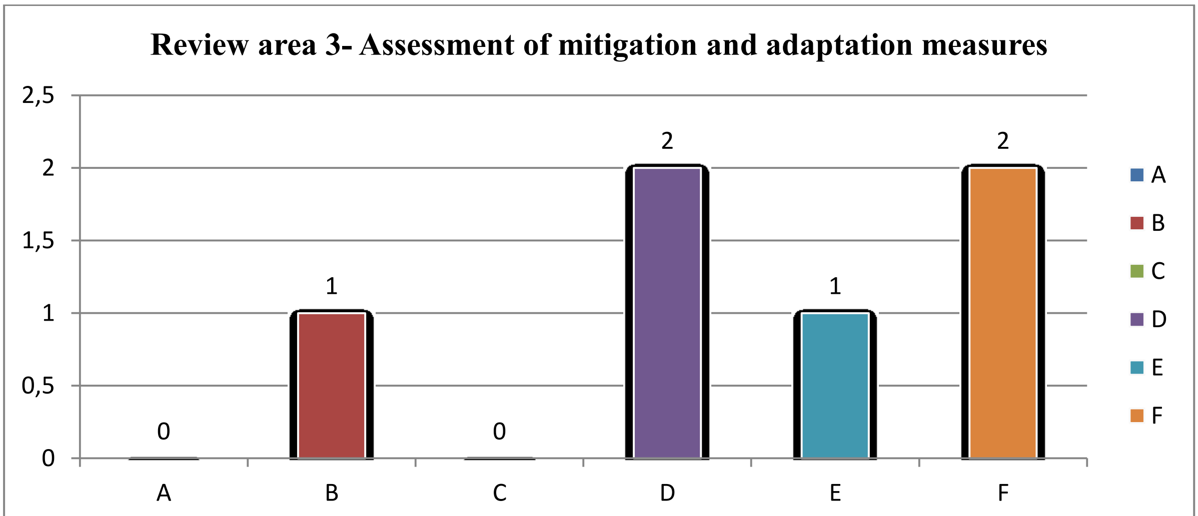
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.6 Performance of review categories of 2.1 & 2.2 of review area 2 of Teilflächennutzungsplan of Büren

Review category 2.2 – belongs to the determination of impact significance. The results of review category 2.2 are also displayed in figure 6.6 showing that this review category obtained 1A, 1F, and 1E. The results of this review category show that the Teilflächennutzungsplan of Büren provides adequate information regarding the current and historic trends in the climate of that area. However, the document failed to identify the cumulative impacts of the wind farms thus giving the document a grade E in this regard, which means that the document is not satisfactory with significant omissions and adequacies. Moreover, the document does not mention any approach and methodology in identifying or predicting impacts related to climate change issues, as a result giving the document an F grade, which means that the task in this sub review category was attempted very unsatisfactorily by not attempting the important task at all.

6.1.1.1.3 Review area 3- Assessment of Mitigation and Adaptation Measures

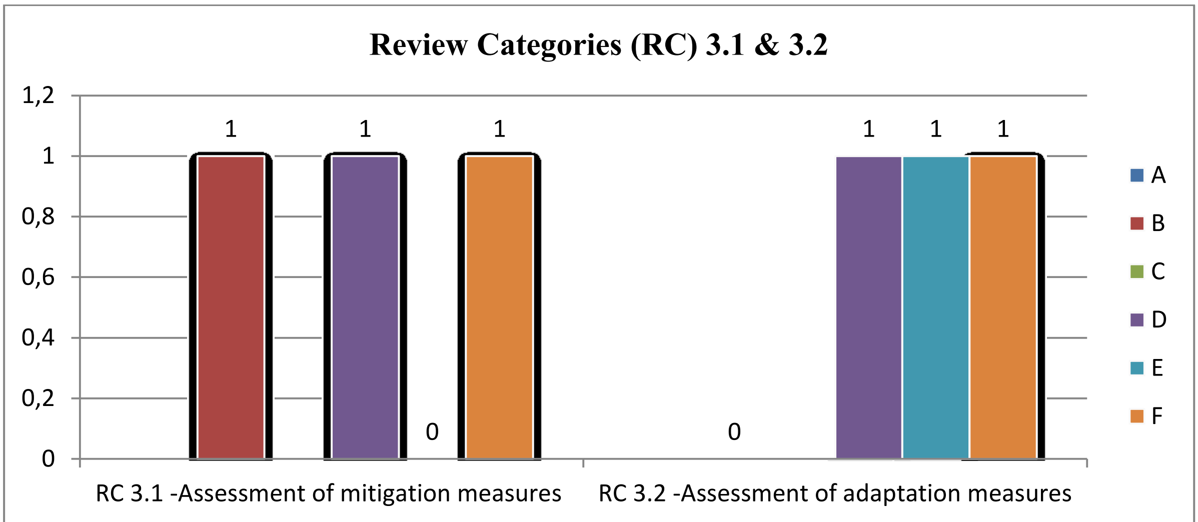
This review area is characterized by two measures, which are used to tackle impacts related to climate change issues. Review area 3 deals with the assessment of mitigation and adaptation measures of the Teilflächennutzungsplan of Büren. The overall analysis of review area 3 in Teilflächennutzungsplan of Büren showed that the document did not perform the task so well which ultimately gave a very low overall score in this review area. As shown in table 6.1 the overall grade allocated for this review area is E, which means the document in this review area is not satisfactory where the important tasks are poorly done or not attempted at all. However, only at one point, the document showed some strength regarding the assessment of mitigation measures. Figure 6.7 illustrates the overall analysis result of review area 3 of Teilflächennutzungsplan of Büren, which is the assessment of mitigation and adaptation measures.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.7 Results of review area 3 of Teilflächennutzungsplan of Büren

The review area 3 is further divided into two review categories, such as review category 3.1- Assessment of mitigation measures and review category 3.2- Assessment of adaptation measures. The results of the review category 3.1 and 3.2 are shown in figure 6.8, which shows that in review category 3.1- Assessment of mitigation measures, the document obtained 1D,1F and 1B, which means that the document includes very less information about mitigating impacts where monitoring reveals adverse effects. Moreover, the document does not include any evidence of mitigating climatic impacts on the environment as well as the wind energy infrastructure. Nevertheless, the document mentions an effective approach to mitigate negative impacts other than climatic impacts by mitigation hierarchy where impacts are first avoided, then minimized, and finally compensated.



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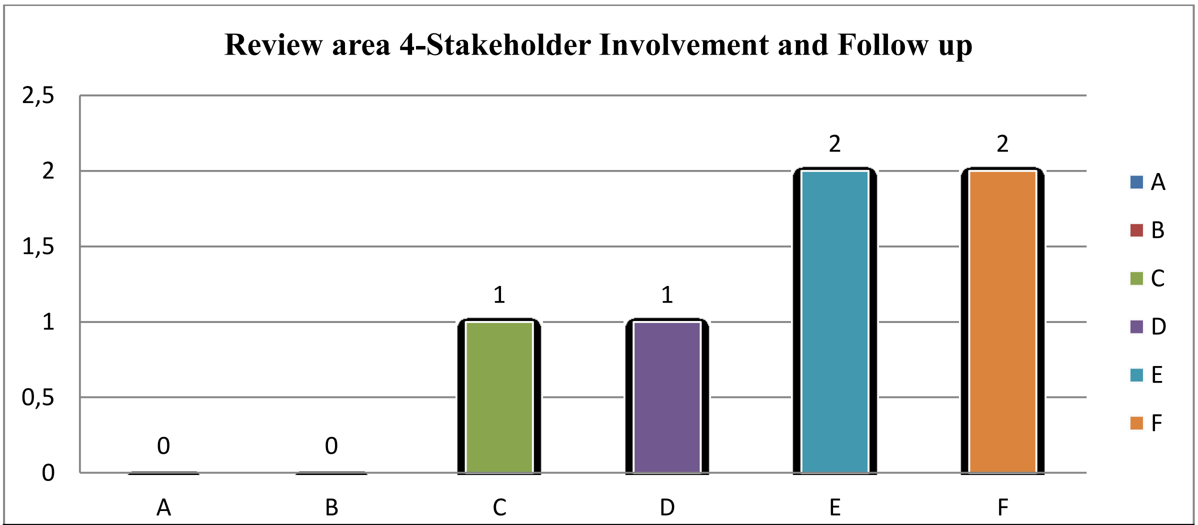
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.8 Performance of review categories 3.1 & 3.2 of review area 3 of Teilflächennutzungsplan of Büren

Review category 3.2 – belongs to the Assessment of adaptation measures. The results of review category 3.2 are also displayed in figure 6.8 showing that this review category obtained 1D, 1F, and 1E. The results of the review category 3.2 show that the Teilflächennutzungsplan of Büren has a lot of omissions and deficiencies since the grades obtained in this review area are all unsatisfactory. The analysis revealed that the tasks related to the assessment of adaptation measures were poorly performed. No adaptation solutions are mentioned in the document and there is no proof of integrating the adaptation measures with the mitigation measures for climate change effects. In addition to that, the document does not include any information about identifying preferred adaptation options in the context of climate change, hence giving the document a grade E which means that the document is not satisfactory with significant omissions and adequacies.

6.1.1.1.4 Review Area 4 – Stakeholder Involvement and Follow up

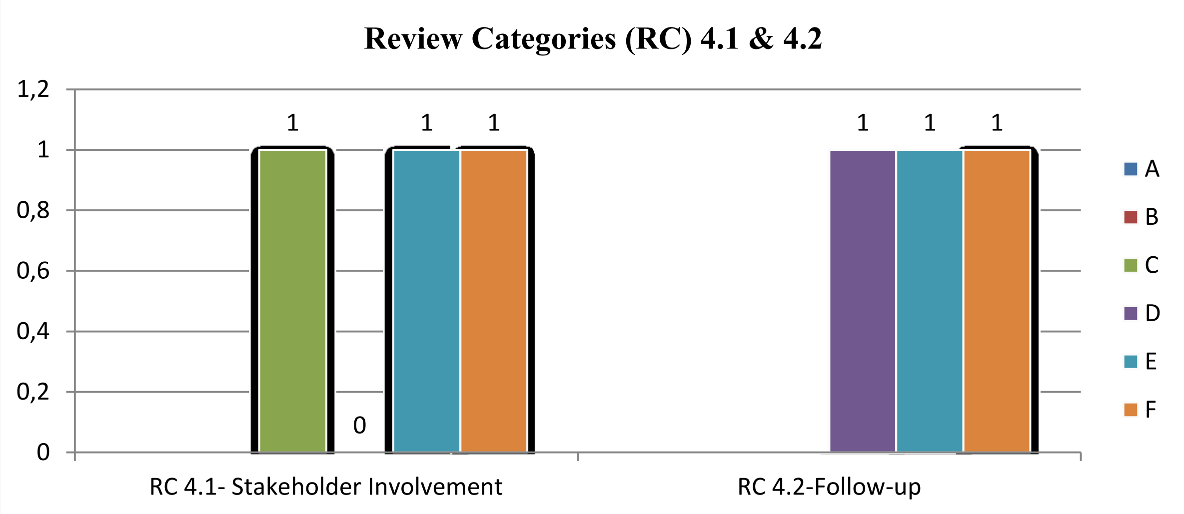
Review area 4 deals with the issues related to Stakeholder Involvement and Follow up in the Teilflächennutzungsplan of Büren. The overall analysis of this review area in Teilflächennutzungsplan of Büren showed that the document provided very unsatisfactory results in this review area with having E as an overall assessment score, which is a very low score in this quality review package. As shown in table 6.1 as well, the overall grade allocated for this review area is E, which means the document in this review area is not satisfactory due to significant omissions or inadequacies. Figure 6.9 illustrates the overall analysis result of review area 4 of Teilflächennutzungsplan of Büren. The following figure demonstrates that the document in this review area obtained 1C, 1D, 2E, and 2F scores at category and subcategory level. In Teilflächennutzungsplan of Büren, review area 4 is observed as the highest frequency of unsatisfactory scores.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.9 Results of review area 4 of Teilflächennutzungsplan of Büren

The review area 4 is further divided into two review categories, such as review category 4.1- Stakeholder Involvement and, review category 4.2- Follow-up. The results of the review category 4.1 and 4.2 are shown in figure 6.10, which shows that in review category 4.1- Stakeholder Involvement, the document obtained 1F, 1E and 1C, which means that the document depicted an unsatisfactory result in tasks related to stakeholder involvement. The document failed to identify applicable stakeholders apart from the general public such as climate change experts, who can provide information and expert advice on policies and issues related to climate change. Secondly, the consultation related matters where poorly dealt in the document such as no time frame is mentioned in the document about public consultation. Lastly, in review category 4.1 the document gave subtle information about taking the comments of public participation in to consideration, where the document received a C score which means this sub review category is just satisfactory despite omissions and/or inadequacies (see table 6.1).



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

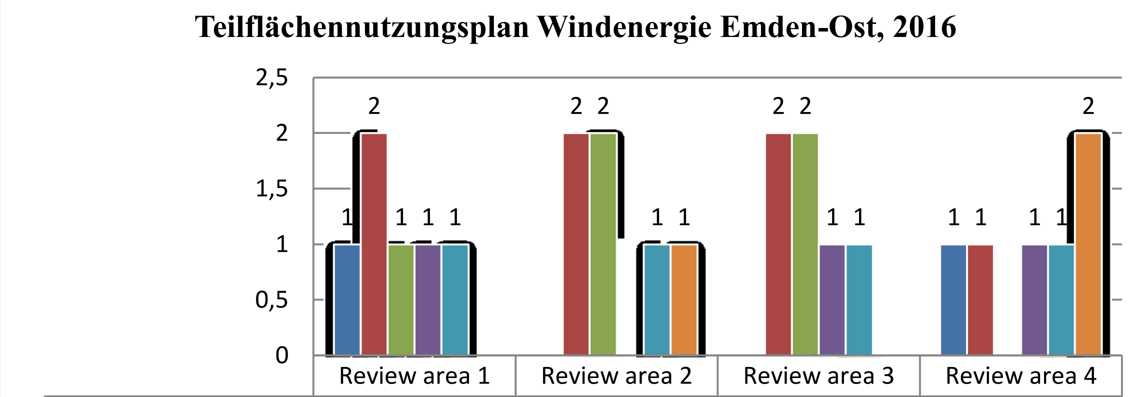
Figure 6.10 Performance of review categories 4.1 & 4.2 of review area 4 of Teilflächennutzungsplan of Büren

Review category 4.2 – belongs to Follow-up. The results of review category 4.2 are also displayed in figure 6.10 showing that this review category obtained 1E, 1F, and 1D. The results of this review category show that the Teilflächennutzungsplan of Büren performed the tasks related to follow up (such as monitoring and evaluation) very unsatisfactorily. The document does not provide any information regarding the indicators used for monitoring climate change issues nor the document includes any provision for monitoring climate-related measures. Moreover, there is no methodology explained in the document about how monitoring is done, thus obtaining a very low score in all the sub review categories of review category 4.2 (Follow-up).

6.1.1.2 Teilflächennutzungsplan Windenergie Emden-Ost, 2016

A summary of all the four review areas of Teilflächennutzungsplan of Emden-Ost is presented in figure 6.11 which shows the document performed just satisfactorily in review area 1 only, which is the description of the plan, its baseline and identification of key issues and the rest of the review areas are found to be below average and are deemed just unsatisfactory. Based on the task performed, the cumulative assessment value of

Teilflächennutzungsplan of Emden-Ost is evaluated as D (see table 6.3), which indicates that in terms of integration of climate change issues into the Teilflächennutzungsplan, the document is considered as just unsatisfactory due to omissions or inadequacies.



	Review area 1	Review area 2	Review area 3	Review area 4
A- Well performed	1	0	0	1
B- Satisfactory	2	2	2	1
C- Just satisfactory	1	2	2	0
D- Just unsatisfactory	1	0	1	1
E- Not satisfactory	1	1	1	1
F- Very unsatisfactoy	0	1	0	2

Figure 6.11 Individual Performance of review areas of Teilflächennutzungsplan of Emden-Ost

The analysis of the degree of satisfactoriness and the overall quality of the SEA document of Teilflächennutzungsplan of Emden-Ost is illustrated in figure 6.12 which indicates that based on the tasks performed in this case study in terms of climate change integration in onshore wind energy planning, 38% of the document could be described as satisfactory (A-B%), while 33% were graded as average (C-D%) and 29% of the tasks in the document are poorly attempted (E-F%). The degree of satisfactoriness mainly shows the strengths and weaknesses of the document in terms of percentages. Table 6.3 shows the corresponding grades of the Teilflächennutzungsplan of Emden-Ost in all review areas.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	A	6	5	0	3	0	0	14	4.7	C	Just satisfactory	C	Just satisfactory	4.2	3.1	D	Just unsatisfactory
		SRC 1.1.2	B																
		SRC 1.1.3	D																
	RC - 1.2	SRC 1.2.1	C	0	5	4	0	2	0	11	3.7	D	Just unsatisfactory						
		SRC 1.2.2	B																
		SRC 1.2.3	E																
RA 2	RC - 2.1	SRC 2.1.1	C	0	5	8	0	0	0	13	4.3	C	Just satisfactory	D	Just unsatisfactory	3.5			
		SRC 2.1.2	B																
		SRC 2.1.3	C																
	RC - 2.2	SRC 2.2.1	B	0	5	0	0	2	1	8	2.7	E	Not satisfactory						
		SRC 2.2.2	E																
		SRC 2.2.3	F																
RA 3	RC - 3.1	SRC 3.1.1	C	0	10	4	0	0	0	14	4.7	C	Just satisfactory	E	Not satisfactory	2.5			
		SRC 3.1.2	B																
		SRC 3.1.3	B																
	RC - 3.2	SRC 3.2.1	D	0	0	4	3	2	0	9	3.0	D	Just unsatisfactory						
		SRC 3.2.2	E																
		SRC 3.2.3	C																
RA 4	RC - 4.1	SRC 4.1.1	D	6	5	0	3	0	0	14	4.7	C	Just satisfactory	E	Not satisfactory	2.2			
		SRC 4.1.2	A																
		SRC 4.1.3	B																
	RC - 4.2	SRC 4.2.1	F	0	0	0	0	2	2	4	1.3	F	Very unsatisfactory						
		SRC 4.2.2	F																
		SRC 4.2.3	E																

Table 6.3 Assessment scores in Teilflächennutzungsplan Windenergie Emden-Ost, 2016

Figure 6.12 illustrates the visual representation of the degree of satisfactoriness of Teilflächennutzungsplan of Emden-Ost showing the main strengths and weaknesses of the document in terms of considering climate change impacts into the document.

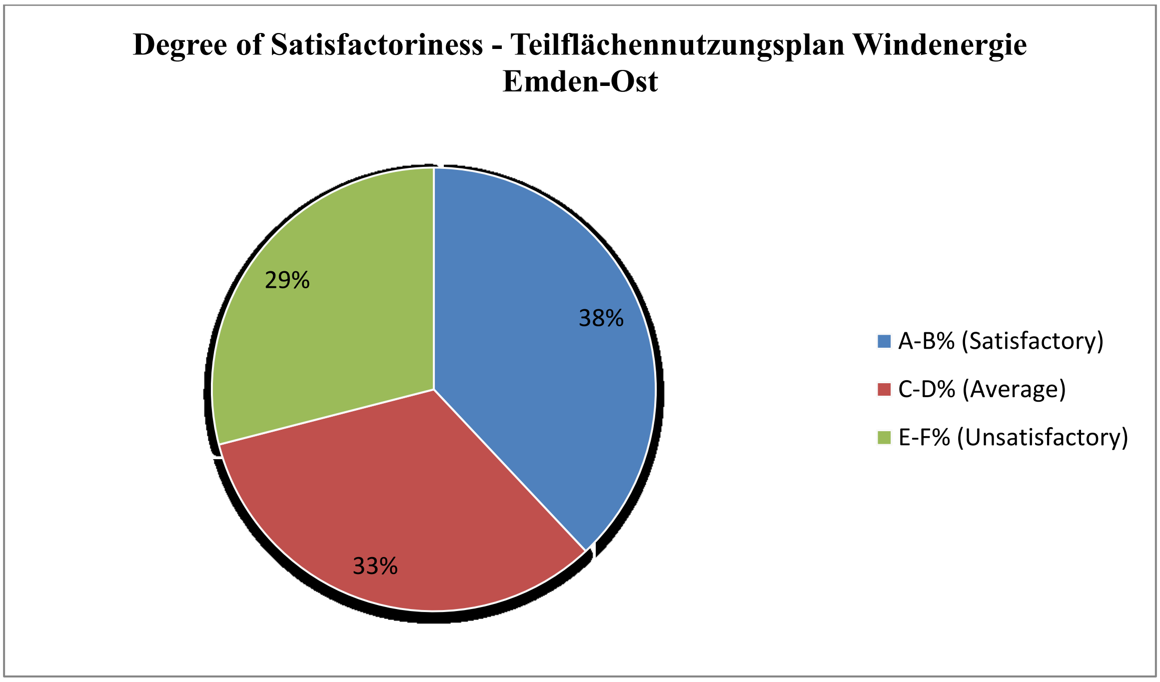


Figure 6.12 Degree of satisfactoriness of Teilflächennutzungsplan of Emden-Ost

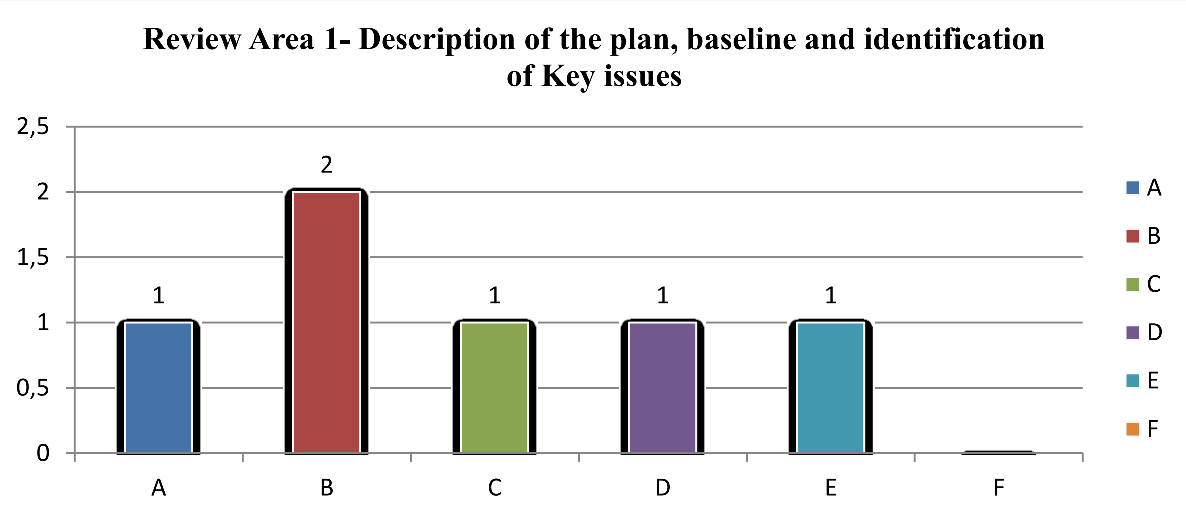
The following section describes a detailed analysis of the performance of tasks in each review area including its strength and weaknesses in each review category and sub review categories. Furthermore, a detailed overview of the degree of satisfactoriness of Teilflächennutzungsplan of Emden-Ost is presented in table 6.4.

Teilflächennutzungsplan of Emden Ost	Assessment Scores						Degree of Satisfactoriness		
Review area topics	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	A-B%	C-D%	E-F%
Review area 1- Description of the plan, baseline & identification of Key issues	1	2	1	1	1	0	50%	33%	17%
Review area 2- Identification and evaluation of alternatives and impact analysis	0	2	2	0	1	1	33%	33%	33%
Review Area 3 – Assessment of mitigation & adaption measures	0	2	2	1	1	0	33%	50%	17%
Review Area 4 – Stakeholder Involvement & Follow up	1	1	0	1	1	2	33%	17%	50%
Cumulative Score of all Review Areas	2	7	5	3	4	3	38%	33%	29%

Table 6.4 Degree of satisfactoriness of Teilflächennutzungsplan of Emden-Ost

6.1.1.2.1 Review area 1 - Description of the Plan, Baseline & Identification of Key issues

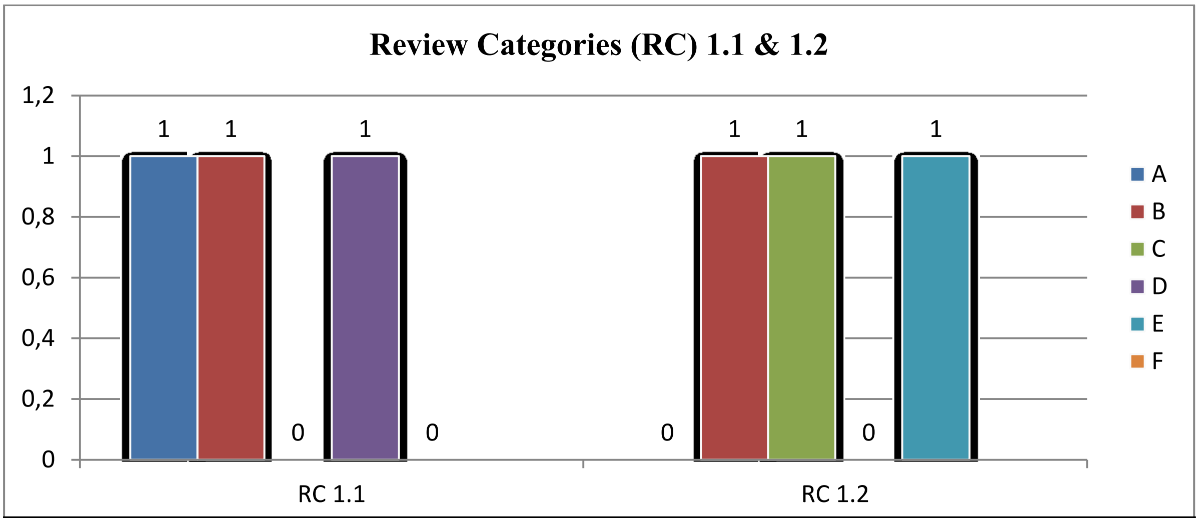
Review area 1 is subject to description of the plan, its baseline and identification of key issues in the Teilflächennutzungsplan of Emden-Ost. The overall analysis of this review area in Teilflächennutzungsplan of Emden-Ost showed that the document performed quite well on describing the plan and its environmental baseline conditions. Moreover, the key issues related to climate change are displayed effectively in the Teilflächennutzungsplan. However, the document illustrated some limitations due to which the overall assessment score of review area 1 for Teilflächennutzungsplan of Emden-Ost is calculated as grade C (see table 6.3), which means the document in review area 1 is just satisfactory, despite omissions and/or inadequacies. Figure 6.13 shows the overall analysis result of review area 1 of Teilflächennutzungsplan of Emden-Ost.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.13 Results of review area 1 of Teilflächennutzungsplan of Emden-Ost

The review area 1 is further divided into two review categories, such as review category 1.1- Plan and environmental baseline descriptions and review category 1.2- Identification and evaluation of key issues. The results of the review category 1.1 and 1.2 are shown in figure 6.14, which shows that in review category 1.1- Plan and environmental baseline descriptions, the document obtained 1A, 1B and 1D, which means that the document´s contents, its SEA process and main objectives are sketched efficiently in the Teilflächennutzungsplan of Emden-Ost. However, the document failed to describe how the proposed project is vulnerable to the impacts of climate change due to which it received a D score at the sub review category level of review category 1.1- Plan and environmental baseline descriptions.



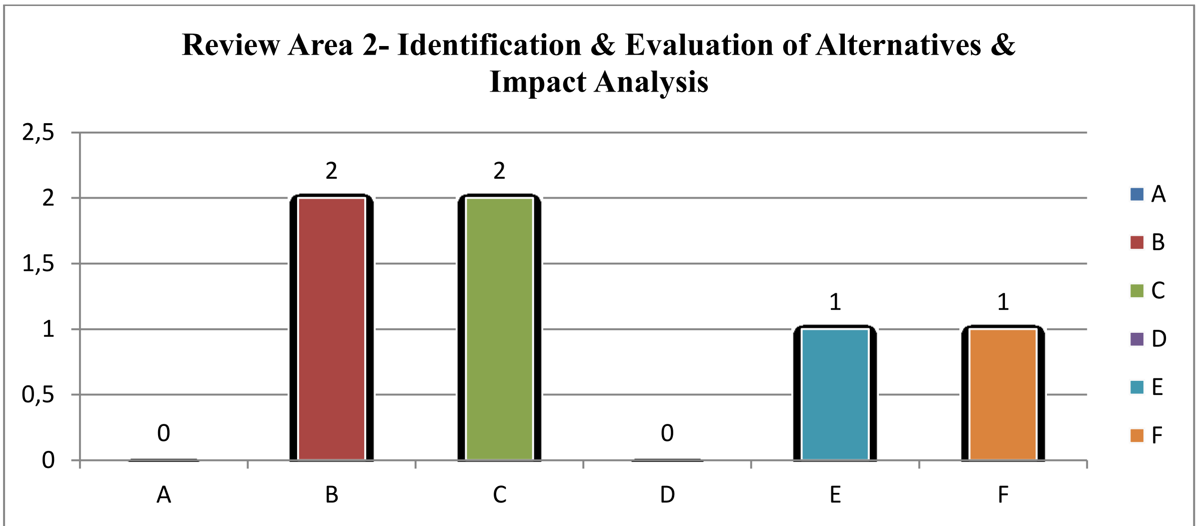
A- Relevant tasks well performed, no important tasks left incomplete.
B- Generally satisfactory and complete, only minor omissions and inadequacies.
C- Can be considered just satisfactory despite omissions and/or inadequacies
D- Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E- Not satisfactory, significant omissions or inadequacies.
F- Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.14 Performance of review categories 1.1 & 1.2 of review area 1 of Teilflächennutzungsplan of Emden-Ost

Review category 1.2 – belongs to the Identification and evaluation of key issues. The results of review category 1.2 are also presented in figure 6.14 showing that this review category obtained 1C, 1B, and 1E (see table 6.3). The results of review category 1.2 show that the tasks in this review category are just satisfactorily attempted in terms of climate change inclusion. The climatic parameters are well mentioned in the document for example the Teilflächennutzungsplan of Emden-Ost includes information about the wind speed, temperature, precipitation, snowfall, and humidity of Emden-Ost. In addition to that, the Teilflächennutzungsplan assesses these climatic parameters in detail for every alternative option considered for this plan. The analysis also revealed that the tasks related to identifying the direct threat of climate change issues to the wind turbines are poorly performed. No such risks to the wind turbines are identified in the plan such as the effects of extreme weather events on wind energy infrastructure. However, climate change effects of the area are discussed after the implementation of the plan. Thus, giving the document a grade E in this review topic which means that the document is not satisfactory and has significant omissions and inadequacies.

6.1.1.2.2 Review Area 2 – Identification & Evaluation of Alternatives & Impact Analysis

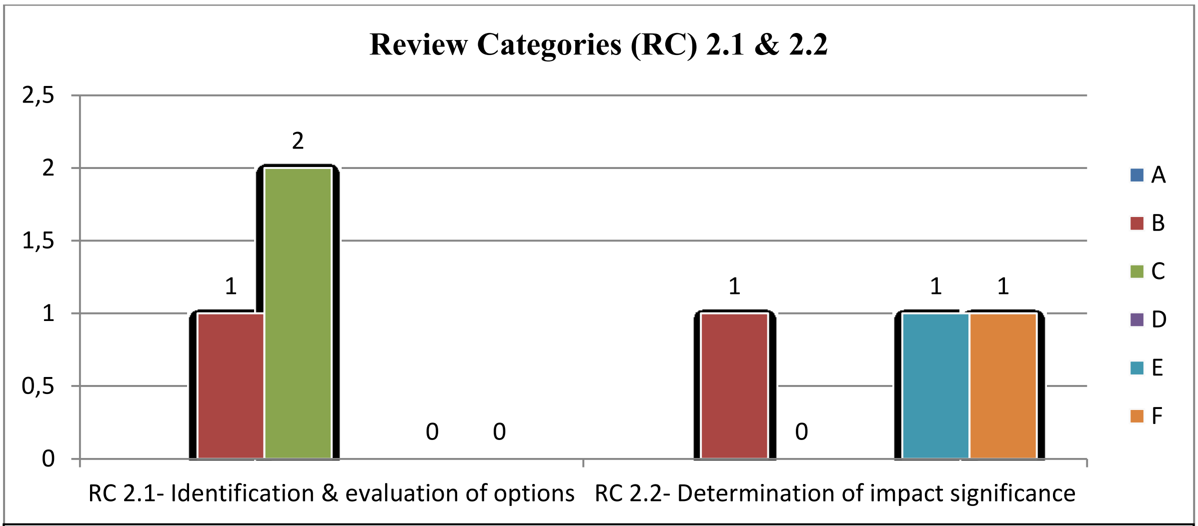
This review area addresses the issues related to the identification and evaluation of alternatives and analysis of impacts of the Teilflächennutzungsplan of Emden-Ost. The overall analysis of this review area in Teilflächennutzungsplan of Emden-Ost revealed that the document had few omissions and did not perform the task so well in this review area which ultimately gave a very low overall score in this review area. As shown in table 6.3 the overall grade allocated for this review area is D, which means the document in this review area is not satisfactory due to inadequacies and omissions while performing the task. Figure 6.15 illustrates the overall analysis result of review area 2 of Teilflächennutzungsplan of Emden Ost, which is the assessment of mitigation and adaptation measures.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.15 Results of review area 2 of Teilflächennutzungsplan of Emden-Ost

The review area 2 is further divided into two review categories, such as review category 2.1- Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are shown in figure 6.16, which shows that in review category 2.1- Identification and evaluation of options, the document obtained 2C and 1B, which means that the document provides a wide range of alternatives in terms of suitable sites for wind energy development and for every alternative climate change issues are assessed satisfactorily. The documents also describe that all the alternatives are selected with respect to urban planning objectives and suitable sites for wind energy development in that area. Considering the grades in this review category and sub review category, the tasks are just satisfactorily attempted. Thus, assigning this review category with an assessment score of C, which means parts can be considered just satisfactory despite omission and/or inadequacies.



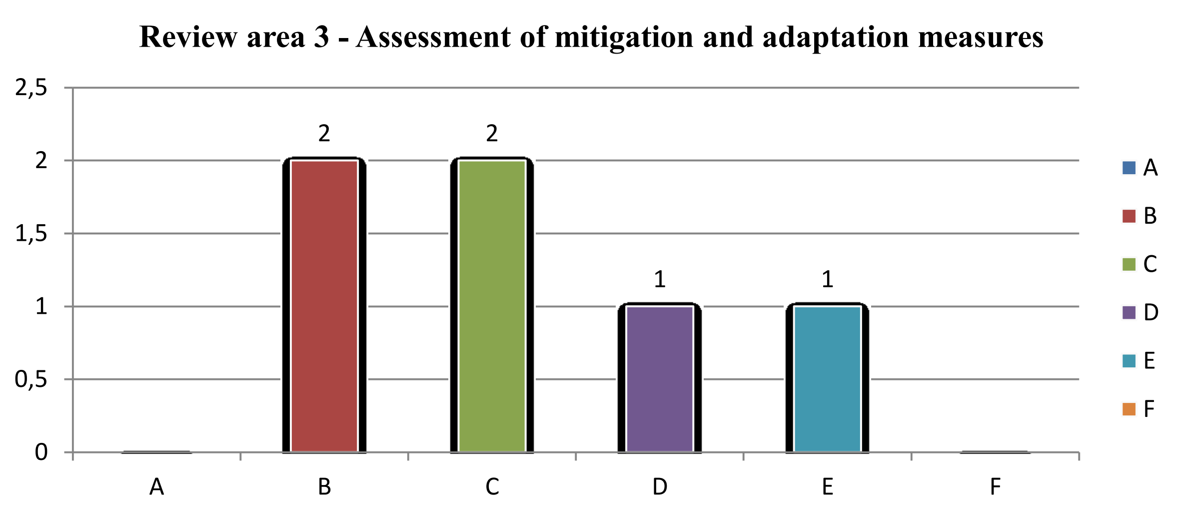
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.16 Performance of review categories 2.1 & 2.2 of review area 2 of Teilflächennutzungsplan of Emden-Ost

Review category 2.2 – belongs to the Determination of impact significance. The results of review category 2.2 are also presented in figure 6.16 showing that this review category obtained 1B, 1E and 1F (see table 6.3), giving the overall review category a very unsatisfactory assessment symbol such as E. The analysis of this review category show that in terms of determination of impact significance of climate change issues the document mentions about current and historic trends in climate by providing enough details about wind speed, wind direction, air quality, temperature, humidity and precipitation of Emden Ost. Thus giving this sub review category a B assessment symbol, which means that the task is generally considered as satisfactory. However, the document failed to identify the cumulative impacts of wind farms in that area. In addition, the document showed omissions and inadequacies on mentioning any approach or methodology in identifying and predicting any climate change impacts of Emden- Ost. These two tasks are poorly attempted therefore giving an E and F assessment symbol in these sub review categories (see table 6.3).

6.1.1.2.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

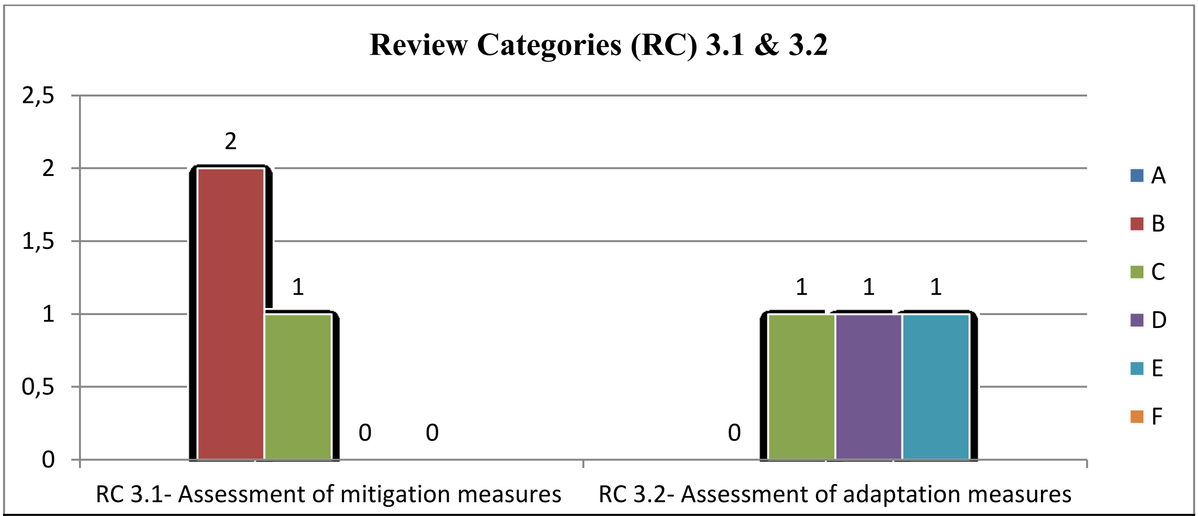
Review area 3 addresses the issues related to the assessment of mitigation and adaptation measures of the Teilflächennutzungsplan of Emden Ost. The overall analysis of this review area in Teilflächennutzungsplan of Emden Ost revealed that the document did not perform the task so well in review area 3 which ultimately gave a very low overall assessment score. As shown in table 6.3 the overall grade allocated for this review area is E, which means the document in this review area is not satisfactory and tasks are attempted with omissions and inadequacies. However, better performance is observed in the Teilflächennutzungsplan regarding the assessment of mitigation measures. Figure 6.17 illustrates the overall analysis result of review area 3 of Teilflächennutzungsplan of Emden Ost, which is the assessment of mitigation and adaptation measures.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.17 Results of review area 3 of Teilflächennutzungsplan of Emden-Ost

The review area 3 is further divided into two review categories, such as review category 3.1- Assessment of mitigation measures and 3.2- Assessment of adaptation measures. Figure 6.18 illustrates the performance of review category 3.1 (Assessment of mitigation measures) and 3.2 (Assessment of adaptation measures), which indicates that in review category 3.1- Assessment of mitigation measures, the document obtained 1C, and 2B, which means that in the Teilflächennutzungsplan the mitigation of impact are highlighted very clearly. In addition to that, mitigation of impacts related to climatic factors on the environment as well as on the wind farms are taken into account. For instance, the Teilflächennutzungsplan mentions the automatic shutdown of the wind turbines in case of extreme weather such as a storm. The document mentions an effective methodology to mitigate the negative impacts by using mitigation hierarchy, it includes a section where the document highlights planned measures to be prevented, reduced, and offset the adverse effects.



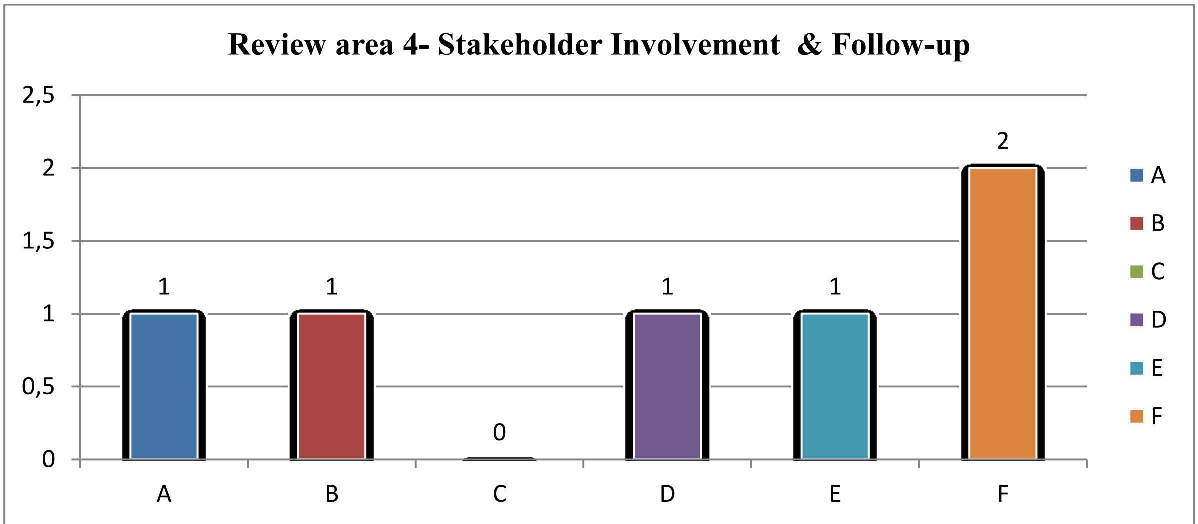
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.18 Performance of review categories 3.1 & 3.2 of review area 3 Teilflächennutzungsplan of Emden-Ost

Review category 3.2 – belongs to the Assessment of adaptation measures. The results of review category 3.2 are summarised in figure 6.18 showing that this review category obtained 1D, 1E, and 1C (see table 6.3), giving the overall review category an unsatisfactory assessment symbol such as D. The analysis of this review category show that in terms of assessing the adaptation measures the document did not provide any reasonable adaptation solutions which are technically feasible to address projected climate vulnerabilities. Moreover, in order to protect the infrastructure used for producing wind energy in Emden Ost, the Teilflächennutzungsplan does not mention any information about technical or non-technical adaptation mechanisms, thus obtaining a D assessment score in this sub review category of review category 3.2. The Teilflächennutzungsplan does not provide any evidence of integration of adaptation measures with the mitigation measure, which is an important factor to take into consideration in order to provide co-benefits between mitigation and adaptation measures to tackle climate change issues more efficiently, therefore the assessment score for this sub review category is E. However, only at one point the document mentions about identifying adaptation options in the context of climate change by referring towards engineering adaptation measures such as providing information on turbine´s height and wind speed of Emden Ost, hence obtaining an assessment score of C which is considered as just satisfactory despite omissions and/or inadequacies.

6.1.1.2.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 aims at issues related to Stakeholder Involvement and Follow-up in the Teilflächennutzungsplan of the city of Emden Ost. The overall analysis of this review area in Teilflächennutzungsplan of Emden Ost is addressed to an unsatisfactory degree with having E as an overall assessment score rating, which means the tasks in Review area 4 are not well attempted and therefore as considered unsatisfactory due to omissions and inadequacies. The overall score allocated for this review area is also presented in table 6.3. The overall analysis result of review area 4 of Teilflächennutzungsplan of Emden Ost is illustrated in Figure 6.19. The following figure demonstrates that the document in this review area obtained 1A, 1B, 1D, 1E, and 2F scores at category and sub category level.

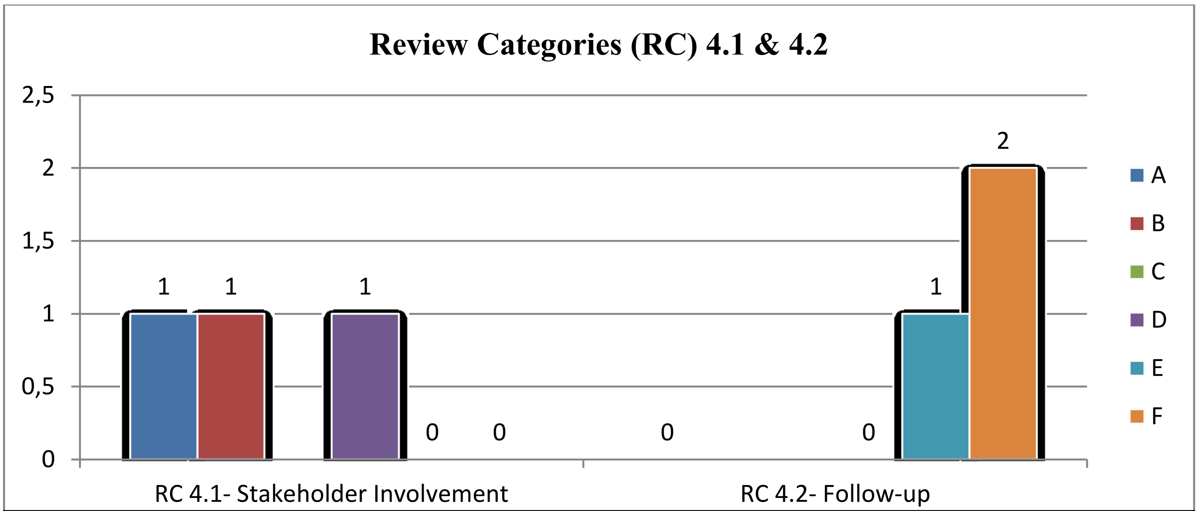


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.19 Results of review area 4 of Teilflächennutzungsplan of Emden-Ost

The review area 4 addresses two review categories, such as review category 4.1- Stakeholder involvement 4.2- Follow-up. Figure 6.20 illustrates the performance of review category 4.1

(Stakeholder involvement) and 4.2 (Follow up), which indicates that in review category 4.1- Stakeholder involvement, the document obtained 1D, 1A and 1B, which means that issues related to stakeholder involvement in the Teilflächennutzungsplan are approached in a satisfactorily manner, thus having an overall assessment of C for review category 4.1- Stakeholder involvement. The analysis of Teilflächennutzungsplan of Emden Ost for review category 4.1- Stakeholder involvement shows that there is no evidence in the document whether there is any involvement of climate change experts apart from general public. However, the document does mention to consult pollution control experts and environmental specialist but climate change experts were never a consideration for consultation. Tackling complex issues of climate change can only be effective if it is understood by specialists along with non-technical components, represented by decision-makers and members of the public. For not considering the climate change experts the document obtained a D assessment score at this sub review category level. Furthermore, in review category 4.1- Stakeholder involvement, the document provided enough information about defining the time frame of the consultation thus acquiring an A grade at sub review category level for this review category. In addition to that, the document also provides sufficient information about the decision taken by the management after the public consultation which resulted into two public consultations, thus obtaining an assessment score of B in the sub review category of review category 4.1- Stakeholder involvement.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.20 Performance of review categories 4.1 & 4.2 of review area 4 of Teilflächennutzungsplan of Emden-Ost

Review category 4.2 – belongs to issues related to follow up such as monitoring and evaluation. The results of review category 4.2 are also presented in figure 6.20 showing that this review category obtained 2F and 1E (see table 6.3), giving the overall review category a poor assessment symbol such as F, which is the lowermost assessment score in the quality review package. The analysis of this review category shows that the Teilflächennutzungsplan of Emden Ost provides no information in terms of the identification of appropriate indicators for monitoring climate change impacts. Moreover, it doesn't include any provisions for monitoring climate related measures, and no methodology for monitoring is mentioned in order to take appropriate remedial actions for addressing climate change issues thus acquiring an F assessment score for this review category. Review category 4.2- Monitoring and evaluation is observed with the poorest performance in terms of dealing with the issues of climate change impacts.

6.1.1.3 Sachlicher Teilregionalplan Windenergienutzung Lausitz-Spreewald, 2016

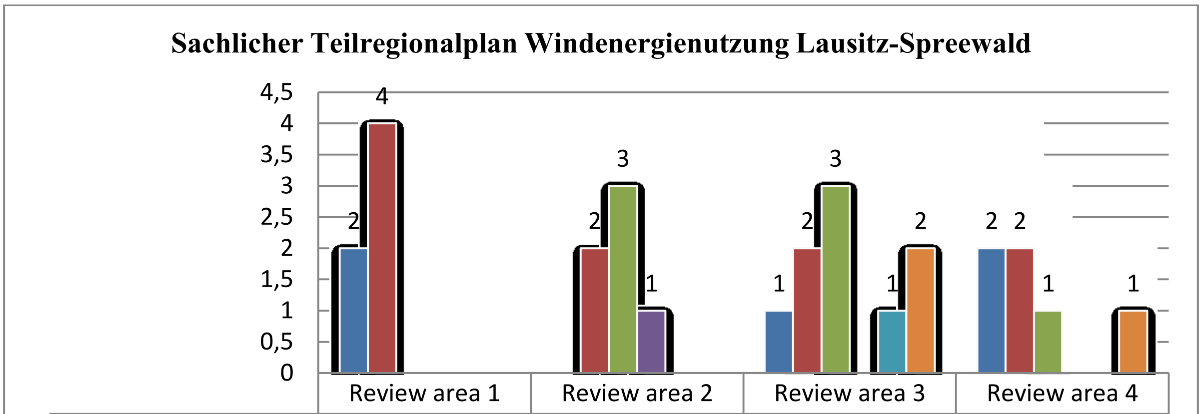
The quality of the Teilregionalplan of the Lausitz-Spreewald is relatively better and satisfactory. On the bases of tasks performed in the quality review package, the overall assessment score of this case study is evaluated as C, which indicates that the quality of Teilregionalplan of Lausitz-Spreewald is considered as just satisfactory despite omissions and/or inadequacies. The analysis of all the four review areas showed that the document performed really well at least in three review areas and only one review area reflected an unsatisfactory assessment score.

Figure 6.21 shows the performance of Sachlicher Teilregionalplan Windenergienutzung Lausitz-Spreewald in all the review areas, which demonstrate that review area 1 (Description of the plan, baseline, and identification of key issues) is the best performed in all the review areas and review area 3 (Assessment of mitigation and adaptation) is the worst performed review area in this case study, The rest of the two review areas are satisfactory and average. Table 6.5 also draws attention towards the performance of the document in integrating climate change in the document by describing allotment of grades in each sub review category, review category, and review area.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	A	6	10	0	0	0	0	16	5.3	B	Satisfactory	B	Satisfactory	5.3	4.3	C	Just satisfactory
		SRC 1.1.2	B																
		SRC 1.1.3	B																
	RC - 1.2	SRC 1.2.1	B	6	10	0	0	0	0	16	5.3	B	Satisfactory						
		SRC 1.2.2	A																
		SRC 1.2.3	B																
RA 2	RC - 2.1	SRC 2.1.1	B	0	5	4	3	0	0	12	4.0	C	Just satisfactory	C	Just satisfactory	4.2			
		SRC 2.1.2	D																
		SRC 2.1.3	C																
	RC - 2.2	SRC 2.2.1	B	0	5	8	0	0	0	13	4.3	C	Just satisfactory						
		SRC 2.2.2	C																
		SRC 2.2.3	C																
RA 3	RC - 3.1	SRC 3.1.1	A	6	10	0	0	0	0	16	5.3	B	satisfactory	D	Just unsatisfactory	3.3			
		SRC 3.1.2	B																
		SRC 3.1.3	B																
	RC - 3.2	SRC 3.2.1	F	0	0	0	0	2	2	4	1.3	F	Very unsatisfactory						
		SRC 3.2.2	F																
		SRC 3.2.3	E																
RA 4	RC - 4.1	SRC 4.1.1	F	6	5	0	0	0	1	12	4.0	C	Just satisfactory	C	Just satisfactory	4.5			
		SRC 4.1.2	A																
		SRC 4.1.3	B																
	RC - 4.2	SRC 4.2.1	C	6	5	4	0	0	0	15	5.0	B	satisfactory						
		SRC 4.2.2	B																
		SRC 4.2.3	A																

Table 6.5 Assessment scores in Sachlicher Teilregionalplan Windenergienutzung Lausitz-Spreewald, 2016



	Review area 1	Review area 2	Review area 3	Review area 4
A- Well performed	2	0	1	2
B- Satisfactory	4	2	2	2
C- Just satisfactory	0	3	3	1
D- Just unsatisfactory	0	1	0	0
E- Not satisfactory	0	0	1	0
F- Very unsatisfactoy	0	0	2	1

Figure 6.21 Individual performance of review areas of Teilregionalplan of Lausitz-Spreewald

Figure 6.22 shows that the document is 62% satisfactory (A-B%), as majority of the tasks performed in the Teilregionalplan of Lausitz-Spreewald are well performed and adequate. Moreover, 21% (C-D%) of the tasks in the document in terms of highlighting climate change aspects are just averagely undertaken and 17% (E-F%) of the tasks in the document are poorly attempted.

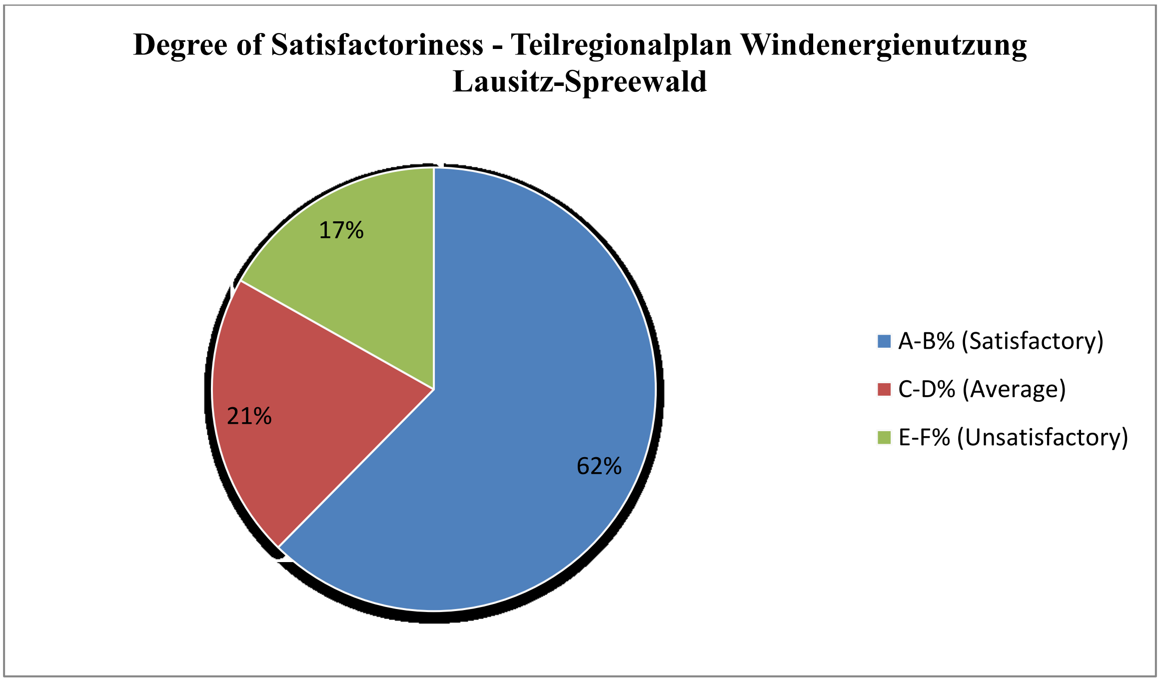


Figure 6.22 Degree of satisfactoriness of Teilregionalplan of Lausitz-Spreewald

Below table 6.6 indicates how well a number of assessment tasks have been performed highlighting the strengths and the weaknesses of the document in carrying out activities to integrate climate change impacts in the document in terms of percentages.

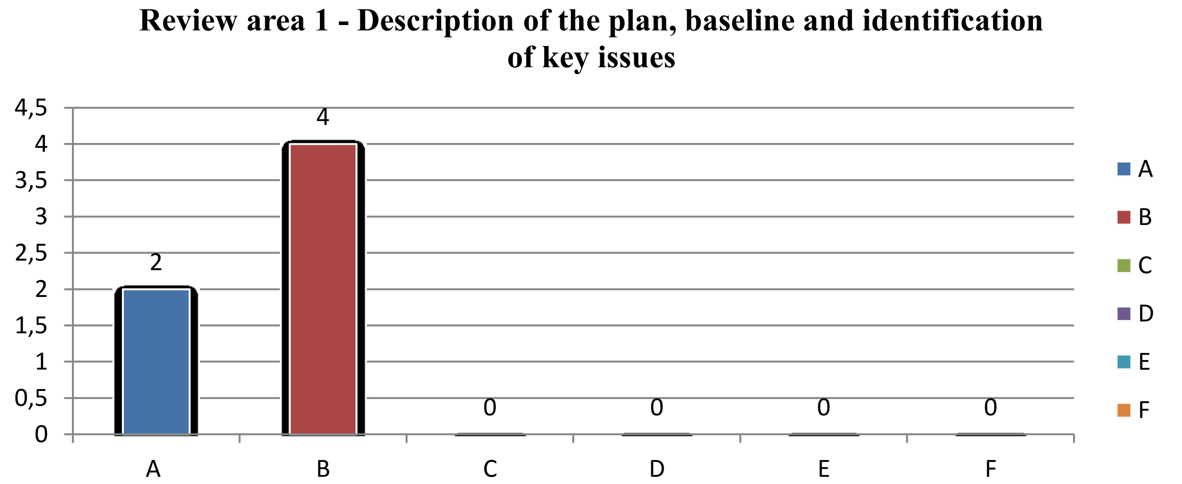
Teilflächennutzungsplan of Lausitz Spreewald	**Assessment Scores**						**Degree of Satisfactoriness**		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of Key issues	2	4	0	0	0	0	100%	0%	0%
Review area 2- Identification and evaluation of alternatives and impact analysis	0	2	3	1	0	0	33%	67%	0%
Review Area 3 – Assessment of mitigation & adaption measures	1	2	0	0	1	2	50%	0%	50%
Review Area 4 – Stakeholder Involvement & Follow up	2	2	1	0	0	1	67%	17%	17%
Cumulative Score of all Review Areas	5	10	4	1	1	3	63%	21%	17%

Table 6.6 Degree of satisfactoriness of Teilregionalplan of Lausitz-Spreewald

In the following section, the strength and weaknesses of the document are highlighted according to the tasks performed in each review area.

6.1.1.3.1 Review Area 1 - Description of the Plan, Baseline & Identification of Key Issues

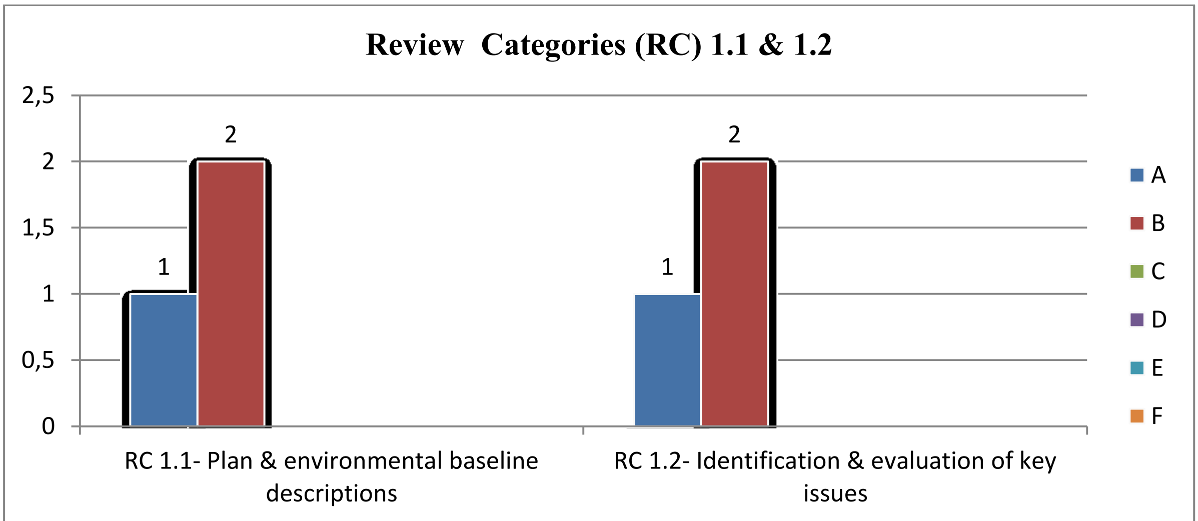
Review area 1 is based on the the description of the plan, its baseline, and identification of key issues in the Teilregionalplan of Lausitz-Spreewald. The overall analysis of review area 1 (Description of the plan, baseline, and identification of key issues) in Teilregionalplan of Lausitz-Spreewald indicates that this review area is relatively well conducted, with an overall assessment score of B grade, which means that the review area 1 is generally satisfactory and complete with minor omissions and inadequacies. The analysis revealed that the document provided a good description of the plan, its baseline conditions are well portrayed and the key issues related to climate change are displayed effectively in the Teilregionalplan. Figure 6.23 illustrates the overall analysis result of review area 1 of the Teilregionalplan of Lausitz-Spreewald.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.23 Results of review area 1 of Teilregionalplan of Lausitz-Spreewald

The review area 1 is further divided into two review categories, such as review category 1.1- Plan and environmental baseline descriptions and review category 1.2- Identification and evaluation of key issues. Figure 6.24 illustrate the performance of review category 1.1 (Plan and environmental baseline descriptions) and 1.2 (Identification and evaluation of key issues), which indicates that in review category 1.1- Plan and environmental baseline descriptions, the document obtained 1A, and 2B, which means that in the Teilregionalplan, the tasks relevant to the description of plan and environmental baseline are very well conducted. According to the analysis of review category 1.1, the Teilregionalplan of Lausitz-Spreewald highlights the contents, SEA process, and main objectives of the plan very clearly. Moreover, the document provides extensive information regarding the current climate baseline of the area by mentioning CO_2 emission sources in that region. It also mentions areas with name where there is increased environmental impacts of air pollution which can be ascertained with increased temperature in those areas. The documents also include information to protect the damaging climate with this plan by explaining its CO_2 emission reduction targets which are reduced CO_2 emission reduction of 40% by 2020 and by 2030 and a further 35% reduction over the year 1990. In addition to that, the document provides detailed information on the consideration of floodplains in the planning area to avoid any damage to the wind energy infrastructure. The Teilregionalplan of Lausitz-Spreewald integrates the climate change issues really well in review category 1.1(Plan and environmental baseline descriptions) thus obtaining a B assessment score in this review category which is generally satisfactory.



A - Relevant tasks well performed, no important tasks left incomplete.
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C - Can be considered just satisfactory despite omissions and/or inadequacies
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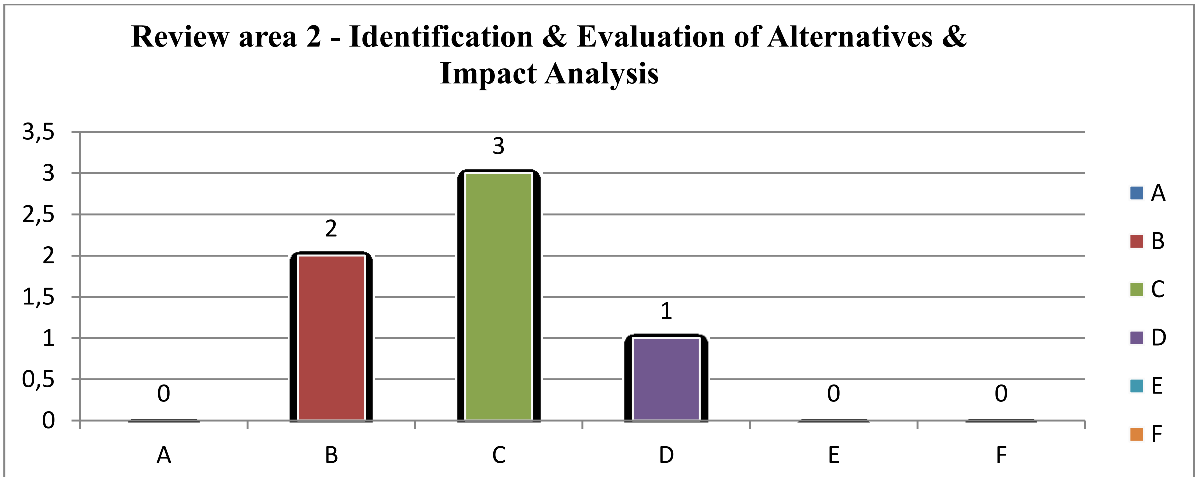
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.24 Performance of review categories 1.1 & 1.2 of review area 1 of Teilregionalplan of Lausitz-Spreewald

Review category 1.2 – deals with the identification and evaluation of key issues. The results of review category 1.2 are also displayed in figure 6.24, indicating that the results of review category 1.2 are analogous to the results of review category 1.1. The analysis revealed that likewise review category 1.1, the review category 1.2 (Identification and evaluation of key issues) also obtained assessment scores of 1A and 2B. The results of the review category 1.2 show that the Teilregionalplan of Lausitz-Spreewald in this area has performed the tasks very satisfactorily. The analysis revealed that the Teilregionalplan identifies climate parameters of each option for this plan such as previous precipitation events in those areas. In terms of identifying key issues related to climate change impacts, the document explains the issues related to flood in detail for every option selected for this plan. It also discusses issues related to peat lands, which are highly significant to combat climate change. The protection and restoration of peat lands are equally vital in the transition towards a low carbon footprint. The document also highlights a direct threat to wind turbines by providing information that due to heavy rainfall there are chances of the flood, which can have negative effects on the turbines, therefore, floodplains should be avoided as well as areas with wetland soils should also be ruled out from the plan. Considering how well documented the climate change issues are in this review category, the overall assessment score for review category 1.2 (Identification and evaluation of key issues) is B, which means the tasks are complete and performed satisfactorily.

6.1.1.3.2 Review Area 2 - Identification & Evaluation of Alternatives & Impact Analysis

Review area 2 deals with the issues related to the identification and evaluation of alternatives and impact analysis in the Teilregionalplan of Lausitz-Spreewald. The inclusive analysis of this review area in Teilregionalplan of Lausitz-Spreewald revealed that the tasks are performed mostly satisfactorily in this review area, due to which the overall assessment score of the review area 2 (Identification and evaluation of alternatives and impact analysis) for Teilregionalplan of Lausitz-Spreewald was calculated as grade C (see table 6.5), which means the document in review area 2 is considered just satisfactory despite few omissions and inadequacies in the tasks performed. Figure 6.25 illustrates the overall analysis result of review area 2 of the Teilregionalplan of Lausitz-Spreewald.



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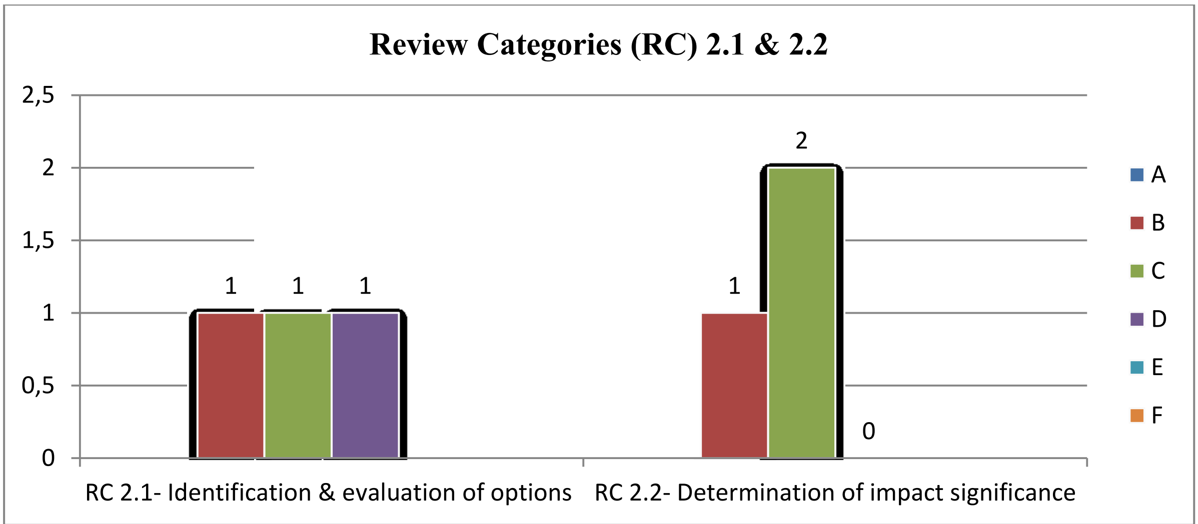
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.25 Results of review area 2 of Teilregionalplan of Lausitz-Spreewald

The review area 2 is further divided into two sub review categories, such as review category 2.1- Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are presented in figure 6.26, which shows that in the review category 2.1- Identification and evaluation of options, the document obtained 1B, 1D and, 1C, which means that the document considers a wide range of alternatives in terms of suitable sites for wind energy development. The plan contained 61 suitable areas for wind energy with a total area of roughly 9443 hectares equivalent to approximately 1.87% of the region area, thus giving an assessment score of B (satisfactory) in this sub review category. The options are tested to be compatible with nature conservation act, technical issues, species protection, and distance to settlements. However, climate change implications are not assessed while considering alternatives. This is the only limitation observed in this review category in which an assessment score of grade D is given, which means this task in Review category 2.1 is not well attempted and therefore is considered unsatisfactory due to omissions and inadequacies. Furthermore, the Teilregionalplan clearly describes how reasonable alternatives are identified, considering objectives, sustainability, and geographical scope of the plan. The document proves that alternatives are identified based on a suitable location for the wind parks and also all the alternatives are thoroughly tested and examined against Natura 2000, and Nature Conservation Act.



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D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
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F - Very unsatisfactory, important task(s) poorly done or not attempted.

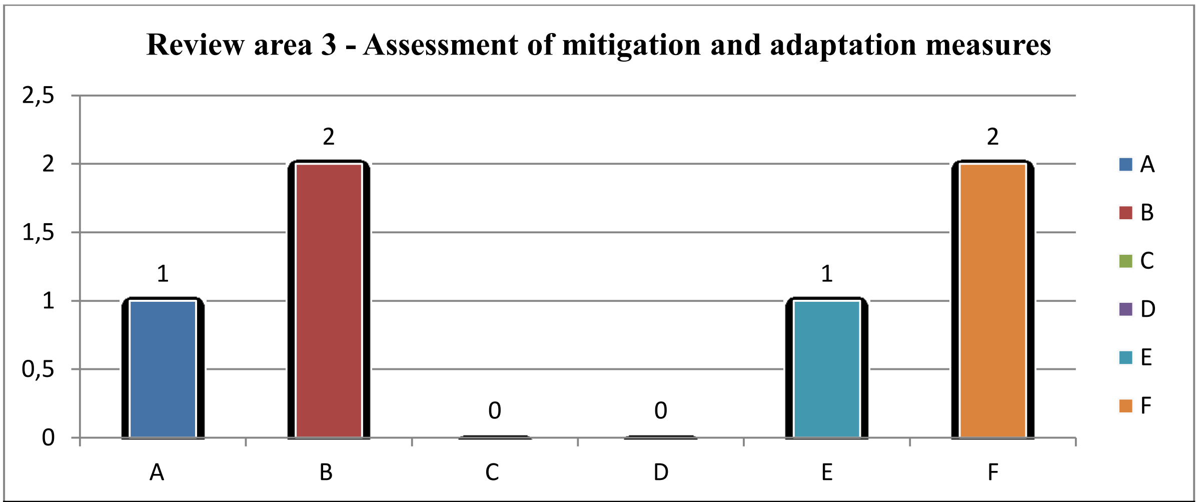
Figure 6.26 Performance of review categories 2.1 & 2.2 of review area 2 of Teilregionalplan of Lausitz-Spreewald

There is a separate chapter in the document based on reasons for selecting alternatives where for every alternative, objectives are mentioned for each protected resources such as humans, animals, water, air, and landscape etc, thus giving the document a C assessment score in this sub review category, which means parts can be considered just satisfactory despite omission and/or inadequacies.

Review category 2.2 addresses the issues of ´Determination of impact significance´. The results of review category 2.2 are also demonstrated in figure 6.26 showing that this review category obtained 1B, and 2C (see table 6.5), giving the overall review category an assessment score of C. The analysis of this review category show that in terms of determination of impact significance of climate change issues the document mentions about current and historic trends in climate in a very satisfactorily way by providing enough details in a separate section in the document where the climatic conditions of the area are identified. The location of the wind parks is also described through the climatic conditions of that area. Thus giving this sub review category a B assessment symbol, which means that the task is generally considered as satisfactory. The document also identifies the cumulative impacts of wind farms of that area by describing how the region is affected by climate-damaging gases from power plants in nearby areas. The document also provides measures to avoid the cumulative environmental effects in that region. In terms of the methodology used in identifying and predicting climate change impacts, the document assesses those significant impacts by using a cause-effect matrix which includes the positive climate change effects as well. Due to these attributes, the document was given an assessment score of C (just satisfactory) for the last two sub review categories of review category 2.2 which is the determination of impact significance in the Teilregionalplan of Lausitz-Spreewald.

6.1.1.3.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

Review area 3 deals with the assessment of mitigation and adaptation measures of the Teilregionalplan of Lausitz-Spreewald. The overall analysis of this review area in the Teilregionalplan of Lausitz-Spreewald showed that the document has equal amounts of well-performed and poorly performed tasks in review area 3 (Assessment of mitigation and adaptation measures), which ultimately gave a very low overall score in this review area. As shown in table 6.5 the overall grade allocated for this review area is D, which means the document in this review area is unsatisfactory due to omissions or inadequacies. The Teilregionalplan showed a number of strengths regarding the assessment of mitigation measures. However, major weaknesses were observed while assessing the adaptation measures for the wind energy Teilregionalplan. Figure 6.27 presents the overall analysis result of review area 3 of Teilregionalplan of Lausitz-Spreewald, which is the assessment of mitigation and adaptation measures.



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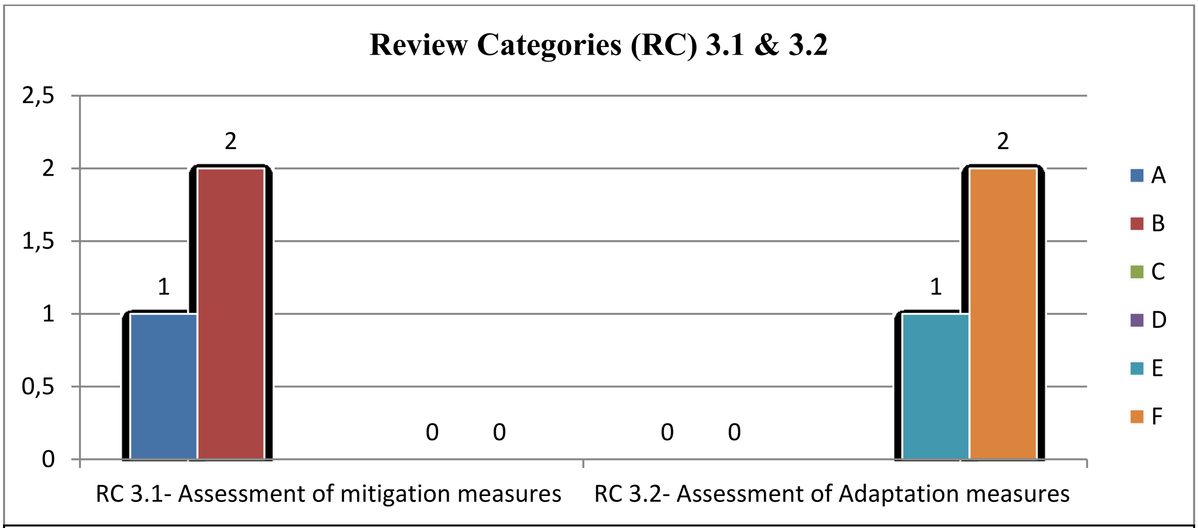
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.27 Results of review area 3 of Teilregionalplan of Lausitz-Spreewald

The review area 3 is divided into two review categories, such as review category 3.1- Assessment of mitigation measures and review category 3.2- Assessment of adaptation measures. Figure 6.28 illuminate the performance of review category 3.1 (Assessment of mitigation measures) and 3.2 (Assessment of adaptation measures), which specifies that in review category 3.1- Assessment of mitigation measures, the document obtained 1A, and 2B, which means that in the Teilregionalplan the assessment of mitigation of impacts are highlighted very evidently in a separate section in the plan. The document highlights the mitigation of climatic impacts on the environment as well as on the wind farms by including information about heavy rainfall sessions in few specific regions and therefore suggest not to build a wind farm in those floodplains. The document also indicates that it considers an effective methodology to mitigate the negative impacts by using mitigation hierarchy, where measures are taken to prevent, reduce, and offset the significant impacts of the plan. Review category 3.1- Assessment of mitigation measures, is the best-performed review area with an overall assessment score of B (see table 6.5), which indicates that the tasks are complete and performed satisfactorily in terms of climate change inclusion.



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C - Can be considered just satisfactory despite omissions and/or inadequacies
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F - Very unsatisfactory, important task(s) poorly done or not attempted.

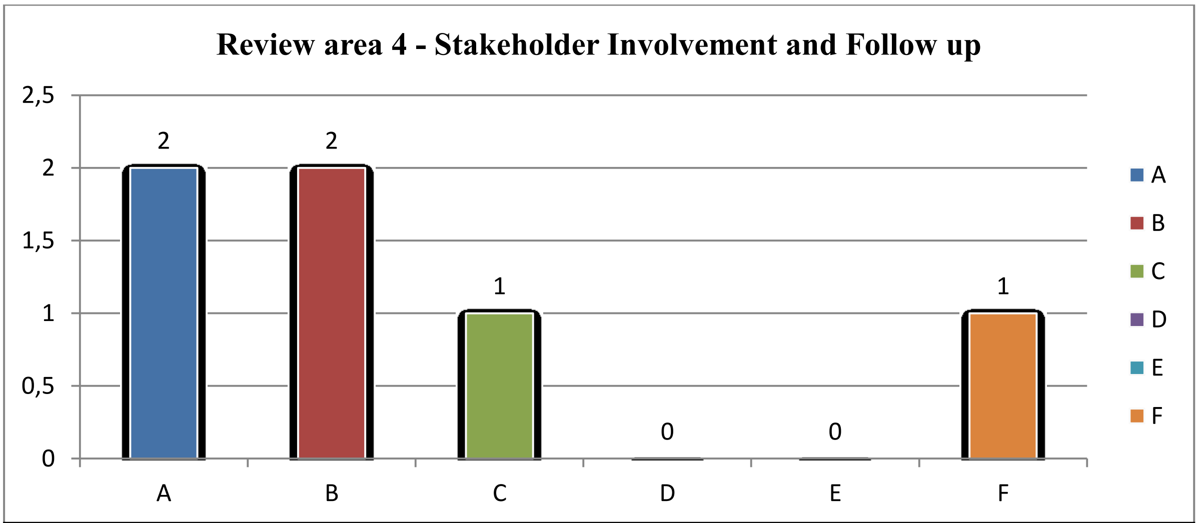
Figure 6.28 Performance of review categories 3.1 & 3.2 of review area 3 of Teilregionalplan of Lausitz-Spreewald

Review category 3.2 addresses the assessment of adaptation measures. The results of review category 3.2 are presented in figure 6.28 showing that this review category obtained 1E, and 2F (see table 6.5), giving the overall review category an unsatisfactory assessment symbol such as F. On evaluating this review category it was found out that the document does not highlight adaptation solutions related to climate change effects. However, adaptative solutions were taken into account in order to adapt the visual and noise effect but no adaptation measures are highlighted to address projected climate vulnerabilities, thus obtaining an assessment score of E (unsatisfactory) in the sub review category of review category 3.2.

In addition to that, the Teilregionalplan does not provide any evidence of incorporation of adaptation measures with the mitigation measure, nor it identifies any preferred adaptation options in the context of climate change, therefore the assessment score for these sub review category is F which this the lowest score in the quality review package. Review category 3.2- Assessment of adaptation measures, is the worst performed review area with an overall assessment score of F (see table 6.5), which indicates that the performed tasks are very unsatisfactory because the important tasks are poorly done or not attempted at all.

6.1.1.3.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 deals with aspects related to stakeholder involvement and follow-up in the Teilregionalplan of Lausitz-Spreewald. The overall analysis of this review area in the Teilregionalplan of Lausitz-Spreewald is found to be at a satisfactory degree with having C as an overall assessment score rating, which indicates that the tasks in Review area 4 are considered satisfactory with only minor omissions and inadequacies. The overall score assigned for this review area is also shown in table 6.5. The assessment result of review area 4 of Teilregionalplan of Lausitz-Spreewald is demonstrated in Figure 6.29. The following figure demonstrates that the document in this review area obtained 2A, 2B, 1C, and 1F scores at the category and sub category level.



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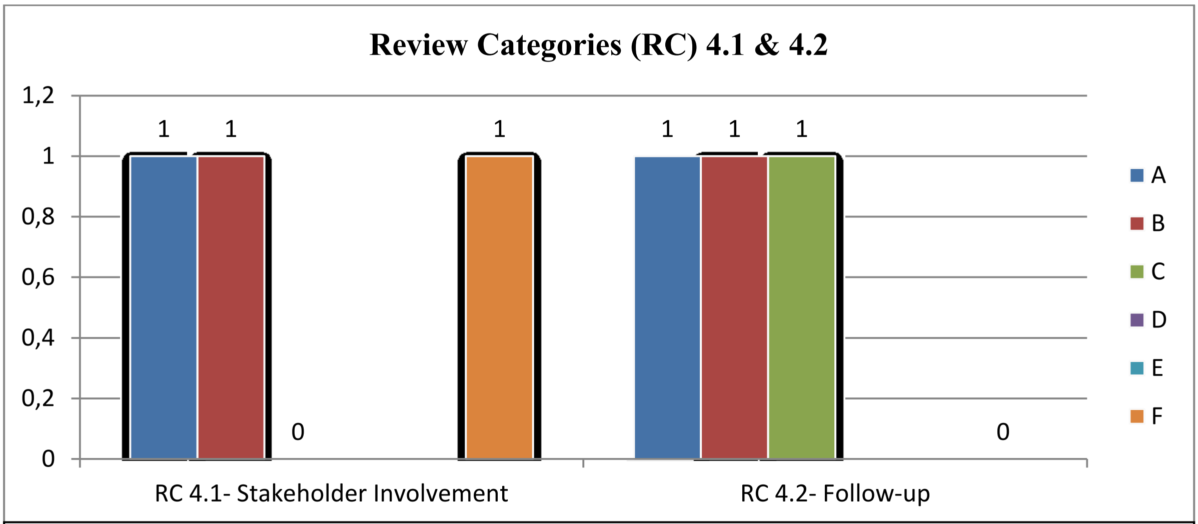
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.29 Results of review area 4 of Teilregionalplan of Lausitz-Spreewald

The review area 4 is divided into two review categories, such as review category 4.1- Stakeholder Involvement and review category 4.2- Follow-up. The results of the review category 4.1 and 4.2 are illustrated in figure 6.30, which shows that in review category 4.1- Stakeholder Involvement, the document attained 1F, 1A, and 1B, which means that the document portrayed a satisfactory result in tasks related to stakeholder involvement. According to the analysis of review category 4.1, it was observed that the Teilregionalplan failed to identify applicable stakeholders apart from the general public such as climate change experts, who can play a vital role on providing information and expert advice on policies and issues related to climate change impacts, thus obtaining a lowest assessment score such as F. However, the document obtained the highest assessment score like A when it came to defining the time frame of the consultation. According to the document, three consultations took place and the time frame for all the consultations are clearly defined in the document. This task was very well done in the document thus acquiring an assessment score of A for this sub review category of review category 4.1 (stakeholder involvement). Moreover, the document highlights information about the number of comments received from stakeholders and also highlights how the comments are taken into consideration, thus giving the document a satisfactory assessment score in this sub review category such as B.



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F - Very unsatisfactory, important task(s) poorly done or not attempted.

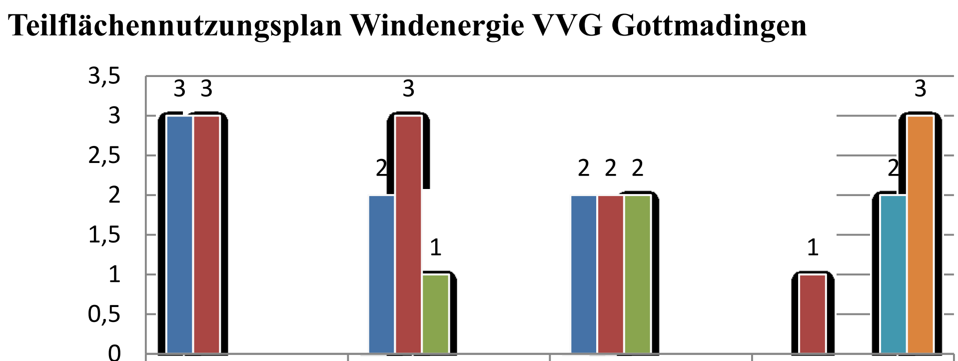
Figure 6.30 Performance of review categories 4.1 & 4.2 of review area 4 of Teilregionalplan of Lausitz-Spreewald

Review category 4.2 – belongs to issues related to Follow-up such as monitoring and evaluation. The results of review category 4.2 are also presented in figure 6.30 showing that this review category obtained 1C, 1B, and 1A (see table 6.5), giving the overall review category a satisfactory assessment symbol such as B. The analysis of this review category shows that in terms of identifying indicators used for monitoring climate change impacts the Teilregionalplan of Lausitz-Spreewald provides information about indicators related to climate change impacts such as precipitation, temperature, duration of sunshine of that region. Moreover, concerning provisions for monitoring climate-related measures the document includes information about monitoring climatic factors such as precipitation, temperature along with flood retention areas, and drainage for flood water. The

Teilregionalplan of Lausitz-Spreewald also highlights how monitoring is done, in order to be able to undertake appropriate remedial actions by providing a separate section in the document where monitoring method and strategy is thoroughly explained thus acquiring an A grade at sub review category level for this review category which means the relevant task is well performed.

6.1.1.4 Sachlicher Teilflächennutzungsplan Windenergie VVG Gottmadingen, 2014

According to the tasks performed in the Teilflächennutzungsplan of VVG Gottmadingen, the overall assessment score of this case study is evaluated as C, which means that the document performed just satisfactorily in integrating the climate change issues into its Teilflächennutzungsplan. The document performed satisfactorily in the first three review areas of quality review package, however, the last review area which is stakeholder involvement and follow up is extremely unsatisfactory. Figure 6.31 presents a summary of all the review areas and their performance in Teilflächennutzungsplan.



	Review area 1	Review area 2	Review area 3	Review area 4
A- Well performed	3	2	2	0
B- Satisfactory	3	3	2	1
C- Just satisfactory	0	1	2	0
D- Just unsatisfactory	0	0	0	0
E- Not satisfactory	0	0	0	2
F- Very unsatisfactoy	0	0	0	3

Figure 6.31 Individual performance of review areas of Teilflächennutzungsplan of VVG Gottmadingen

The below table 6.7 also presents the execution of grades in all the review areas. These grades are allotted based on the performances of the tasks in sub review categories. According to this table, the overall grade given to Teilflächennutzungsplan of VVG Gottmadingen is C which shows a just satisfactory score.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	A	12	5	0	0	0	0	17	5.7	B	Satisfactory	B	Satisfactory	5.5	4.4	C	Just satisfactory
		SRC 1.1.2	A																
		SRC 1.1.3	B																
	RC - 1.2	SRC 1.2.1	B	6	10	0	0	0	0	16	5.3	B	Satisfactory						
		SRC 1.2.2	A																
		SRC 1.2.3	B																
RA 2	RC - 2.1	SRC 2.1.1	A	12	5	0	0	0	0	17	5.7	B	Satisfactory	B	Satisfactory	5.2			
		SRC 2.1.2	B																
		SRC 2.1.3	A																
	RC - 2.2	SRC 2.2.1	B	0	10	4	0	0	0	14	4.7	C	Just satisfactory						
		SRC 2.2.2	C																
		SRC 2.2.3	B																
RA 3	RC - 3.1	SRC 3.1.1	A	6	10	0	0	0	0	16	5.3	B	Satisfactory	B	Satisfactory	5.0			
		SRC 3.1.2	B																
		SRC 3.1.3	B																
	RC - 3.2	SRC 3.2.1	A	6	0	8	0	0	0	14	4.7	C	Just satisfactory						
		SRC 3.2.2	C																
		SRC 3.2.3	C																
RA 4	RC - 4.1	SRC 4.1.1	F	0	0	0	0	2	2	4	1.3	F	Very unsatisfactory	E	Not satisfactory	2.0			
		SRC 4.1.2	E																
		SRC 4.1.3	F																
	RC - 4.2	SRC 4.2.1	F	0	5	0	0	2	1	8	2.7	E	Not satisfactory						
		SRC 4.2.2	E																
		SRC 4.2.3	B																

Table 6.7 Assessment Scores in Sachlicher Teilflächennutzungsplan Windenergie VVG Gottmadingen, 2014

The following table 6.8 illustrates the degree of satisfactoriness of Teilflächennutzungsplan of VVG Gottmadingen in all the review areas and also the cumulative score of the degree of satisfactoriness of the document in terms of inclusion of climate change impacts.

Teilflächennutzungsplan of VVG Gottmadingen	**Assessment Scores**						**Degree of Satisfactoriness**		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of Key issues	3	3	0	0	0	0	100%	0%	0%
Review area 2- Identification and evaluation of alternatives and impact analysis	2	3	1	0	0	0	83%	17%	0%
Review Area 3 – Assessment of mitigation & adaption measures	2	2	2	0	0	0	67%	33%	0%
Review Area 4 – Stakeholder Involvement & Follow up	0	1	0	0	2	3	17%	0%	83%
Cumulative Score of all Review Areas	7	9	3	0	2	3	67%	13%	21%

Table 6.8 Degree of satisfactoriness of Teilflächennutzungsplan of VVG Gottmadingen

Figure 6.32 shows the degree of satisfactoriness for this case study which demonstrates that the majority of the portion of Teilflächennutzungsplan of VVG Gottmadingen could be described as satisfactory (A-B%). According to the analysis, 67% of the tasks performed in the document are satisfactory. Only 13% of the tasks attempted are average which means they are not satisfactory neither unsatisfactory (C-D%). However, the performance of the document in highlighting the crucial components in tackling complex issues of climate change showed 21% (E-F%) of unsatisfactory results.

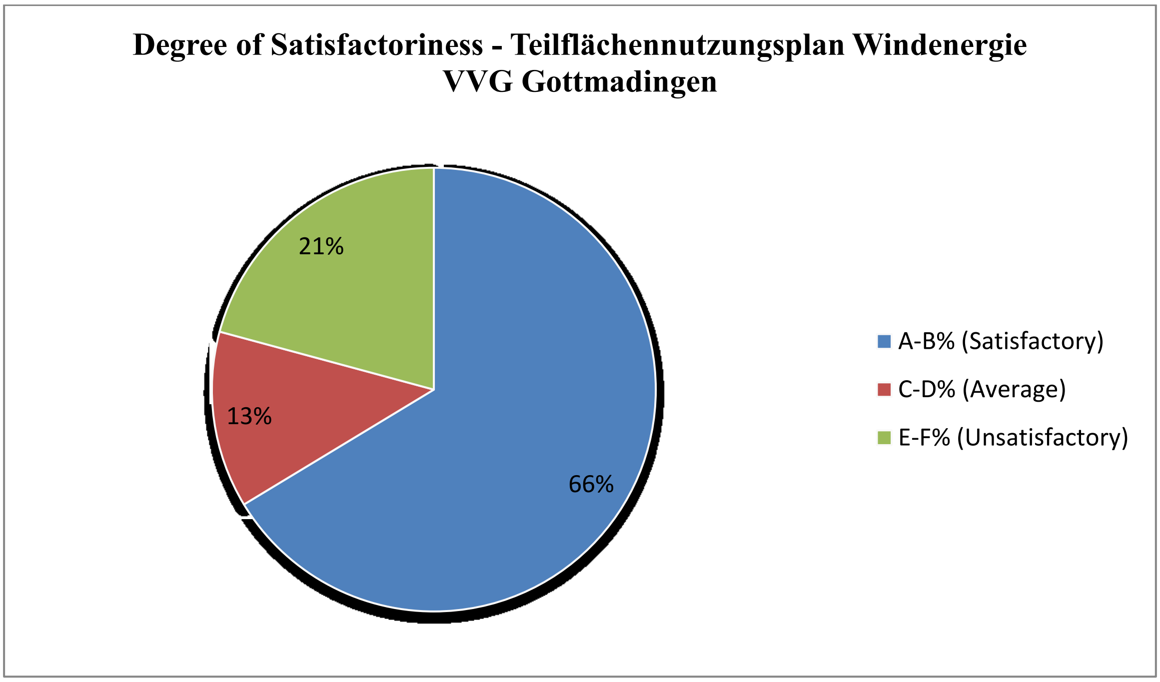
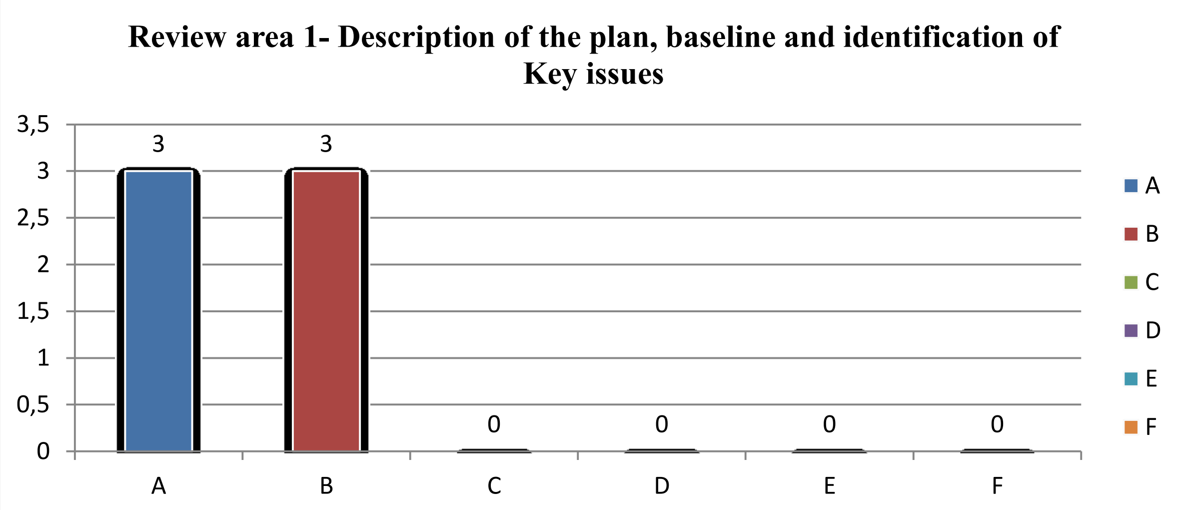


Figure 6.32 Degree of satisfactoriness of Teilflächennutzungsplan of VVG Gottmadingen

The following section describes the performance of all the four review areas in much detail highlighting their strong and weak traits in all the review categories and sub review categories.

6.1.1.4.1 Review Area 1 - Description of the Plan, Baseline & Identification of Key Issues

Review area 1 is concerned with issues related to the description of the plan, its baseline, and identification of key issues in the Teilflächennutzungsplan of VVG Gottmadingen. The overall analysis of this review area in Teilflächennutzungsplan of VVG Gottmadingen showed that the tasks are performed satisfactorily. The analysis revealed that the document provided a good description of the plan, its baseline conditions are well portrayed and the key issues related to climate change are highlighted effectively in the Teilflächennutzungsplan. The overall assessment score of review area 1 for Teilflächennutzungsplan of VVG Gottmadingen is calculated as grade B, which means the document in review area 1 is satisfactory. Figure 6.33 illustrates the analysis result of review area 1 of Teilflächennutzungsplan of VVG Gottmadingen. The following figure shows that the document in this review area obtained 3As and 3Bs, thus giving the total score of B (satisfactory) for review area 1 (see table 6.7).



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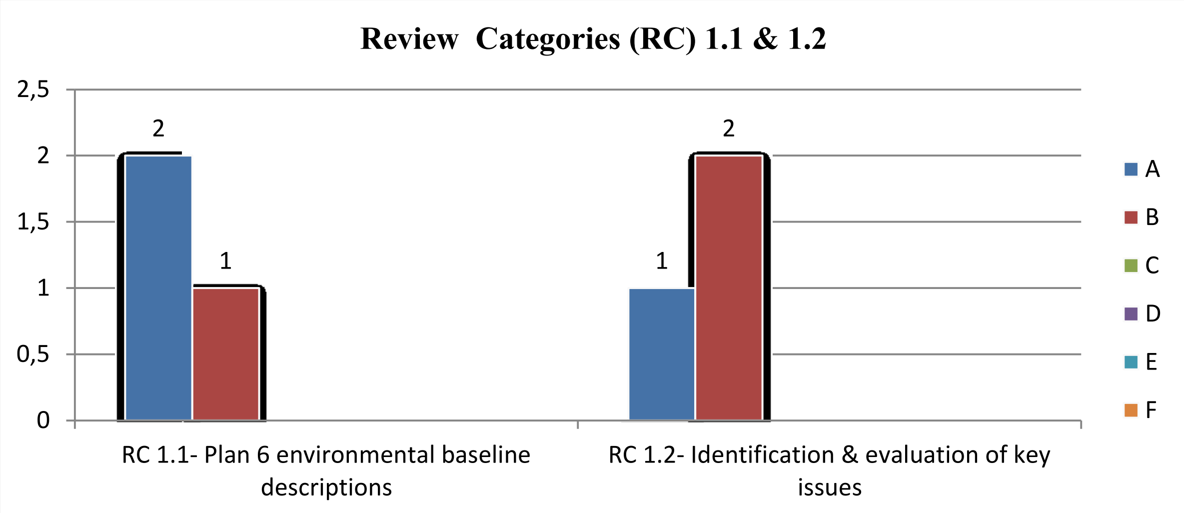
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.33 Result of review area 1of Teilflächennutzungsplan of VVG Gottmadingen

The review area 1 has two review categories, such as review category 1.1- Plan and environmental baseline descriptions and 1.2- Identification and evaluation of key issues. Figure 6.34 illuminate the performance of review category 1.1 (Plan and environmental baseline descriptions) and 1.2 (Identification and evaluation of key issues), which specifies that in review category 1.1- Plan and environmental baseline descriptions, the document obtained 2As, and 1B, which means that in the Teilflächennutzungsplan the assessment of the plan and environmental baseline descriptions are well highlighted very evidently. It was observed that the SEA process is outlined and the objective of the plan is also well defined in the document.

The current and expected future climate baseline is also well explained in the Teilflächennutzungsplan. Moreover, in terms of describing how the proposed project is vulnerable to the impacts of climate change over its life span, the document discusses the flood issues of VVG Gottmadingen very comprehensively. Due to all these positive attributes, the documents scored very well in the sub review category and review category level. Review category 1.1- Assessment of mitigation measures, is the best-performed review area with 2A scores in the first two sub review categories (see table 6.7), which indicates that the tasks are complete and well performed.



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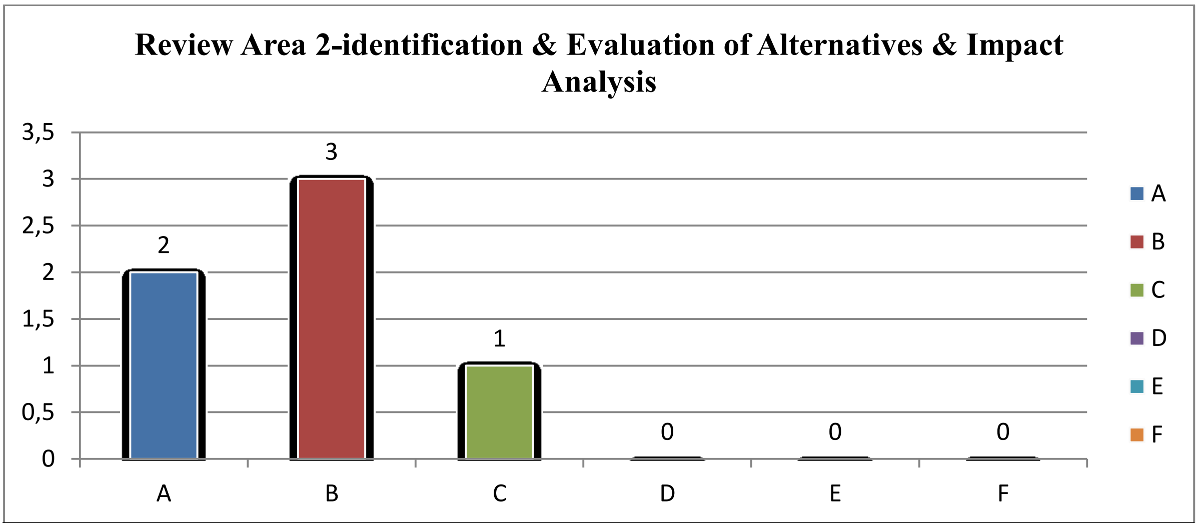
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.34 Performance of review cateogories 1.1 & 1.2 of review area 1 of Teilflächennutzungsplan of VVG Gottmadingen

Review category 1.2 – belongs to the identification and evaluation of key issues. The results of review category 1.2 are displayed in figure 6.34 showing that this review category also performed satisfactorily by obtaining 2Bs, and 1A (see table 6.7). The explanation of these assessment scores are also showed in figure 6.34. The results of review category 1.2 (Identification and evaluation of key issues) show that the tasks in this review category are very satisfactorily attempted. The document identifies climate parameters for each alternative option considered for this plan. The climatic parameters emphasized in the document are wind speed, precipitation, and temperature of that area. The identification of key issues are done very comprehensively in the document. The report identifies the operational and constructional impacts of the wind turbine on protected goods such as human, culture, biodiversity, water, ground, climate, and air. The document also mentions that the environmental issues of the plan are included at a very early stage. Key issues mentioned in the report are related to public and human health, culture, landscape, ground, water, climate, and air. Moreover, the document also identifies a direct threat to wind farms by discussing flood issues of VVG Gottmadingen. Considering all these characteristics and the analysis of this review category reveal that the tasks related to identifying and evaluation of key issues are very well performed, thus giving the document a grade B in this regard, which means that the document is satisfactory with tasks related to review category 1.2 (Identification and evaluation of key issues).

6.1.1.4.2 Review Area 2 - Identification & Evaluation of Alternatives & Impact Analysis

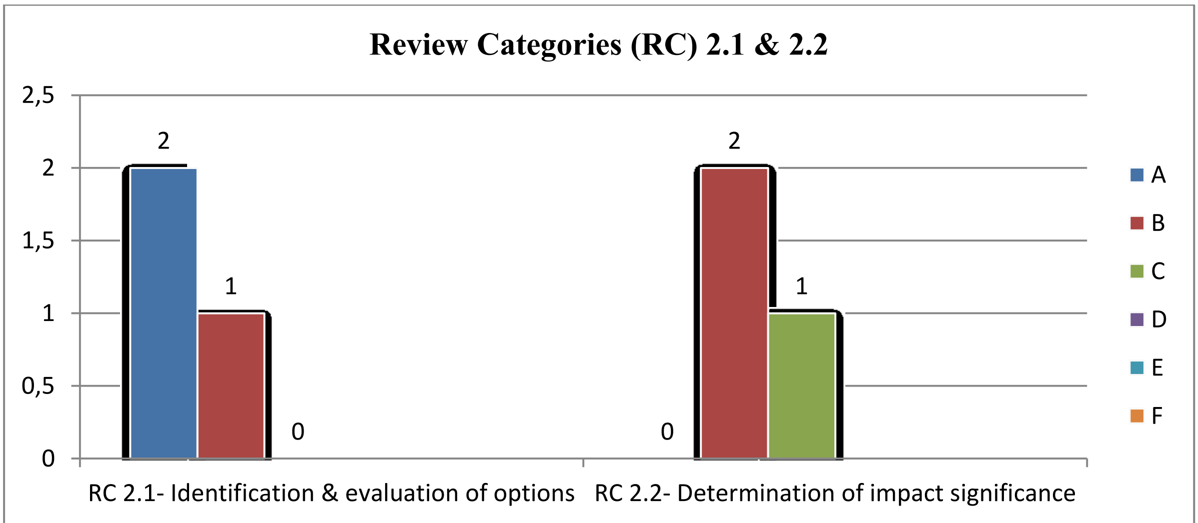
This review area is related to the identification and evaluation of alternatives and analysis of impacts of the Teilflächennutzungsplan of VVG Gottmadingen. The analysis of this review area in Teilflächennutzungsplan of VVG Gottmadingen indicates that the document performed very efficiently in this review area and due to strong attributes observed in review categories and sub review categories, the document obtained a score of B grade, which signifies a satisfactory assessment score in the quality review package. The overall grade allocated for this review area is B as shown in table 6.7. Figure 6.35 illustrates the overall analysis result of review area 2 of Teilflächennutzungsplan of VVG Gottmadingen, which is the Identification and evaluation of alternatives and impact analysis.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.35 Results of review area 2 of Teilflächennutzungsplan of VVG Gottmadingen

The review area 2 is divided into two review categories, such as review category 2.1-Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are displayed in figure 6.36, which shows that in review category 2.1- Identification and evaluation of options, the document obtained 2As and 1B, which means that the document performed very satisfactorily in this review category. The assessment of this review category shows that while identifying alternatives the document comprehensively provides a wide range of alternatives in terms of suitable sites for wind energy development. The negative and the positive effects of the alternatives are assessed separately according to impacts on humans, culture, landscape, biodiversity, ground, water, climate, air, and species protection. The restrictions and recommendations are then mentioned for every option in the Teilflächennutzungsplan. In terms of identifying how reasonable alternatives were considered it was observed that the document has a separate section in which the alternatives are described and evaluated considering plan objectives and environmental impacts. All these above tasks are very well performed in the Teilflächennutzungsplan, therefore considering it as the best-performed review category with a total score of B grade, which reflects a satisfactory result.



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F - Very unsatisfactory, important task(s) poorly done or not attempted.

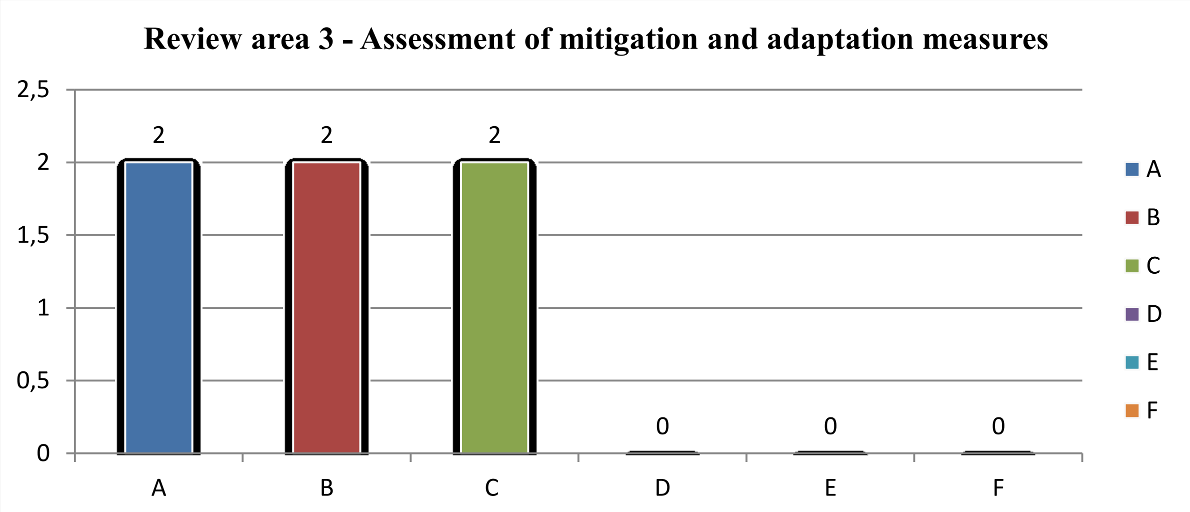
Figure 6.36 Performance of review categories 2.1 & 2.2 of review area 2 of Teilflächennutzungsplan of VVG Gottmadingen

Review category 2.2 addresses issues related to the determination of impact significance. The results of review category 2.2 are also exhibited in figure 6.36 showing that this review category obtained 2Bs and 1C (see table 6.7), giving the overall review category an assessment symbol of C, which depicts that the tasks in this review category are considered just satisfactory despite omissions and/or inadequacies. The assessment of this review category revealed that in terms of determination of impact significance of climate change issues the document gives enough reference about current and historic trends in climate. Thus, giving this sub review category a B assessment symbol, which means that the task is generally considered as satisfactory. However, in terms of identifying the cumulative impacts of wind farms of that area, the document provides very scarce information, thus showing omissions and inadequacies which resulted in allocating a C assessment score (just satisfactory) in this sub review category. On recognising any approach or methodology in identifying and predicting any climate change impacts of VVG Gottmadingen, the document indicates major climate change impacts such as a) loss of climate compensation areas (forests), b) loss of carbon storage and sinks. Moreover, the Teilflächennutzungsplan mentions the impacts of wind energy (constructional impacts, operational impacts, and windmill itself) on each protected goods. The assessment symbol assigned for this sub review category is B (satisfactory). In addition to that, the interrelationship between the key issues is also mentioned in this document. The document does not just include identification, description, and assessment of the direct and indirect effects on the protected goods, but also the interaction between them. Therefore, the "total system environment" (Gesamtsystem Umwelt) is also the subject of consideration in this Teilflächennutzungsplan.

6.1.1.4.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

Review area 3 is related to the assessment of mitigation and adaptation measures of the Teilflächennutzungsplan of VVG Gottmadingen. Both mitigation and adaptation are the two-pronged approaches that help to respond to climate change by reducing GHG emissions (mitigation) and secondly by adapting to the climate change that has already happened (adaptation). The analysis of this review area in Teilflächennutzungsplan of VVG Gottmadingen revealed that the document performed the task very well in this review area (see table 6.7), which ultimately gave the document an overall score of B (satisfactory) in review area 3.

Better performance is observed in the Teilflächennutzungsplan when assessing the mitigation and adaptation measures of the Teilflächennutzungsplan of VVG Gottmadingen. Figure 6.37 illustrates the analysis result of review area 3 of Teilflächennutzungsplan of VVG Gottmadingen, which deals with the assessment of mitigation and adaptation measures, demonstrates that the document obtained 2As, 2Bs, and 2Cs in evaluating the mitigation and adaptation measures of the plan.



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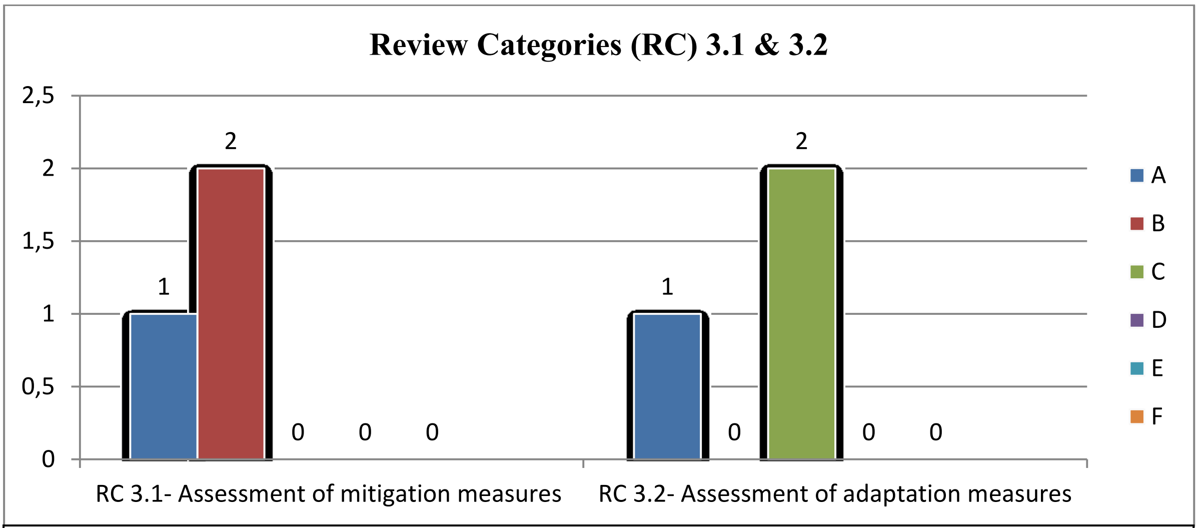
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.37 Results of review area 3 of Teilflächennutzungsplan of VVG Gottmadingen

The review area 3 is divided into two review categories, such as review category 3.1- Assessment of mitigation measures and 3.2- Assessment of adaptation measures. The results of the review category 3.1 and 3.2 are shown in figure 6.38, which illustrate that in review category 3.1- Assessment of mitigation measures, the document obtained 1A, and 2Bs, which means that the document performed the tasks in this review category satisfactorily with an overall assessment score of B.

In terms of stating contingent plans to mitigate negative environmental effects, the document highlights the mitigation of impacts according to relevant laws. Mitigation of climatic impacts are also discussed in the document by mentioning issues related to the flood. Moreover, the document also highlights about using mitigation hierarchy as a tool to mitigate negative impacts where the impacts are first avoided, minimized, and then finally compensated.



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D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

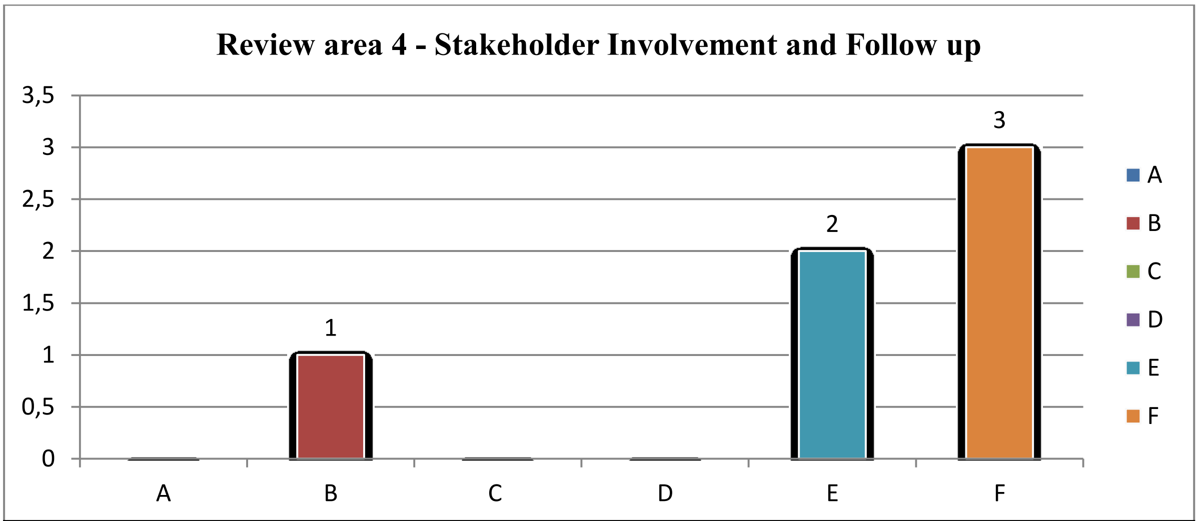
Figure 6.38 Performance of review categories 3.1 & 3.2 of review area 3 of Teilflächennutzungsplan of VVG Gottmadingen

Review category 3.2 deals with the assessment of adaptation measures. The results of review category 3.2 are displayed in figure 6.38 showing that this review category obtained 1A and 2Cs. The results of review category 3.2 show that the tasks in Teilflächennutzungsplan of VVG Gottmadingen in review category 3.2 (Assessment of adaptation measures) performed quite satisfactorily since the grades obtained in this review area are all satisfactory. The analysis revealed that since the tasks related to the assessment of adaptation measures are performed quite satisfactorily therefore, the overall grade assigned for this review category is C (just satisfactory).

The Teilflächennutzungsplan describes adaptation solutions that are technically feasible to address projected climate vulnerabilities by mentioning the use of technical adaptation measures such as the document highlights the use of ENERCON E-82, E-101, and E-82, which is a state of the art wind turbine from a German company, ideal for medium to high wind speed areas. The document mentions that due to its reduced floor space, less area is consumed and also it is applicable for high wind velocity and most importantly it is less noisy (4db). All the technical details related to the turbines are presented in the document.

6.1.1.4.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 deals with the issues related to Stakeholder Involvement and Follow up in the Teilflächennutzungsplan of VVG Gottmadingen. The overall analysis of this review area in Teilflächennutzungsplan of VVG Gottmadingen illustrates that the document provided very poor and unsatisfactory results in this review area with having E as an overall rating, which is a very low score in this quality review package. The analysis shows that this review area is the worst performed review area of Teilflächennutzungsplan of VVG Gottmadingen from all the four review areas observed. As shown in table 6.7 as well, the overall grade allocated for this review area is E, which means the document in this review area is not satisfactory due to significant omissions or inadequacies. Figure 6.39 demonstrates the overall analysis result of review area 4 (Stakeholder Involvement and Follow up) of Teilflächennutzungsplan of VVG Gottmadingen. This following figure 6.39 exhibits that the document in this review area obtained 1B, 2E, and 3F scores at the category and sub category level. In Teilflächennutzungsplan of VVG Gottmadingen, review area 4 is observed as the highest frequency of unsatisfactory scores.



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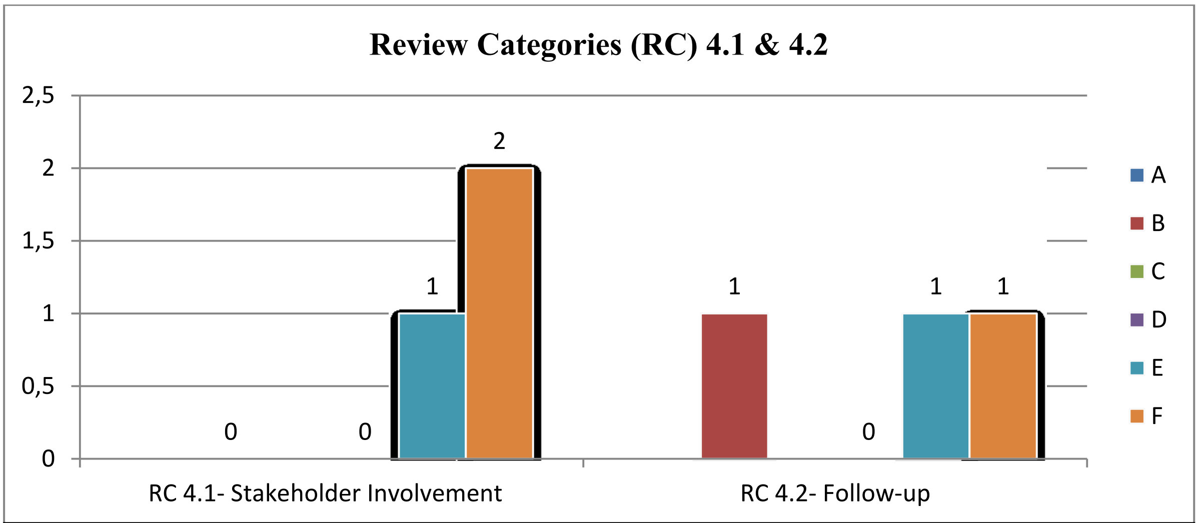
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.39 Results of review area 4 of Teilflächennutzungsplan of VVG Gottmadingen

The review area 4 has two review categories, such as review category 4.1- Stakeholder Involvement and, 4.2- Monitoring and Evaluation. The results of the review category 4.1 and

4.2 are shown in figure 6.40, which shows that in the review category 4.1- Stakeholder Involvement, the document obtained 2F, and 1E, which means that the document depicted an extremely poor and unsatisfactory result in tasks related to stakeholder involvement. The analysis reveals that the document failed to identify relevant stakeholders other than the general public such as climate change experts. Secondly, the consultation related matters are poorly dealt with in the document such as no time frame is stated in the document about public consultation. Lastly, in review category 4.1 the document did not provide any information about taking the comments of public participation into consideration, neither the document describes any procedure in engaging the stakeholder in the Teilflächennutzungsplan of VVG Gottmadingen. Considering all these inadequacies and weaknesses the overall assessment score allotted for review category 4.1 is F (see table 6.7), which indicates that the performed tasks are very unsatisfactory because the important tasks are poorly done or not attempted at all.



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F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.40 Performance of review categories 4.1 & 4.2 of review area 4 of Teilflächennutzungsplan of VVG Gottmadingen

Review category 4.2 – belongs to Follow-up such as monitoring and evaluation. The results of review category 4.2 are also displayed in figure 6.40 showing that this review category obtained 1F, 1E, and 1B. The results of this review category show that the Teilflächennutzungsplan of VVG Gottmadingen performed the tasks quite unsatisfactorily in review category 4.2 (Follow-up). The document fails to provide any evidence regarding the indicators used for monitoring climate change issues nor the document includes any provision for monitoring climate-related measures. However, the Teilflächennutzungsplan mentions about the methodology used for monitoring, in order to be able to undertake appropriate remedial actions. Thus, obtaining an only satisfactory score in this sub review category of review category 4.2 (Follow-up). But due to the other tasks poorly attempted in this review category, the overall assessment score allocated to this review category is E, which means the document in this review area is not satisfactory due to significant omissions or inadequacies.

6.1.2 Analysis of Onshore Wind Energy Plans in Scotland

The main objective in undertaking this study was to gain a better understanding of the quality of SEA and its likely influence on the effectiveness of the environmental assessment reports in integrating climate change aspects. This section discusses the overall analysis of the onshore wind energy plans of Scotland which are selected for this research. The results discussed are based on the overall performance of the four different SEA documents in the four review areas, which will be discussed below. The performances are discussed on how satisfactory, average, unsatisfactory, or poor the documents are, based on the tasks they attempt in each review area and the grades they obtained.

6.1.2.1 East Renfrewshire Supplementary Planning Guidance: Renewable Energy Strategic Environmental Assessment, 2016

The overall quality of the East Renfrewshire Supplementary Planning Guidance for Renewable Energy Strategic Environmental Assessment is evaluated as D, which means the document is just unsatisfactory due to omissions and inadequacies based on the tasks it executed in terms of taking climate change issues into consideration. This overall assessment score is given to the document according to the tasks it performed in each review area of the quality review package.

The least performed review area observed is review area 3 which is the assessment of mitigation and adaptation measures, which are also the main components to address climate change issues. Moreover, a detailed overview of the corresponding grades in all the review categories and sub review categories are presented in table 6.9, which represents how these grades are assigned to each sub review category, review category, and finally to review areas.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	A	12	0	0	3	0	0	15	5.0	B	Satisfactory	C	Just satisfactory	4.5	3.7	D	Just unsatisfactory
		SRC 1.1.2	D																
		SRC 1.1.3	A																
	RC - 1.2	SRC 1.2.1	B	6	5	0	0	0	1	12	4.0	C	Just satisfactory						
		SRC 1.2.2	A																
		SRC 1.2.3	F																
RA 2	RC - 2.1	SRC 2.1.1	A	12	0	3	0	0	0	15	5.0	B	Satisfactory	C	Just satisfactory	4.0			
		SRC 2.1.2	C																
		SRC 2.1.3	A																
	RC - 2.2	SRC 2.2.1	C	0	0	4	3	2	0	9	3.0	D	Just unsatisfactory						
		SRC 2.2.2	D																
		SRC 2.2.3	E																
RA 3	RC - 3.1	SRC 3.1.1	C	0	0	4	6	0	0	10	3.3	D	Just unsatisfactory	D	Just unsatisfactory	3.0			
		SRC 3.1.2	D																
		SRC 3.1.3	D																
	RC - 3.2	SRC 3.2.1	D	0	0	4	3	0	1	8	2.7	E	Not satisfactory						
		SRC 3.2.2	F																
		SRC 3.2.3	C																
RA 4	RC - 4.1	SRC 4.1.1	D	6	0	0	3	2	0	11	3.7	D	Just unsatisfactory	D	Just unsatisfactory	3.5			
		SRC 4.1.2	A																
		SRC 4.1.3	E																
	RC - 4.2	SRC 4.2.1	B	0	5	0	3	2	0	10	3.3	D	Just unsatisfactory						
		SRC 4.2.2	E																
		SRC 4.2.3	D																

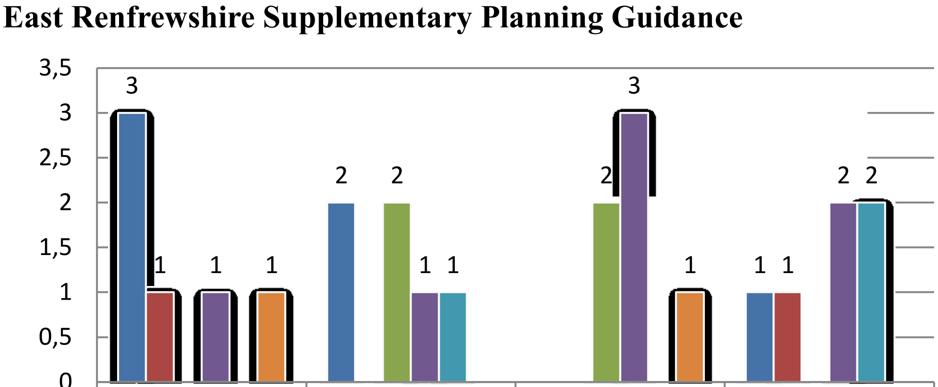
Table 6.9 Assessment Scores in East Renfrewshire Supplementary Planning Guidance: Renewable Energy Strategic Environmental Assessment, 2016

The following table 6.10 shows the degree of satisfactoriness of Supplementary Planning Guidance of East Renfrewshire of all the four review areas and also the cumulative score of the degree of satisfactoriness of the document which represents the extent of the document in terms of integration of climate change impacts in the Supplementary Planning Guidance of East Renfrewshire.

East Renfrewshire Supplementary Planning Guidance	**Assessment Scores**						**Degree of Satisfactoriness**		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of Key issues	3	1	0	1	0	1	67%	17%	17%
Review area 2- Identification and evaluation of alternatives and impact analysis	2	0	2	1	1	0	33%	50%	17%
Review Area 3 – Assessment of mitigation & adaption measures	0	0	2	3	0	1	0%	83%	17%
Review Area 4 – Stakeholder Involvement & Follow up	1	1	0	2	2	0	33%	33%	33%
Cumulative Score of all Review Areas	6	2	4	7	3	2	33%	46%	21%

Table 6.10 Degree of satisfactoriness of Supplementary Planning Guidance of East Renfrewshire

Figure 6.41 presents the summary of all the four review areas in East Renfrewshire Supplementary Planning Guidance for Renewable Energy Strategic Environmental Assessment. According to this figure, review area, 1 is best performed (as compared to all the review areas) when including climate change impacts in the documents while the rest of the review areas are just averagely and/or poorly performed in terms of tasks attempted to reflect on impacts of climate change, thus giving this document an overall assessment score of D.



	Review area 1	Review area 2	Review area 3	Review area 4
A- Well performed	3	2	0	1
B- Satisfactory	1	0	0	1
C- Just satisfactory	0	2	2	0
D- Just unsatisfactory	1	1	3	2
E- Not satisfactory	0	1	0	2
F- Very unsatisfactoy	1	0	1	0

Figure 6.41 Individual performance of review areas of Supplementary Planning Guidance of East Renfrewshire

Figure 6.42 shows the visual illustration of the degree of satisfactoriness of the document in terms of climate change inclusion into the supplementary planning guidance of East Renfrewshire, which indicates that according to the tasks performed in this review area, only 33% of the document could be described as satisfactory (A-B%), while 21% were graded as unsatisfactory (E-F%) where the tasks are poorly attempted in order to address climate change issues in the document.

Based on the grades assigned in this document (see table 6.10) majority of the tasks (46%) are graded as C or D due to which in terms of the degree of satisfactoriness the document shows a high range of averagely attempted tasks (C-D%) when considering climatic issues into the plan.

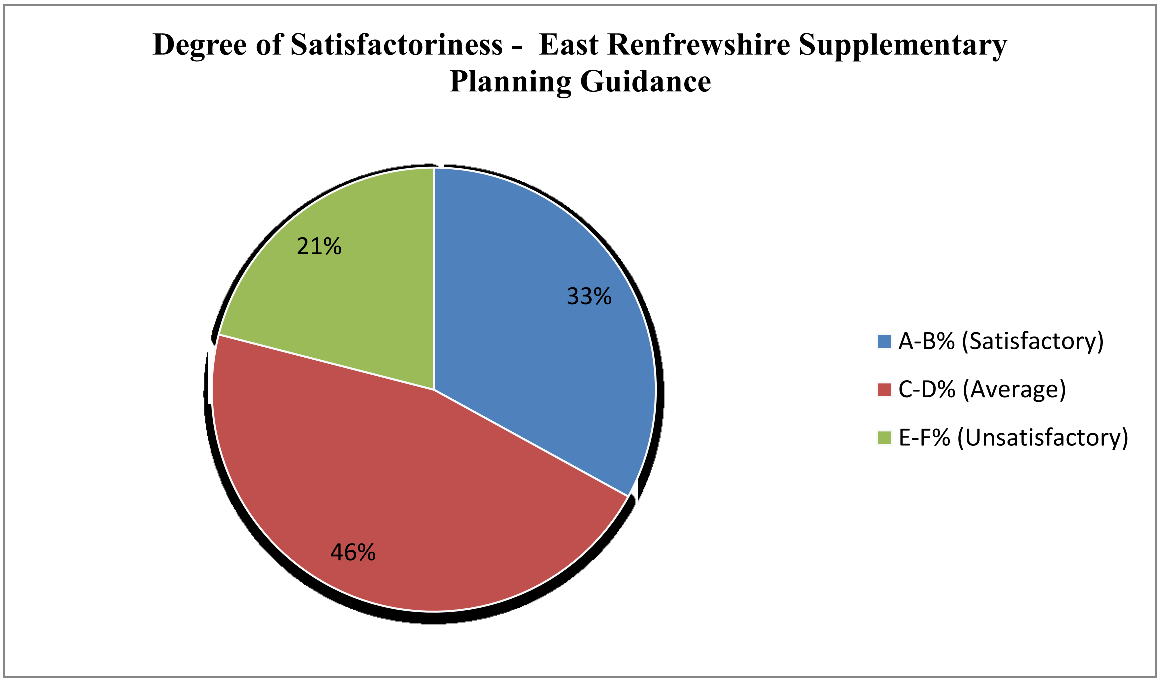
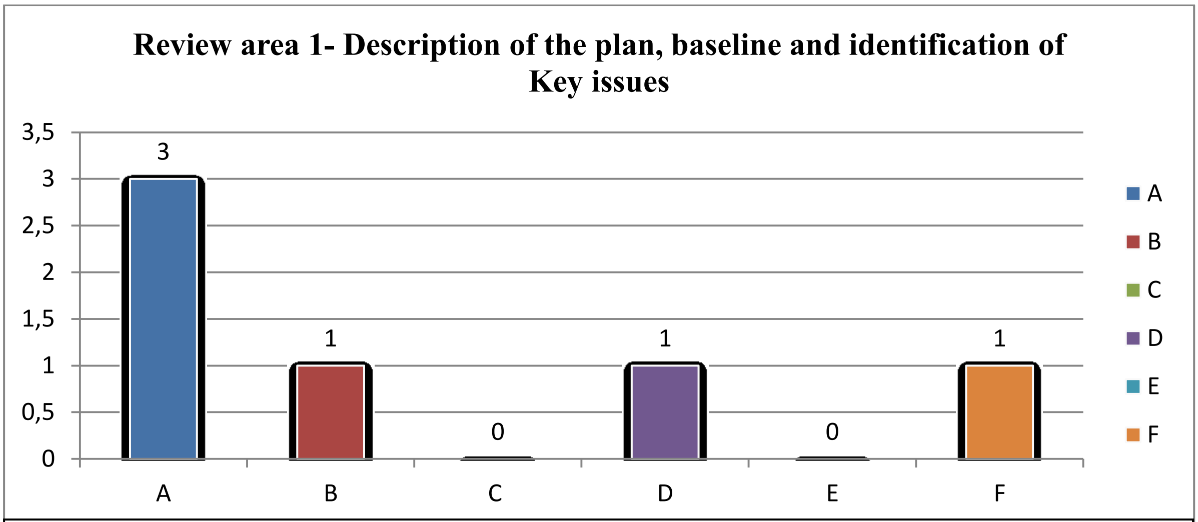


Figure 6.42 Degree of satisfactoriness of Supplementary Planning Guidance of East Renfrewshire

In the subsequent sections, an analysis of all the review areas are discussed in detail considering the good and bad qualities of the document in terms of incorporating climate change issues.

6.1.2.1.1 Review Area 1 - Description of the Plan, Baseline & Identification of Key Issues

Review area 1 focuses on the description of the plan, its baseline, and identification of key issues in the East Renfrewshire Supplementary Planning Guidance. The overall analysis of this review area in this Supplementary Planning Guidance indicates that the document performed quite satisfactorily on describing the plan and its environmental baseline conditions. The significant concerns subject to climate change issues are also exhibited effectively in the Supplementary Planning Guidance of East Renfrewshire. However, the document showed few weaknesses due to which the overall assessment score of review area 1 for East Renfrewshire Supplementary Planning Guidance is calculated as grade C (see table 6.9), which indicates that the document in review area 1 is just satisfactory, despite omissions and/or inadequacies. Figure 6.43 shows the complete evaluation result of review area 1 of East Renfrewshire Supplementary Planning Guidance.



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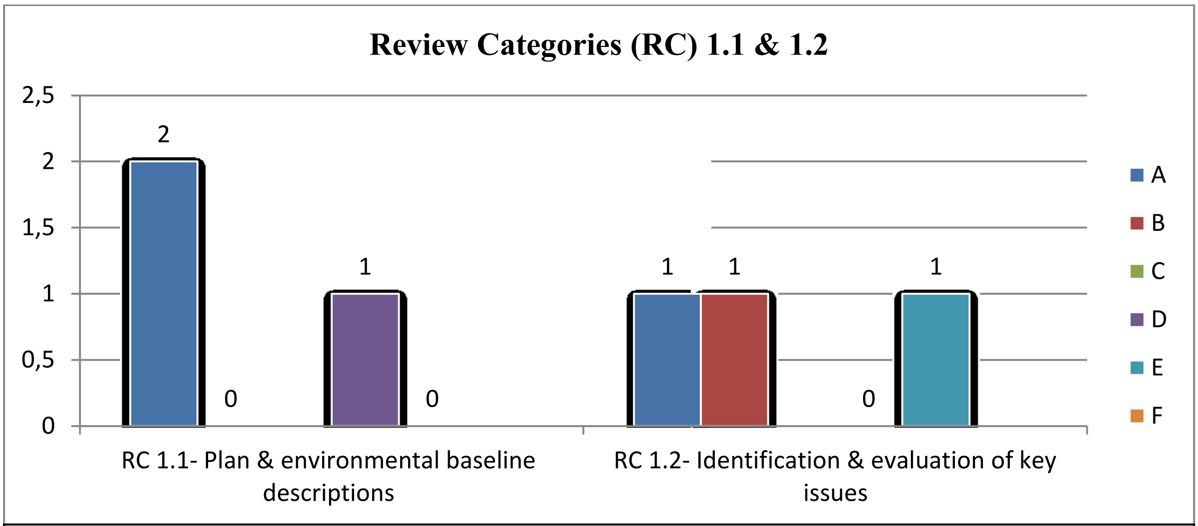
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.43 Results of review area 1 of Supplementary Planning Guidance of East Renfrewshire

The review area 1 has two review categories, such as review category 1.1- Plan and environmental baseline descriptions and 1.2- Identification and evaluation of key issues. Figure 6.44 present the performance of review category 1.1 (Plan and environmental baseline descriptions) and 1.2 (Identification and evaluation of key issues), which specifies that in review category 1.1- Plan and environmental baseline descriptions, the document obtained 2As, and 1D which means that in the Supplementary Planning Guidance, the assessment of the plan and environmental baseline descriptions are well highlighted very evidently with only a few omissions and inadequacies. The evaluation of the East Renfrewshire Supplementary Planning Guidance for review area 1 revealed that the SEA process is outlined and the objective of the plan is well explained in the document.

However, the current and expected future climate baseline is not so evident in the Supplementary Planning Guidance. In terms of describing how the proposed project is vulnerable to the impacts of climate change over its life span, the document discusses the flood-related matters of East Renfrewshire very comprehensively by carefully assessing flood issues with flood risk maps and guidance documents related to flood management. Due to these positive and few negative attributes, the documents scored just satisfactorily in the sub review category and review category level with an overall assessment score of C (see table 6.9), which indicates that the tasks performed are considered just satisfactory despite omission and/or inadequacies.



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D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
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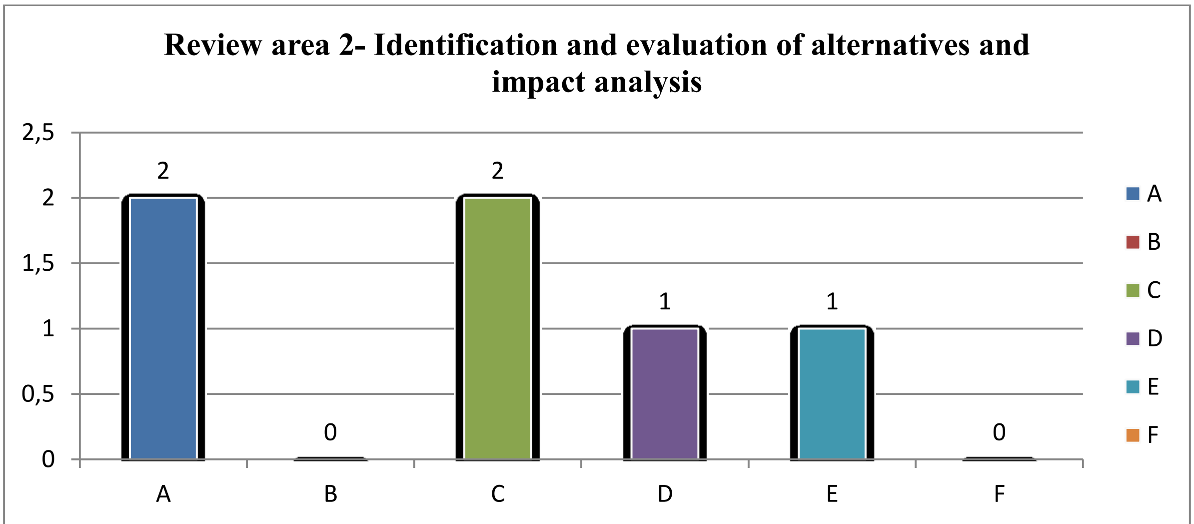
Figure 6.44 Performance of review categories 1.1 & 1.2 of review area 1of Supplementary Planning Guidance of East Renfrewshire

Review category 1.2 – deals with the identification and evaluation of key issues. The results of review category 1.2 are also presented in figure 6.44, indicating that the overall results of review category 1.2 are corresponding to the results of review category 1.1. The analysis revealed that similar to review category 1.1, the review category 1.2 (Identification and evaluation of key issues) also obtained an overall assessment scores of C (just satisfactory). The results of review category 1.2 show that the East Renfrewshire Supplementary Planning Guidance in this area obtained 1B, 1A, and 1F, which shows that the tasks are performed just satisfactorily. The analysis revealed that the Supplementary Planning Guidance identifies climate/air factors of East Renfrewshire, therefore assigning a B (satisfactory) assessment score for this sub review category. In terms of identifying key issues related to climate change impacts, the document explains the issues related to flood in detail with the help of flood risk management, flood maps, and guidance related to managing flood issues. The document also considers peat lands and carbon-rich soils of that area, which are highly significant to combat climate change issues. This task is done very efficiently therefore an assessment score of A is allotted for this sub review category. However, with regard to highlighting direct threats of climate change to wind turbines, the document did not provide any evidence and attempted the task very unsatisfactorily, therefore obtaining an assessment score of F, which means important tasks are poorly done or not attempted at all.

6.1.2.1.2 Review Area 2 - Identification & Evaluation of Alternatives Impact Analysis

Review area 2 deals with the issues related to the identification and evaluation of alternatives and impact analysis in the Supplementary Planning Guidance of East Renfrewshire. The overall analysis of this review area in East Renfrewshire Supplementary Planning Guidance reveals that the tasks are performed just satisfactorily in this review area, due to which the overall assessment score of the review area 2 (Identification and evaluation of alternatives and impact analysis) for East Renfrewshire Supplementary Planning Guidance is assigned as grade C (see table 6.9), which means the document in review area 2 is considered just satisfactory despite few omissions and inadequacies in the tasks performed to integrate climate change impacts in the plan. Figure 6.45 presents the overall analysis result of review area 2 of East Renfrewshire Supplementary Planning Guidance.



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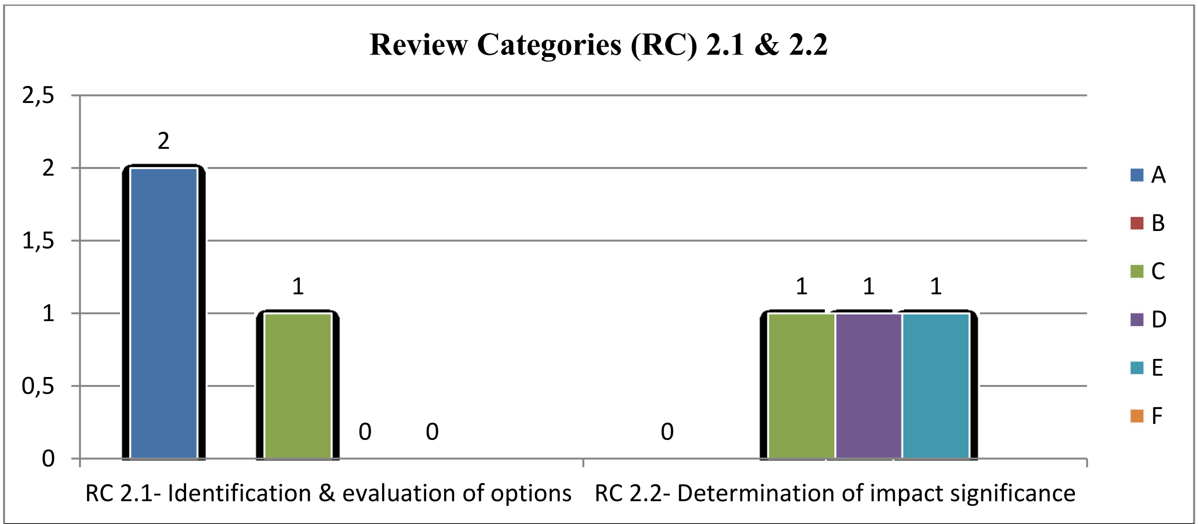
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.45 Results of review area 2 of Supplementary Planning Guidance of East Renfrewshire

There are two review categories in review area 2, such as review category 2.1- Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are shown in figure 6.46, which illustrates that in review category 2.1- Identification and evaluation of options, the document obtained 2As and 1C. The in-depth analysis reveals that the document provides a wide range of alternatives in terms of suitable sites for onshore wind energy development. For all alternative options, climate change issues which include peat land and carbon-rich soils are also assessed just satisfactorily. The document also describes that all the alternatives are selected with respect to Scottish Planning Policy (SPP, 2014) which also helps to protect environmental designation through spatial framework set in the Scottish Planning Policy (SPP, 2014). Considering the tasks performed in this review category and sub review category level, it was observed that the sub review categories are attempted just satisfactorily, thus assigning this review category with an overall assessment score of C, which means the tasks, could be considered just satisfactory despite omission and/or inadequacies.



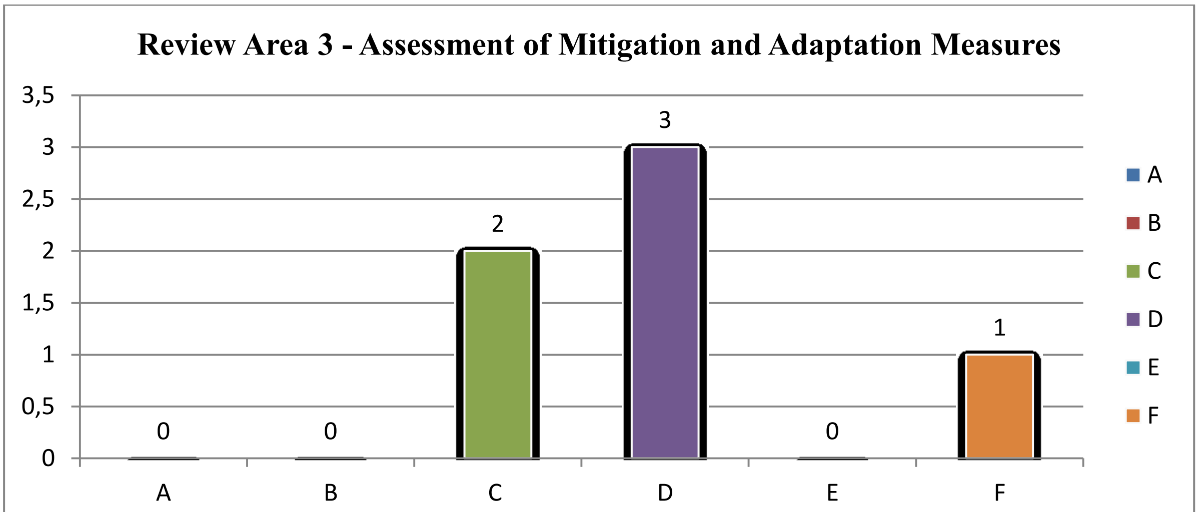
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.46 Performance of review category 2.1 & 2.2 of review area 2 of Supplementary Planning Guidance of East Renfrewshire

Review category 2.2 belongs to ´Determination of impact significance. The results of review category 2.2 are also demonstrated in figure 6.46 presenting that this review category obtained assessment scores of 1C, 1D and 1E (see table 6.9), giving the overall review category an unsatisfactory assessment symbol such as D. The analysis of this review category show that in terms of determination of impact significance of climate change issues the document mentions very subtly about current and historic trends in climate by providing very scarce information about this issue, therefore giving an assessment score of C in this sub review category. The document also barely identifies the cumulative impacts of wind farms of that area, due to which the document obtained an assessment score of D grade, which refers to an unsatisfactory symbol. In terms of the methodology used in identifying and predicting climate change influences, the document does not provide any information on how climate change impacts are predicted and identified. Due to these characteristics, the document is given an assessment score of D, which means that the tasks in this review category are considered as unsatisfactory because of omissions or inadequacies.

6.1.2.1.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

Review area 3 refers to the assessment of mitigation and adaptation measures of the East Renfrewshire Supplementary Planning Guidance. The analysis of this review area in the Supplementary Planning Guidance of East Renfrewshire, reveal that the document did not perform the task very well in this review area (see table 6.9), which ultimately gave the document an overall assessment score of D (unsatisfactory). Review area 3 (Assessment of mitigation and adaptation measures) is observed to be the worst performed review area of the Supplementary Planning Guidance when assessing the mitigation and adaptation measures of the East Renfrewshire Supplementary Planning Guidance. Figure 6.47 explains the analysis result of the review area 3 of Supplementary Planning Guidance, which is the assessment of mitigation and adaptation measures.



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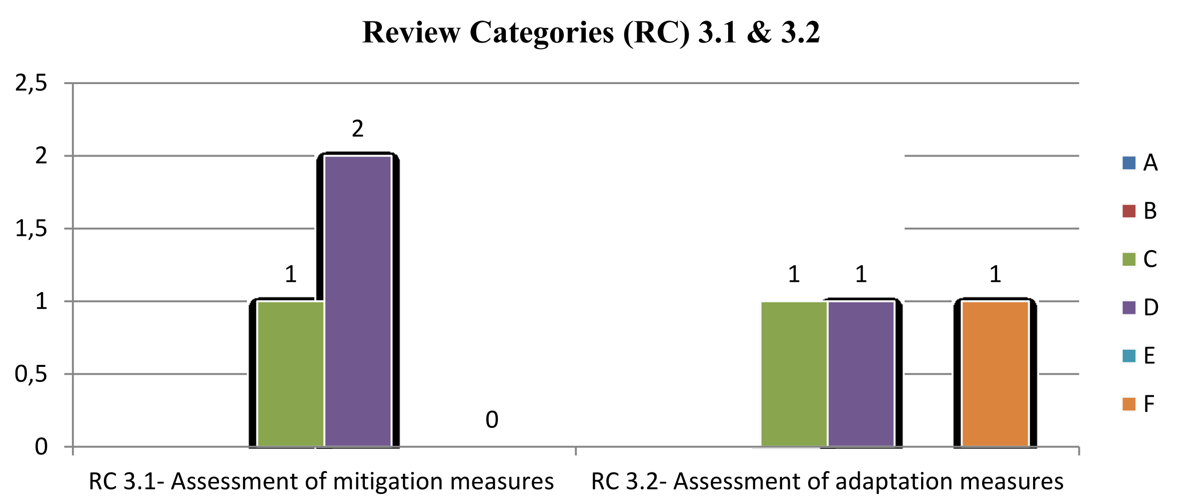
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.47 Results of review area 3 of Supplementary Planning Guidance of East Renfrewshire

The review area 3 has two review categories, such as review category 3.1- Assessment of mitigation measures and 3.2- Assessment of adaptation measures. Figure 6.48 present the performance of review category 3.1 (Assessment of mitigation measures) and 3.2 (Assessment of adaptation measures), which shows that in review category 3.1 (Assessment of mitigation measures), the document obtained 1C, and 2Ds, which means that in the Supplementary Planning Guidance the assessment of mitigation of impacts are highlighted very unsatisfactorily. In terms of mitigating negative impacts, the document obtained an assessment score of C (satisfactory) because it mentioned that if any impact is identified, mitigation measures would be set and implemented at a project level and will be dealt through the development management process. Mitigation of climatic impacts are also scarcely identified on the environment and on wind farms except for discussing flood issues, therefore allotting an assessment score of D in this sub review category (see table 6.9). The document does not provide any evidence of using methodology or approach for mitigation of impacts such as mitigation hierarchy, which again gives the document as assessment score of D grade, thus indicating that the tasks are incomplete and performed unsatisfactorily.



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D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
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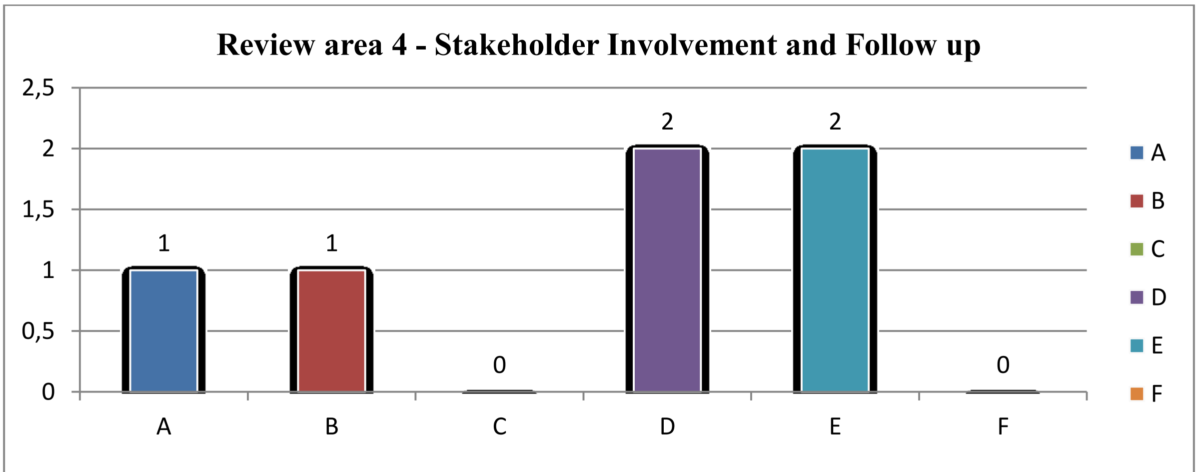
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.48 Performance of review categories 3.1 & 3.2 of review area 3 of Supplementary Planning Guidance of East Renfrewshire

Review category 3.2 focuses on the assessment of adaptation measures. The results of review category 3.2 are presented in figure 6.48, showing that this review category obtained 1D, 1F and 1C (see table 6.9), giving the overall review category a very unsatisfactory assessment symbol such as E. On evaluating this review category it was found out that the document does not stress much on adaptation solutions related to climate change effects, thus obtaining a D grade in this sub review category of review category 3.2. In addition to that, the Supplementary Planning Guidance does not provide any evidence of integrating adaptation measures with the mitigation measure, nor it identifies any preferred adaptation options in the context of climate change, therefore the assessment score for this sub review category is F which this the lowest score in the quality review package. Review category 3.2- Assessment of adaptation measures, is the worst performed review area with an overall assessment score of E (see table 6.9), which shows that the accomplished tasks are very unsatisfactory because the important tasks related to climate change inclusion are poorly done or not attempted at all.

6.1.2.1.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 refers to Stakeholder Involvement and Follow up in the East Renfrewshire Supplementary Planning Guidance. The overall analysis of this review area in SEA report showed that the document provided very unsatisfactory results in this review area with having D as an overall rating, which is a very unsatisfactory score in this quality review package. As shown in table 6.9 as well, the overall grade allocated for this review area is D, which means that the tasks performed in the document in this review area are not satisfactory due to significant omissions or inadequacies. Figure 6.49 shows the overall analysis result of review area 4 of East Renfrewshire Supplementary Planning Guidance.



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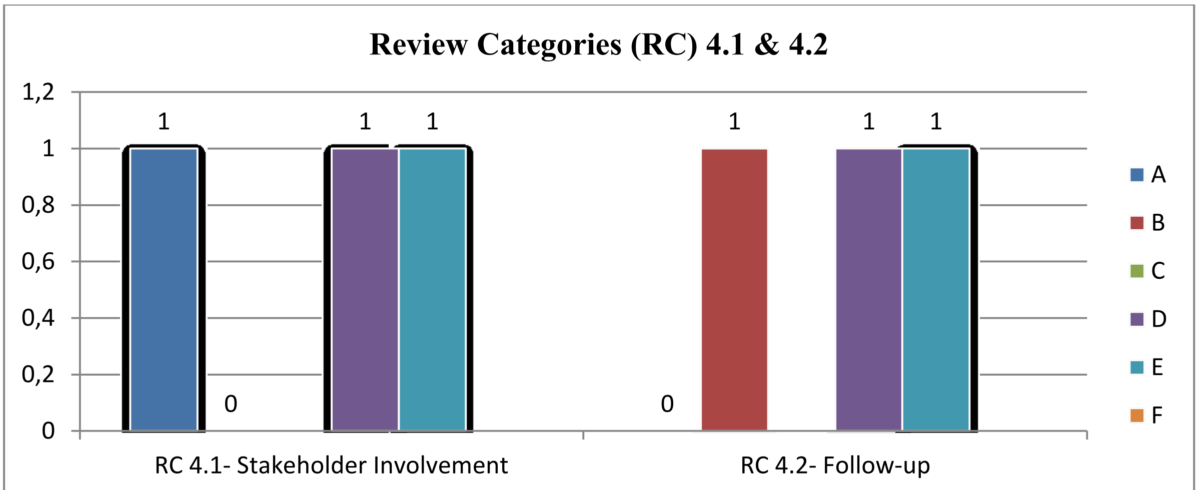
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.49 Results of review area 4 of Supplementary Planning Guidance of East Renfrewshire

The above figure 6.49 demonstrates that the document in this review area obtained assessment scores of 1A, 1B, 2Ds, and 2Es at category and sub category level. The review area 4 has two review categories, such as review category 4.1- Stakeholder Involvement and, 4.2- Follow up. The results of the review category 4.1 and 4.2 are shown in figure 6.50, which shows that in review category 4.1- Stakeholder Involvement, the document obtained 1D, 1A and 1E, which means that the document depicted a very poor and unsatisfactory result in tasks related to stakeholder involvement except for one task where it received an assessment score of A. The analysis reveals that the document was considered as weak and inadequate on identifying relevant stakeholder other than general public such as climate change experts. However, the consultation related matters are satisfactorily dealt in the document such as time frame of the consultation is clearly mentioned in the East Renfrewshire Supplementary Planning Guidance, thus giving the document a satisfactory assessment score of A. Lastly, in review category 4.1 the document did not provide any information about taking the comments of public participation into consideration, neither the document describes any procedure in engaging the stakeholder in the planning process. Considering all these inadequacies and weaknesses the final assessment score allotted for review category 4.1 (Stakeholder Involvement) is D (see table 6.9), which indicates that the performed tasks are very unsatisfactory because the important tasks related to climate change issues are poorly done or not attempted at all.



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C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.50 Performance of review categories 4.1 & 4.2 of review area 4of Supplementary Planning Guidance of East Renfrewshire

Review category 4.2 belongs to issues related to follow up such as monitoring and evaluation. The results of review category 4.2 are also displayed in figure 6.50 showing that this review category obtained 1B, 1E and 1D (see table 6.9), thus giving the overall review category an unsatisfactory assessment symbol such as D. The analysis of this review category show that in terms of identifying indicators used for monitoring climate change impacts, the East Renfrewshire Supplementary Planning Guidance provides information about indicators related to climate change impacts.

With regard to provisions for monitoring climate-related measures, the document does include relevant information about monitoring climatic factors such as precipitation, temperature along with flood areas. However, the East Renfrewshire Supplementary Planning Guidance does not provide any information about how monitoring is done, in order to be able to undertake appropriate remedial actions. Considering all these above mentioned tasks the document obtained a very unsatisfactory overall assessment score in this review category (4.2) such as D.

6.1.2.2 Stirling Supplementary Planning Guidance: Wind Energy Strategic Environmental Assessment, 2015

Based on the task performed in the document, the overall quality of the Stirling Supplementary planning Guidance of Wind Energy Strategic Environmental Assessment is evaluated as C, which means the document is just satisfactory in terms of climate change integration despite some omissions and inadequacies. The analysis showed various degrees of satisfactoriness and unsatisfactoriness in the tasks performed. According to the analysis of this document, review area 2 (Identification and evaluation of alternatives and impact analysis) is the best-performed review area and review area 4 which depicts stakeholder involvement and follow-up is the worst performed review area in terms of tasks performed to identify climate change issues.

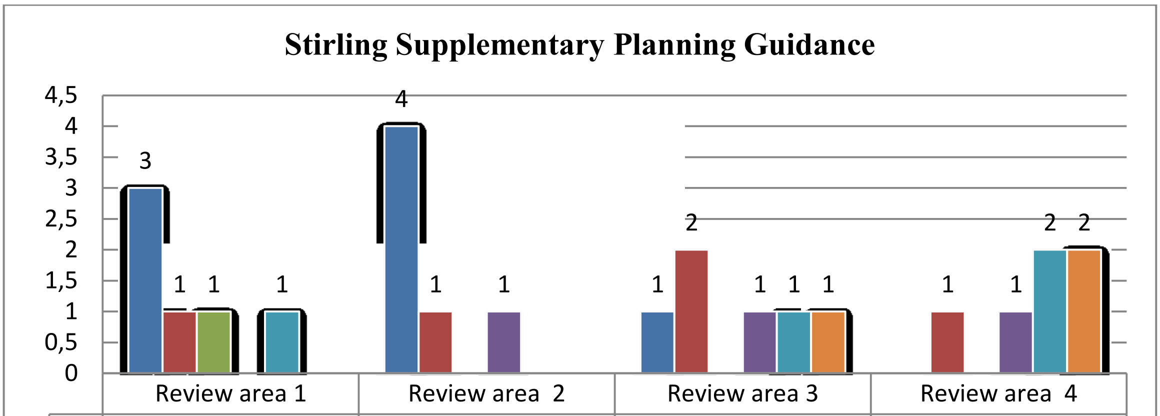
Table 6.11 present the performance of all the review areas and their grades allocated according to how well and poor the tasks are attempted in order to take climate change impacts into consideration. Based on the performance of the tasks to include climate change impacts in the SEA process of the onshore wind energy plan of Stirling the overall grade allocated to this document is C, which means that the tasks are performed just averagely when including climate change issues into the planning process.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	A	12	0	0	0	2	0	14	4.7	C	Just satisfactory	C	Just satisfactory	4.8	4.0	C	Just satisfactory
		SRC 1.1.2	E																
		SRC 1.1.3	A																
	RC - 1.2	SRC 1.2.1	B	6	5	4	0	0	0	15	5.0	B	Satisfactory						
		SRC 1.2.2	A																
		SRC 1.2.3	C																
RA 2	RC - 2.1	SRC 2.1.1	A	12	5	0	0	0	0	17	5.3	B	Satisfactory	B	satisfactory	5.2			
		SRC 2.1.2	B																
		SRC 2.1.3	A																
	RC - 2.2	SRC 2.2.1	D	12	0	0	3	0	0	15	5.0	B	Satisfactory						
		SRC 2.2.2	A																
		SRC 2.2.3	A																
RA 3	RC - 3.1	SRC 3.1.1	A	6	5	0	0	2	0	13	4.3	C	Just satisfactory	D	Just unsatisfactory	3.6			
		SRC 3.1.2	B																
		SRC 3.1.3	E																
	RC - 3.2	SRC 3.2.1	B	0	5	0	3	0	1	9	3.0	D	Just unsatisfactory						
		SRC 3.2.2	F																
		SRC 3.2.3	D																
RA 4	RC - 4.1	SRC 4.1.1	F	0	0	0	3	2	1	6	2.0	E	Not satisfactory	E	Not satisfactory	2.5			
		SRC 4.1.2	E																
		SRC 4.1.3	D																
	RC - 4.2	SRC 4.2.1	F	0	5	0	0	2	1	8	2.7	E	Not satisfactory						
		SRC 4.2.2	B																
		SRC 4.2.3	E																

Table 6.11 Assessment scores in Stirling Supplementary planning Guidance: Wind Energy Strategic Environmental Assessment, 2015

The following figure 6.51 shows a summary of all the review areas and their performance in general in Supplementary Planning Guidance of Stirling, showing the best and the least performed review areas.



	Review area 1	Review area 2	Review area 3	Review area 4
A	3	4	1	0
B	1	1	2	1
C	1	0	0	0
D	0	1	1	1
E	1	0	1	2
F	0	0	1	2

Figure 6.51 Individual performance of review areas of Supplementary Planning Guidance of Stirling

According to the degree of satisfactoriness (see figure 6.52), in which the main strengths and weaknesses of the document are displayed, most of the tasks in the review categories of all the review areas are satisfactorily attempted when integrating climate change impacts.

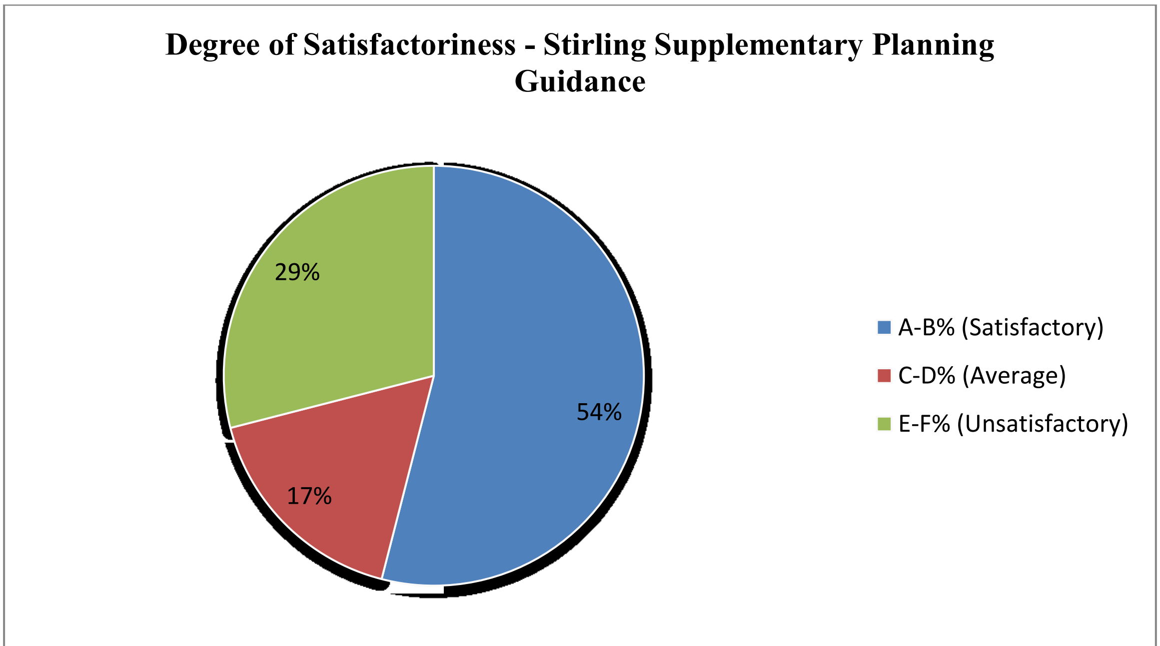


Figure 6.52 Degree of Satisfactoriness of Supplementary Planning Guidance of Stirling

Figure 6.52 shows that 54% of the document could be described as satisfactory (A-B%). The document attempted the task very adequately in most parts of the tasks and portrayed immense strength in addressing climate change issues, which resulted in accomplishing half of the tasks adequately. The analysis also shows that very few tasks (17%) are graded as just average (C-D%), where the tasks attempted are neither satisfactory nor unsatisfactory. While 29% of the documents showed unsatisfactory performance and attempted the significant tasks poorly (E-F%). Table 6.12 present the degree of satisfactoriness of all the review areas along with the cumulative score of the degree of satisfactoriness of the document.

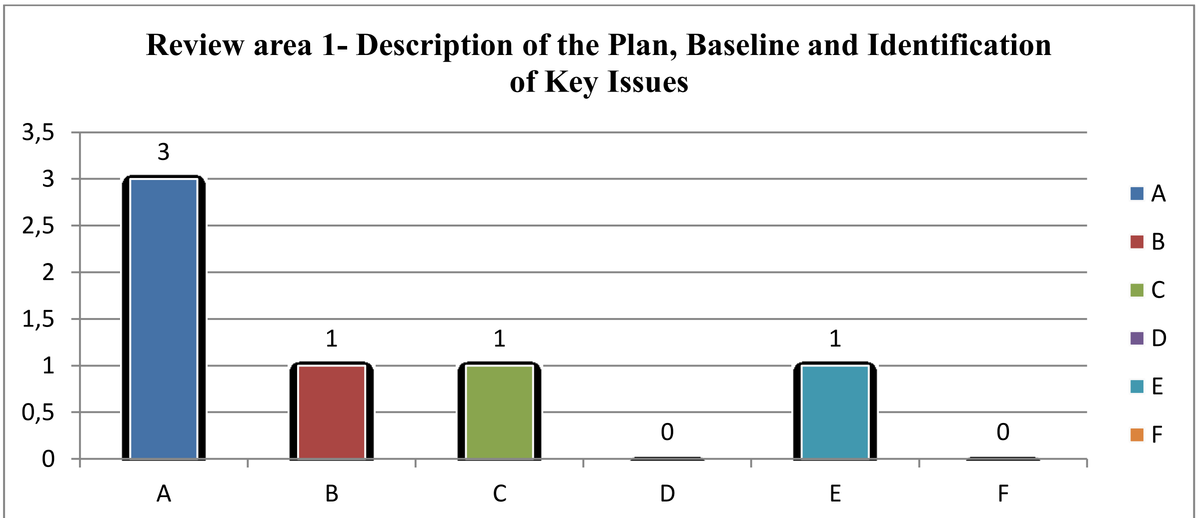
Stirling Supplementary Planning Guidance	**Assessment Scores**						**Degree of Satisfactoriness**		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of Key issues	3	1	1	0	1	0	67%	17%	17%
Review area 2- Identification and evaluation of alternatives and impact analysis	4	1	0	1	0	0	83%	17%	0%
Review Area 3 – Assessment of mitigation & adaption measures	1	2	0	1	1	1	50%	17%	33%
Review Area 4 – Stakeholder Involvement & Follow up	0	1	0	1	2	2	17%	17%	67%
Cumulative Score of all Review Areas	8	5	1	3	4	3	54%	17%	29%

Table 6.12 Degree of satisfactoriness of Supplementary Planning Guidance of Stirling

The following sections give a detailed analysis of how well the Stirling Supplementary Planning Guidance of wind energy Strategic Environmental Assessment considered climate change impacts through the quality review package.

6.1.2.2.1 Review Area 1 - Description of the Plan, Baseline & Identification of Key Issues

Review area 1 is based on the description of the plan, its baseline, and identification of key issues in the Stirling Supplementary Planning Guidance. The overall analysis of this review area in Stirling Supplementary planning Guidance showed that the tasks performed in this review area are mostly satisfactorily. The analysis revealed that the document provided a good description of the plan, its baseline conditions are well portrayed and the key issues related to climate change are mentioned effectively in the Supplementary Planning Guidance. The overall assessment score of review area 1 for Stirling Supplementary Planning Guidance is calculated as grade C, which means the document in review area 1 is just satisfactory despite omissions and / or inadequacies. Figure 6.53 illustrates the assessment result of review area 1 of Stirling Supplementary Planning Guidance. The following figure shows that the document in this review area obtained 3As, 1B, 1C, and 1E, thus giving the total score of C (satisfactory) for review area 1 (see table 6.11).



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F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.53 Results of review area 1 of Supplementary Planning Guidance of Stirling

The review area 1 has two review categories, such as review category 1.1- Plan and environmental baseline descriptions and 1.2- Identification and evaluation of key issues. Figure 6.54 present the analysis of review category 1.1 (Plan and environmental baseline descriptions) and 1.2 (Identification and evaluation of key issues), which indicates that in review category 1.1- Plan and environmental baseline descriptions, the document obtained

2As, and 1E which means that in the Supplementary Planning Guidance of Stirling, the assessment of the plan and environmental baseline descriptions are well highlighted with only a few omissions and inadequacies. The evaluation of the Stirling Supplementary Planning Guidance for review area 1 revealed that the SEA process is outlined and the objective of the plan is well explained. The document mentioned that its main objective of the plan is to meet the target of at least 30% of overall energy demand from renewables by 2020. However, the current and expected future climate baseline is not well depicted in the Supplementary Planning Guidance of Stirling thus obtaining an assessment score of E (unsatisfactory) in this sub review category. Moreover, in terms of describing how the proposed project is vulnerable to the impacts of climate change over its life span, the document mentions that the sites are assessed for flood risk with respect to Scottish Planning Policy (SPP, 2014). The document mentions that flood maps for Scotland are available to view online and further information and advice can be sought from the Council’s Flood Team and the SEPA´s website. Therefore, if flood risk is identified then a Flood Risk Assessment will be carried out following the guidance set out in SEPA’s document “Technical flood risk guidance for stakeholders”. The task in this sub review category of review category 1.1 is very well accomplished. Therefore, the assessment score given to this sub review category is A, which is the highest score in this quality review package. Due to these positive and few negative attributes, the documents scored just satisfactorily in the sub review categories of review category 1.1 with an overall assessment score of C (see table 6.11).

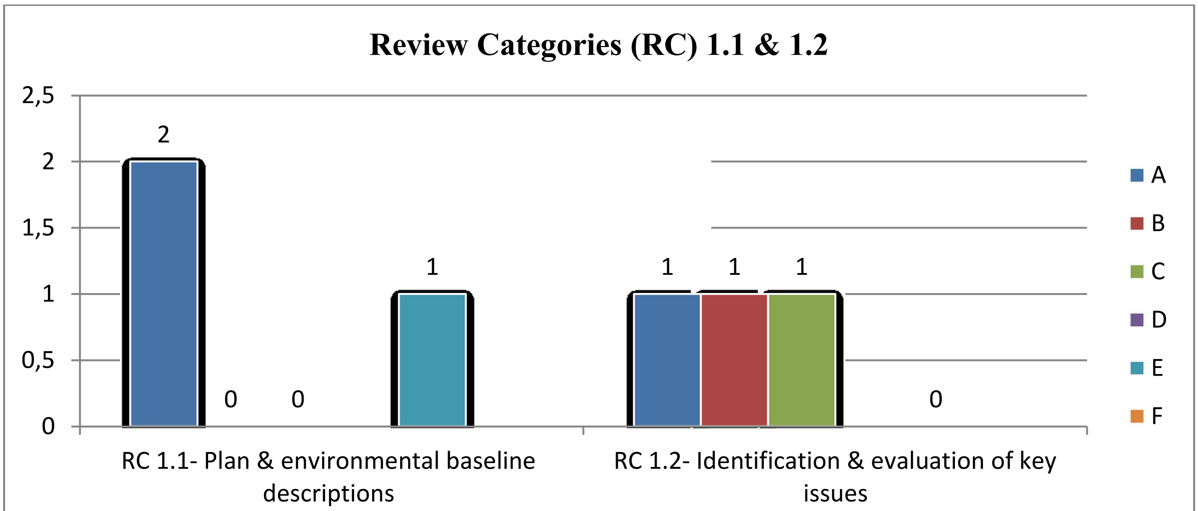

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Figure 6.54 Performance of review categories 1.1 & 1.2 of review area 1of Supplementary Planning Guidance of Stirling

The overall assessment score of C indicates that the tasks performed are just considered satisfactory despite omission and/or inadequacies. Review category 1.2 deals with the identification and evaluation of key issues. The results of review category 1.2 are also displayed in figure 6.54. The analysis revealed that the review category 1.2 (Identification and evaluation of key issues) obtained assessment scores of 1B, 1A, and 1C. The results of review category 1.2 shows that the Stirling Supplementary Planning Guidance in this area has performed the tasks satisfactorily. The analysis revealed that the Supplementary Planning Guidance identifies climate parameters of each option for this plan such as considering the air quality of the area. In terms of identifying key issues related to climate change impacts, the document comprehensively explains the issues related to flood in detail. It also refers to the SEPA guidance document for wetlands and "Technical flood risk guidance for stakeholder". The document also highlights a direct threat to wind turbines by providing information related to flood which can have negative effects on the turbines, therefore floodplains and wetlands are exempted from the plan. Considering how well documented the climate change issues are in this review category, the overall assessment score for review category 1.2 (Identification and evaluation of key issues) is B, which means the tasks are complete and performed satisfactorily. However, the combined score for review area 1 for Stirling Supplementary planning Guidance is C, which means the tasks performed are considered just satisfactory despite omission and/or inadequacies.

6.1.2.2.2 Review Area 2 - Identification & Evaluation of Alternatives a& Impact Analysis

This review area is based on the identification and evaluation of alternatives and analysis of impacts of the Stirling Supplementary Planning Guidance. The analysis of this review area in Stirling Supplementary Planning Guidance reveals that the document performed very efficiently in this review area and due to mostly strong attributes observed in this review category and sub review category level, the document obtained an assessment score of B grade, which signifies a satisfactory assessment score in the quality review package. The overall grade allocated for this review area is B as shown in table 6.11. Figure 6.55 illustrates the complete analysis result of review area 2 of Stirling Supplementary Planning Guidance, which is the identification and evaluation of alternatives and impact analysis.

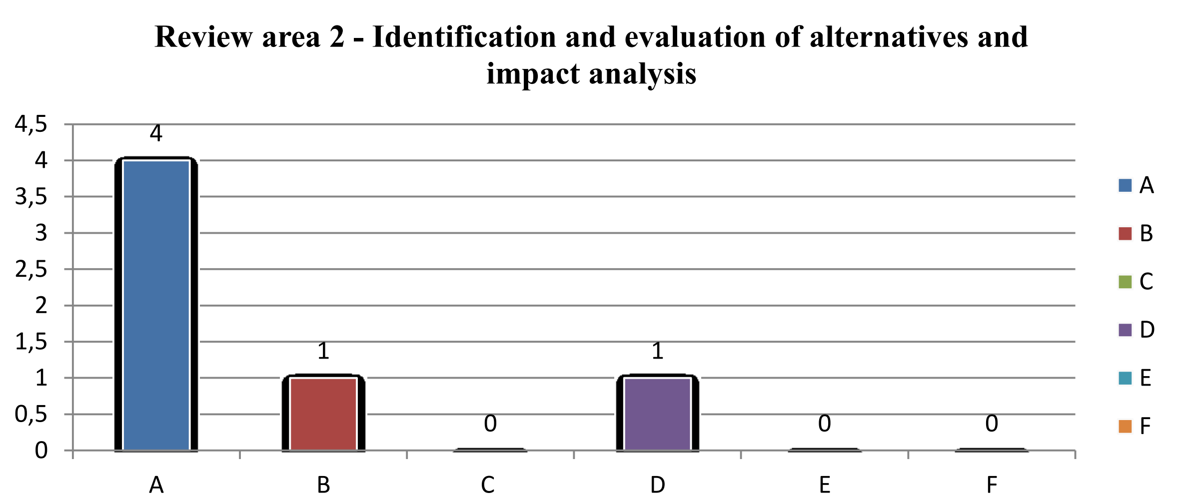

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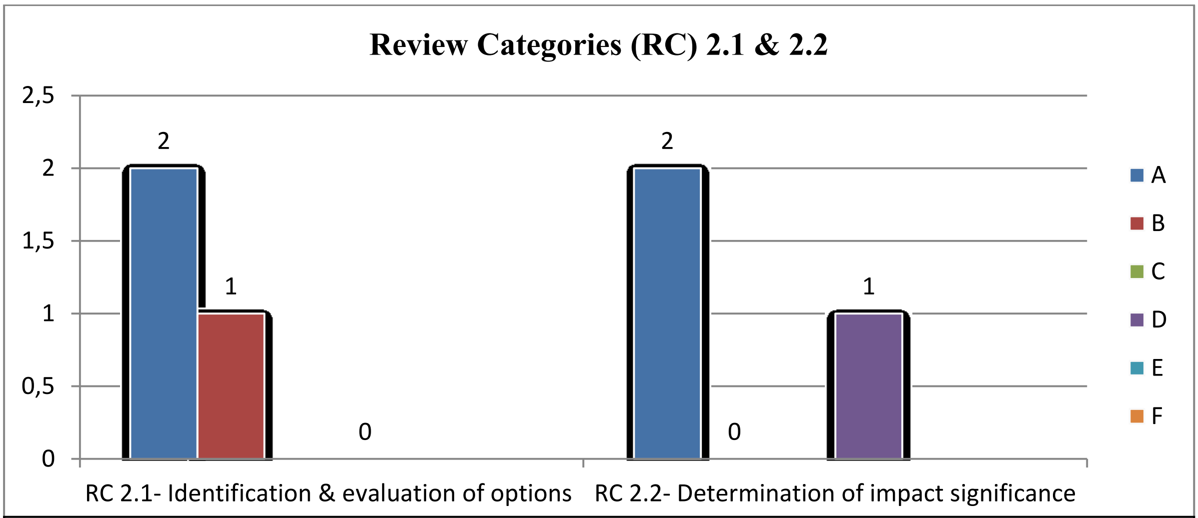
Figure 6.55 Result of review area 2 of Supplementary Planning Guidance of Stirling

The review area 2 is divided into two review categories, such as review category 2.1- Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are shown in figure 6.56, which indicates that in review category 2.1- Identification and evaluation of options, the document obtained 2As and 1B, which means that the document efficiently identified a wide range of alternative options in terms of suitable zones for onshore wind energy development. The document mentions that the alternatives are identified in terms of areas categorize under Scottish Planning Policy (SPP, 2014). While the identification of options, the climate change implications of the alternatives are assessed satisfactorily, which gives the document a B grade in the performance of this task. The document comprehensively described how reasonable alternatives were identified by mentioning the spatial framework for onshore wind energy development (see chapter four, table 4.1).

By taking into account all the positive characteristics of the Supplementary Planning Guidance, the document performed the tasks quite well in review category 2.1, thus obtaining a final assessment score of grade B, which means that the tasks are complete and performed satisfactorily when taking climate change issues into the planning process.



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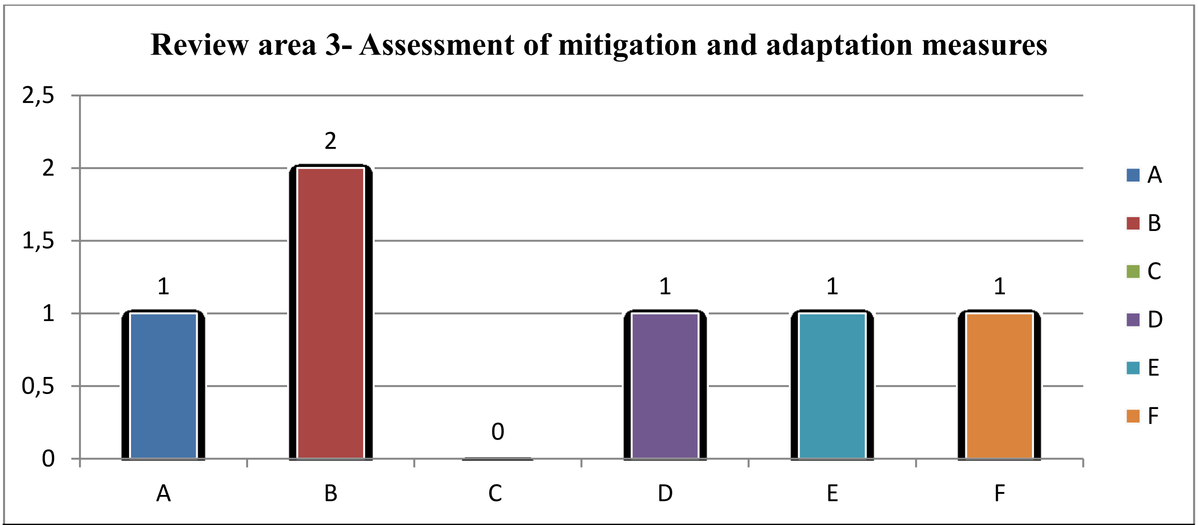
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.56 Performance of review categories 2.1 & 2.2 of review area 2 of Supplementary Planning Guidance of Stirling

Review category 2.2 addresses issues related to the determination of impact significance. The results of review category 2.2 are also exhibited in figure 6.56 showing that this review category obtained 2As and 1D (see table 6.11), giving the overall review category an assessment symbol of B, which depicts that the tasks in this review category are considered satisfactory. The assessment of this review category revealed that in terms of determination of impact significance of climate change issues the document did not include this information, however, it gave reference to a separate scoping report where the current and historic trends in climate of Stirling is mentioned in detail. Thus, giving this sub review category an assessment symbol of D, which means that the task is unsatisfactory. However, in terms of identifying the cumulative impacts of wind farms of that area, the document provides information regarding assessing the cumulative impacts of onshore wind energy developments, thus allocating an assessment score of A in this sub review category. On recognizing any approach in identifying and predicting any climate change impacts of Stirling, the document does not mention or indicates any methodology, however, it does mention about certain guidance (for flood, and peat lands,) on how to identify and predict climate change impacts. The assessment symbol assigned for this sub review category is A (well performed).

6.2.2.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

Review area 3 addresses the issues related to the assessment of mitigation and adaptation measures of the Stirling Supplementary Planning Guidance for wind energy parks. The overall analysis of this review area in Supplementary Planning Guidance of Stirling shows that the document did not execute the tasks so well in this review area which ultimately gave a very low overall score in review area 3 (Assessment of mitigation and adaptation measures). As shown in table 6.11 the overall grade assigned for this review area is D, which means the tasks related to review area 3 in this document are not satisfactory due to omissions and inadequacies. However, much better performance is observed in the Supplementary Planning Guidance regarding the assessment of mitigation measures. Figure 6.57 presents the overall analysis result of review area 3 of Supplementary Planning Guidance of Stirling wind energy parks, which is the assessment of mitigation and adaptation measures. The following figure shows that the document in this review area obtained 1A, 2Bs, 1D, 1E, and 1F, thus giving the total score of D (unsatisfactory) for review area 3 (Assessment of mitigation and adaptation measures).



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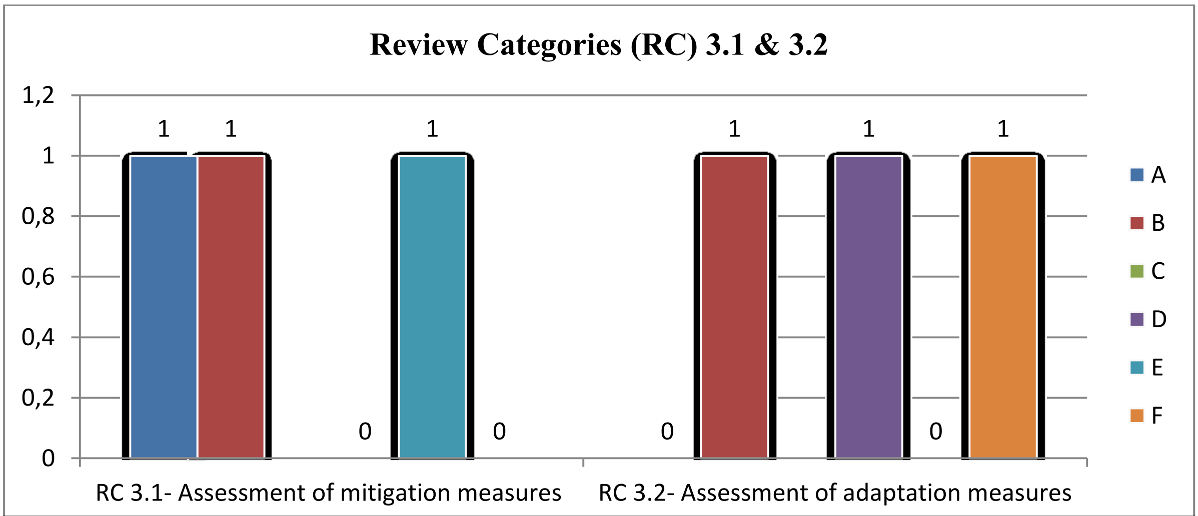
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.57 Results of review area 3 of Supplementary Planning Guidance of Stirling

The review area 3 has two review categories, such as review category 3.1- Assessment of mitigation measures and 3.2- Assessment of adaptation measures. The results of the review category 3.1 and 3.2 are shown in figure 6.58, which shows that in review category 3.1- Assessment of mitigation measures, the document obtained 1A, 1B and 1E, which means that the performed tasks in this review category are just satisfactory with an overall assessment score of C. In terms of mitigating negative environmental effects, the document highlights that the unnecessary engineering works should be avoided and the developer will be required to demonstrate the inclusion of all suitable mitigation measures to minimize adverse effects thus the assessment score assigned for this sub review category is A (well performed). Mitigation of climatic impacts are also discussed in the document by referring to guidance documents that help to mitigate the impacts of carbon-rich soils, peat lands, and wetlands. This sub review category obtained an assessment score of B (satisfactory). However, the document does not mention using any mitigation hierarchy as a tool to mitigate negative impacts where the impacts are first avoided, minimized, and then finally compensated. Therefore, in this sub review category, the document obtains an assessment symbol of E, which means the tasks performed in this sub review category is not satisfactory due to significant omissions or inadequacies. The overall assessment score allocated to this review area is C, which means the tasks are considered just satisfactory in this review category despite omissions and / or inadequacies.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.58 Performance of review categories 3.1 & 3.2 of review area 3 of Supplementary Planning Guidance of Stirling

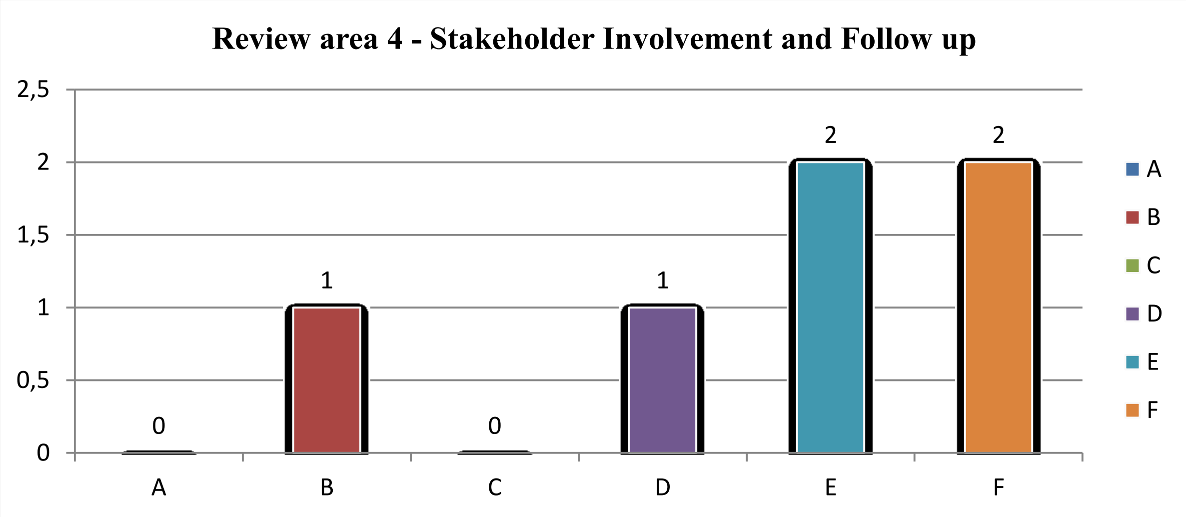
Review category 3.2 addresses the assessment of adaptation measures. The results of review category 3.2 are displayed in figure 6.58 presenting that based on the tasks performed this review category obtained 1B, 1F and 1D (see table 6.11), giving the overall review category an unsatisfactory assessment symbol such as D. On assessing the review category 3.2 (the assessment of adaptation measures) it was observed that the document did mention adaptation solutions related to climate change effects by highlighting that if flood risk is identified, then a flood risk assessment should be carried out according to the guidance set out in SEPA´s document "Technical Flood Risk Guidance for Stakeholders" therefore assigning an assessment symbol of B (satisfactory) for this sub review category of review category 3.2.

In addition to that, Supplementary Planning Guidance of Stirling does not provide any indications of incorporation of adaptation measures with the mitigation measure, nor it identifies any preferred adaptation options in the context of climate change. The overall assessment score of review category 3.2 (Assessment of adaptation measures), is D (see table 6.11), which indicates that the performed tasks are very unsatisfactory because of omissions or inadequacies.

6.2.2.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 is based on Stakeholder Involvement and Follow-Up in the Stirling Supplementary Planning Guidance. The overall analysis of this review area in Supplementary Planning Guidance of Stirling is found to be at an unsatisfactory degree with having E as an overall assessment score rating, which indicates that the tasks in Review area 4 (Stakeholder Involvement and Follow-Up) are considered unsatisfactory with significant omissions and inadequacies.

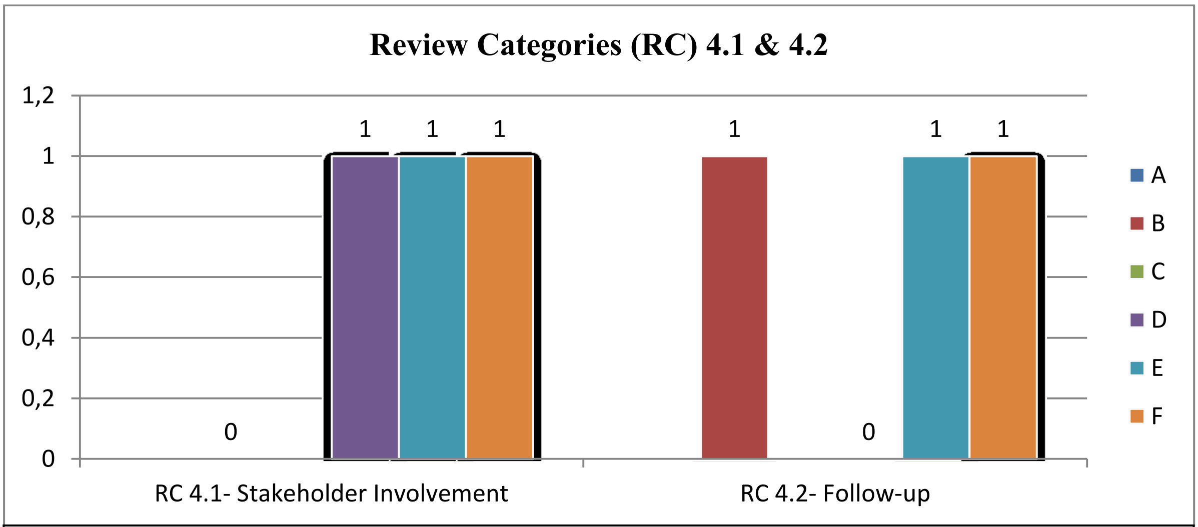
The overall score assigned for this review area is also shown in table 6.11. The assessment result of review area 4 of Supplementary Planning Guidance of Stirling for onshore wind energy is presented in Figure 6.59. The following figure demonstrates that the document in this review area obtained 1B, 1D, 2Es, and 2Fs scores at the category and sub category level.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.59 Result of review area 4 of Supplementary Planning Guidance of Stirling

The review area 4 addresses two review categories, such as review category 4.1- Stakeholder involvement and 4.2- Follow-up. Figure 6.60 illustrates the performance of review category 4.1 (Stakeholder involvement) and 4.2 (Follow-up), which indicates that in review category 4.1- Stakeholder involvement, the document obtained 1F, 1E, and 1D, which means that issues related to stakeholder involvement in the Stirling Supplementary Planning Guidance are approached in an extremely unsatisfactorily way, thus having an overall assessment of E (unsatisfactory) for review category 4.1(Stakeholder involvement). The analysis of the Stirling Supplementary Planning Guidance for review category 4.1 (Stakeholder involvement) shows that there are no proofs in the document whether or not there is any involvement of climate change experts apart from the general public. For not considering the climate change experts, the document obtained an F assessment score at this sub review category level, which means the tasks performed are very unsatisfactory and poorly done. Additionally, in review category 4.1- Stakeholder involvement, the document did not provide any information about defining the time frame of the consultation thus acquiring an E grade at sub review category level for this review category. In addition to that the document provides no information about the decision taken by the management after the public consultation, thus obtaining an assessment score of D in this sub review category of review category 4.1 (Stakeholder involvement). Considering all the assessment scores of sub review categories in this review category it is observed that this review category is the worst performed in terms of tasks attempted thus having an overall assessment score of E in this review category.



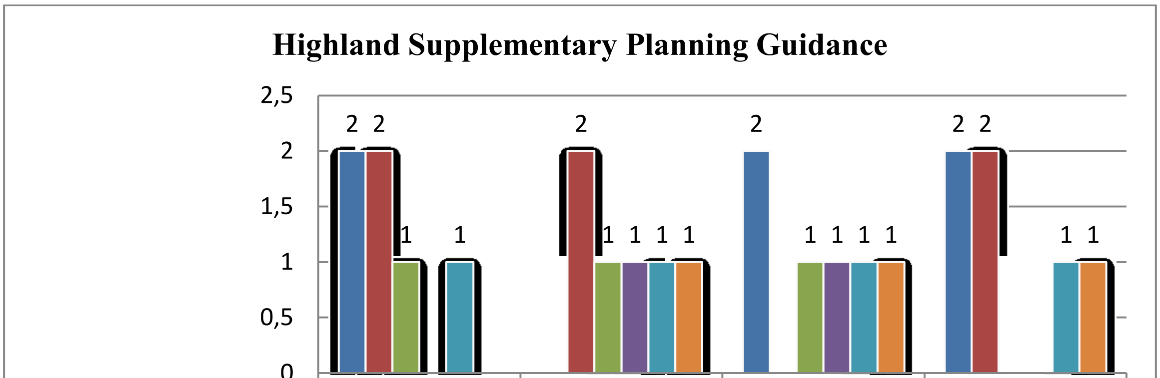
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.60 Performance of review categories 4.1 & 4.2 of review area 4 of Supplementary Planning Guidance of Stirling

Review category 4.2 – belongs to Follow-up such as monitoring and evaluation. The results of review category 4.2 are also displayed in figure 6.60 showing that this review category obtained 1F, 1B, and 1E. The results of this review category show that the Stirling Supplementary Planning Guidance performed the tasks related to monitoring and evaluation very unsatisfactorily. As it also shows in table 6.11 that the overall assessment score allotted for this review category is E, which means that the tasks performed are not satisfactory due to significant omissions or inadequacies. According to the analysis, the Stirling Supplementary Planning Guidance does not provide any information regarding the indicators used for monitoring climate change issues. However, with regard to provisions used for monitoring climate-related measures, guidance documents are used to monitor climate change issues. This characteristic gave the document an assessment score of B (satisfactory). In addition, there is no methodology explained in the document about how monitoring is done, thus obtaining a very low score in all the sub review categories of review area 4.2 (Follow-up) due to which an assessment score of E is given to this review category.

6.1.2.3 Highland Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2016

Based on the quality of the Highland Supplementary Guidance for onshore wind energy strategic environmental assessment, it was noticed that the quality of the document is just average in terms of highlighting climate change impacts. The grades obtained in all the review areas are either just satisfactory or just unsatisfactory, which made the overall assessment score as C, which means the document is just satisfactory despite omissions and inadequacies. Figure 6.61 presents a summary of the performance of all the review areas based on their grades.



	Review area 1	Review area 2	Review area 3	Review area 4
A- Well performed	2	0	2	2
B- Satisfactory	2	2	0	2
C- Just satisfactory	1	1	1	0
D- Just unsatisfactory	0	1	1	0
E- Not satisfactory	1	1	1	1
F- Very unsatisfactoy	0	1	1	1

Figure 6.61 Individual performance of review areas of Supplementary Planning Guidance of Highland

The above figure depicts the assessment scores of Highland Supplementary Guidance in all the review areas, showing the best performed and the worst performed review areas in terms of incorporating climate change impacts in the document. According to the figure review area 1 is comparatively better performed then the rest of the review areas based on attempting the tasks of the review categories. Table 6.13 also shows the assessment scores of all the sub review categories, review categories, and the review areas. These grades are assigned based on the tasks they performed in terms of integrating climate change impacts in the document.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	A	6	5	0	0	2	0	13	4.3	C	Just satisfactory	C	Just satisfactory	4.7	4.0	C	Just satisfactory
		SRC 1.1.2	B																
		SRC 1.1.3	E																
	RC - 1.2	SRC 1.2.1	B	6	5	4	0	0	0	15	5.0	B	Satisfactory						
		SRC 1.2.2	A																
		SRC 1.2.3	C																
RA 2	RC - 2.1	SRC 2.1.1	B	0	10	0	0	0	1	11	3.7	D	Just unsatisfactory	D	Just unsatisfactory	3.3			
		SRC 2.1.2	F																
		SRC 2.1.3	B																
	RC - 2.2	SRC 2.2.1	C	0	0	4	3	2	0	9	3.0	D	Just unsatisfactory						
		SRC 2.2.2	D																
		SRC 2.2.3	E																
RA 3	RC - 3.1	SRC 3.1.1	A	12	0	0	3	0	0	15	5.0	B	Satisfactory	D	Just unsatisfactory	3.7			
		SRC 3.1.2	D																
		SRC 3.1.3	A																
	RC - 3.2	SRC 3.2.1	E	0	0	4	0	2	1	7	2.3	E	Not satisfactory						
		SRC 3.2.2	F																
		SRC 3.2.3	C																
RA 4	RC - 4.1	SRC 4.1.1	F	6	0	0	0	2	1	9	3.0	C	Just satisfactory	C	Just satisfactory	4.2			
		SRC 4.1.2	E																
		SRC 4.1.3	A																
	RC - 4.2	SRC 4.2.1	B	6	10	0	0	0	0	16	5.3	B	Satisfactory						
		SRC 4.2.2	B																
		SRC 4.2.3	A																

Table 6.13 Assessment scores in Highland Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2016

The below table (6.14) depicts the strengths and weaknesses of the document in Highland Supplementary Planning Guidance for onshore wind energy development in the form of percentages in all the review areas.

Highland Supplementary Planning Guidance	**Assessment Scores**						**Degree of Satisfactoriness**		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of Key issues	2	2	1	0	1	0	67%	17%	17%
Review area 2- Identification and evaluation of alternatives and impact analysis	0	2	1	1	1	1	33%	33%	33%
Review Area 3 – Assessment of mitigation & adaption measures	2	0	1	1	1	1	33%	33%	33%
Review Area 4 – Stakeholder Involvement & Follow up	2	2	0	0	1	1	67%	0%	33%
Cumulative Score of all Review Areas	6	6	3	2	4	3	50%	21%	29%

Table 6.14 Degree of satisfactoriness of Supplementary Planning Guidance of Highland

Figure 6.62 shows the visual representation of the degree of satisfactoriness, illustrating that 50% of the tasks in the document in terms of focusing on issues of climate change are satisfactorily carried out, while 21% were graded as just average (C-D%) where the tasks attempted are not satisfactory nor unsatisfactory(C-D%), and almost 29% of the tasks in this document are poorly attempted in terms of considering climate change issues into the document.

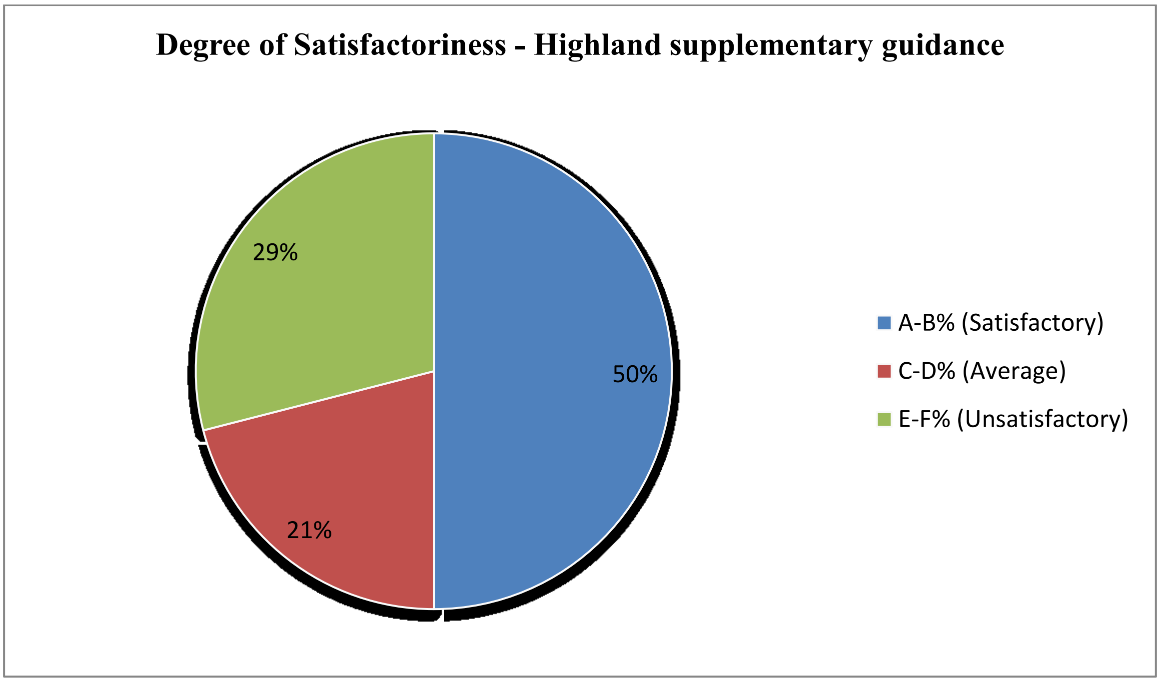
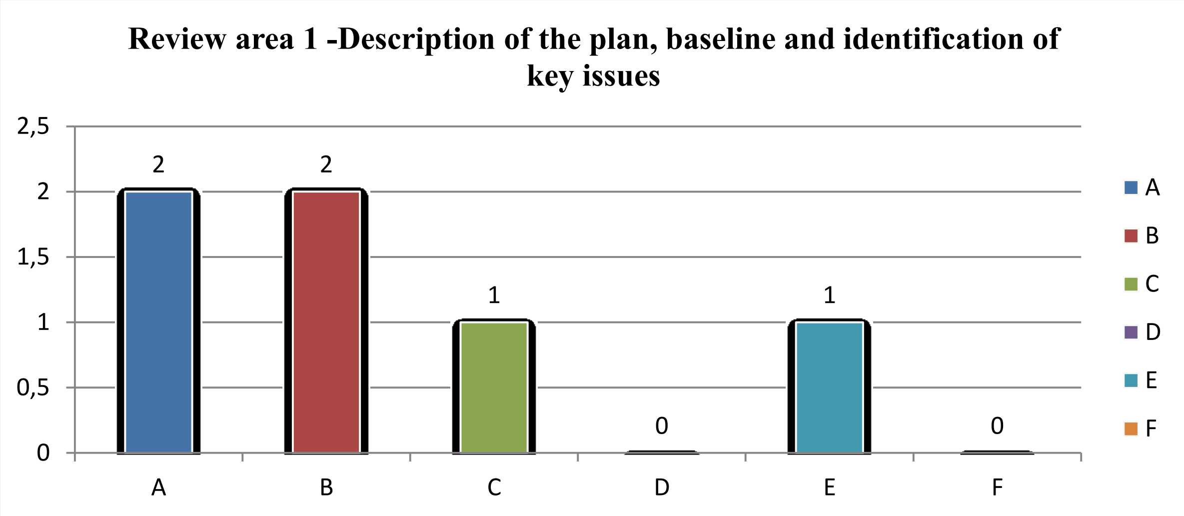


Figure 6.62 Degree of satisfactoriness of Supplementary Planning Guidance of Highland

A detailed analysis of how the Highland supplementary guidance performed in all four review areas is explained in the following section describing the document's strengths and weaknesses in all review topics.

6.1.2.3.1 Review Area 1 - Description of the Plan, Baseline & Identification of Key Issues

Review area 1 is based on the description of the plan, its baseline, and identification of key issues in the Highland Supplementary Planning Guidance for onshore wind energy. The overall analysis of review area 1 (Description of the plan, baseline, and identification of key issues) in Highland Supplementary Planning Guidance indicates that this review area is relatively well conducted, with an overall assessment score of C grade, which means that the review is considered just satisfactory despite omissions and/or inadequacies. The analysis revealed that the document provided a good description of the plan, its baseline conditions are well represented and the key issues related to climate change are exhibited effectively in the Highland Supplementary Planning Guidance for onshore wind energy. Figure 6.63 illustrates the overall analysis result of review area 1 of Highland Supplementary Planning Guidance, which shows that the document in this review area obtained 2As, 2B, 1C, and 1E scores at category and sub category level.



A - Relevant tasks well performed, no important tasks left incomplete.
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D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.63 Results of review area 1 of Supplementary Planning Guidance of Highland

The review area 1 is further divided into two review categories, such as review category 1.1- Plan and environmental baseline descriptions and 1.2- Identification and evaluation of key issues. Figure 6.64 illustrates the performance of review category 1.1 (Plan and environmental baseline descriptions) and 1.2 (Identification and evaluation of key issues), which indicates that in review category 1.1- Plan and environmental baseline descriptions, the document obtained 1A, 1B and 1E, which means that in the Highland Supplementary Planning Guidance, the tasks relevant to the description of the plan and environmental baseline are quite well conducted.

According to the analysis of review category 1.1, the Highland Supplementary Planning Guidance for onshore wind energy highlights the contents, SEA process, and main objectives of the plan very clearly. The document provides evidence regarding the current climate baseline of the area. In addition to that, the document also presents information on the consideration of extreme weather events in the planning area to avoid any damage to the wind energy infrastructure. The Highland Supplementary Planning Guidance for onshore wind energy integrates the climate change issues quite well in review category 1.1 (Plan and environmental baseline descriptions) thus obtaining a C assessment score in this review category which is relatively satisfactory.

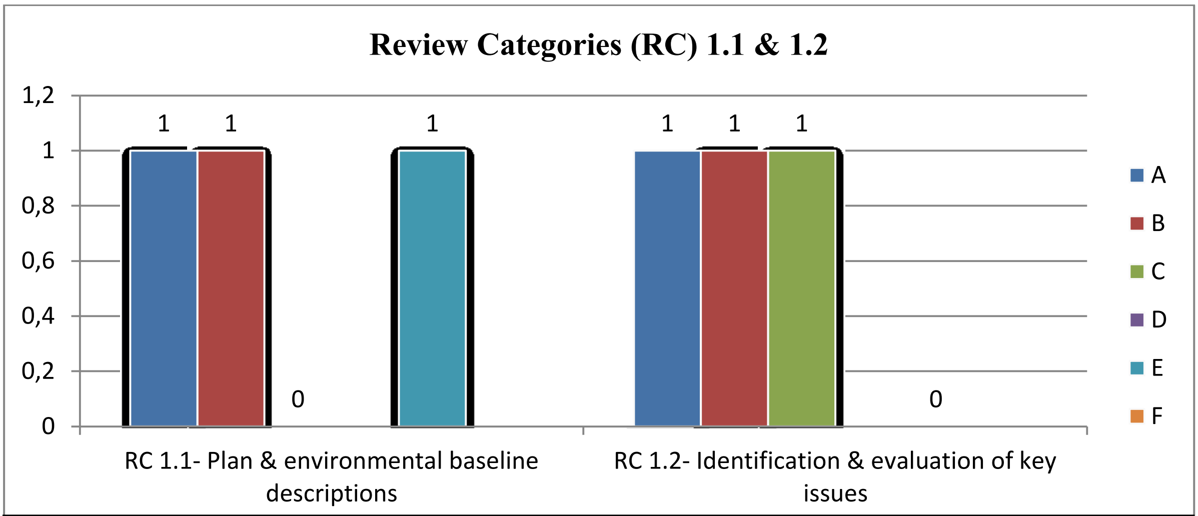

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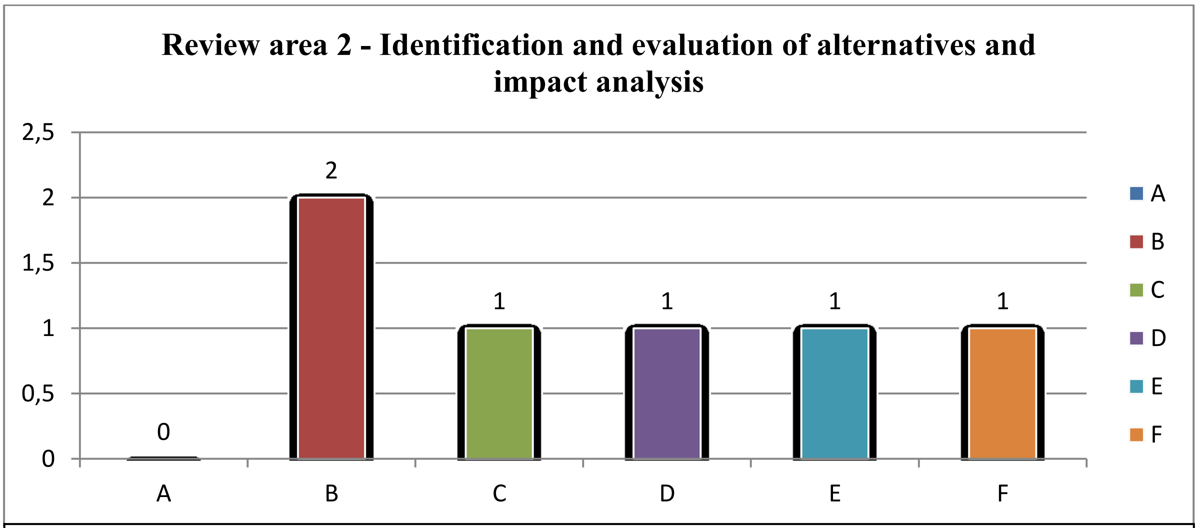
Figure 6.64 Performance of review categories 1.1 & 1.2 of review area 1of Supplementary Planning Guidance of Highland

Review category 1.2 – deals with the identification and evaluation of key issues. The results of review category 1.2 are also displayed in figure 6.64. The analysis revealed that the review category 1.2 (Identification and evaluation of key issues) on the sub review category level, obtained assessment scores of 1B, 1A, and 1C. The results of review category 1.2 show that the Highland Supplementary Planning Guidance for onshore wind energy in this area has performed the tasks very satisfactorily. The analysis revealed that the document identifies climate parameters by mentioning about air quality and rainfall patterns of that area, thus obtaining an assessment score of B (satisfactory) in this sub review category. In terms of identifying key issues related to climate change impacts, the document explains the issues related to flood, storm events, changes in rainfall patterns, increased temperature as well as rises in sea level as they may have an effect on the coastal communities throughout the plan area. It also discusses issues related to peat lands, by mentioning that the carbon storage potential in Highland (both in the existing woodland and reserves of peat) are key carbon sinks that have to be carefully managed in relation to wind energy development. Considering all these pieces of information, the assessment score given to this sub review category is A, which means that the relevant tasks are well performed with no task left incomplete. In terms of direct climate change threats to wind energy infrastructure, the documents do refer to strong weather events such as storms and extreme rainfall, but the information is quite indirect therefore the assessment score assigned for this sub review category is C (just satisfactory). In view of how well the climate change issues are documented in this review category, the overall assessment score for review category 1.2 (Identification and evaluation of key issues) is B, which means the tasks are complete and performed satisfactorily.

6.1.2.3.2 Review Area 2 - Identification & Evaluation of Alternatives & Impact Analysis

Review area 2 deals with the issues related to the identification and evaluation of alternatives and impact analysis in the Highland Supplementary Planning Guidance for onshore wind energy. The overall analysis of this review area in Highland Supplementary Planning Guidance reveals that the tasks are performed bit unsatisfactorily in this review area, due to which the overall assessment score of the review area 2 (Identification and evaluation of alternatives and impact analysis) was calculated as grade D (see table 6.13), which means that the review categories in the document for review area 2 are considered unsatisfactory because of omissions or inadequacies in the tasks performed. Figure 6.65 illustrates the overall analysis result of review area 2 of Highland Supplementary Planning Guidance for onshore wind energy development, which shows that the review area obtained 2Bs, 1C, 1D, 1E, and 1F at sub review categories level of review area 2.



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C - Can be considered just satisfactory despite omissions and/or inadequacies
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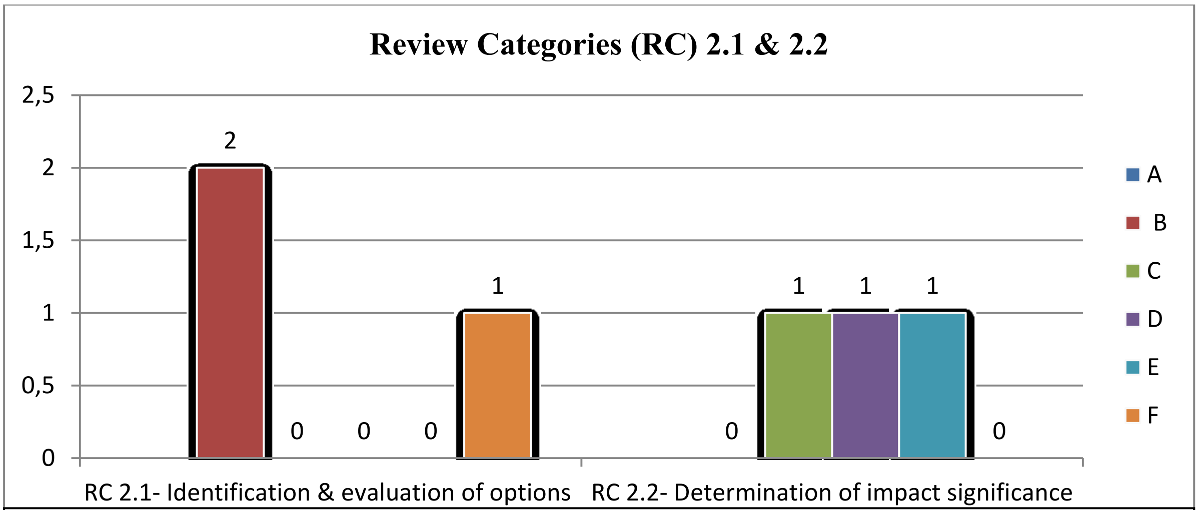
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.65 Results of review area 2 of Supplementary Planning Guidance of Highland

The review area 2 is further divided into two review categories, such as review category 2.1- Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are presented in figure 6.66, which demonstrate that in review category 2.1- Identification and evaluation of options, the document obtained 1B, 1F and, 1B, which means that the document considers a wide range of alternatives in terms of suitable sites for wind energy development. The reasonable alternatives are assessed through the assessment matrix. Thus giving an assessment score of B (satisfactory) in this sub review category.

However, climate change implications are not assessed while considering alternatives. This is the only limitation observed in the review category in which an assessment score of grade F is given, which means this task in review category 2.1 is not well attempted and therefore is considered very unsatisfactory due to significant omissions and inadequacies. The Highland Supplementary Planning Guidance clearly describes how reasonable alternatives are identified, considering objectives, sustainability, and geographical scope of the plan. The document proves that alternatives are identified based on assessment matrix which is a method where the severity of an event occurs on one axis, and the probability of it occurring on the other, thus giving the document a B assessment score in this sub review category, which means that the task is generally satisfactory and complete, only with minor omissions and inadequacies.



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D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.66 Performance of review categories 2.1 & 2.2 of review area 2 of Supplementary Planning Guidance of Highland

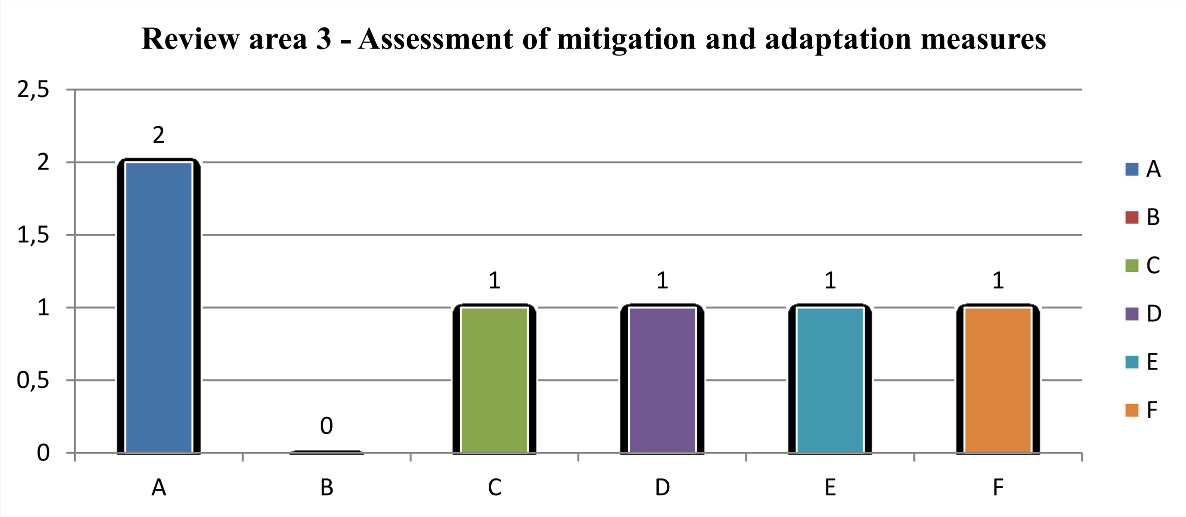
Review category 2.2 addresses the issues of ´Determination of impact significance´. The results of review category 2.2 are also demonstrated in figure 6.66 showing that this review category obtained 1C, 1D and 1E (see table 6.13), giving the overall review category an unsatisfactory assessment symbol such as D. The analysis of this review category show that in terms of determination of impact significance of climate change issues the document mentions about current and historic trends in climate in a very satisfactorily way by providing enough information about climatic conditions of the area. Thus giving this sub review category a C assessment symbol, which means that the task is considered as just satisfactory. The document does not identify the cumulative impacts of wind farms of that area, therefore allocating a D (unsatisfactory) assessment score for this sub review category.

In terms of the methodology used in identifying and predicting climate change impacts the document does not provide many details about this sub review category thus obtaining an assessment score of E, which means the tasks performed are not satisfactory due to significant omissions or inadequacies. Due to these attributes, the document was given an assessment score of D (unsatisfactory) for review category 2.2 which is the determination of impact significance in the Highland Supplementary Planning Guidance for onshore wind energy development.

6.1.2.3.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

Review area 3 is based on the assessment of mitigation and adaptation measures of the Highland Supplementary Planning Guidance for onshore wind energy development. The analysis of this review area in the document revealed that it did not perform the task so well in this review area (see table 6.13), which ultimately gave the document an overall score of D (unsatisfactory).

However, better performance is observed in the Highland Supplementary Planning Guidance when assessing the mitigation measures of the wind energy plan instead of evaluating adaptation measures. Figure 6.67 illustrates the analysis result of review area 3 of Highland Supplementary Planning Guidance for onshore wind energy development, which is the assessment of mitigation and adaptation measures. The following figure (6.67) shows that the review area obtained 2As, 1C, 1D, 1E, and 1F at sub review categories level of review area 3.



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C - Can be considered just satisfactory despite omissions and/or inadequacies
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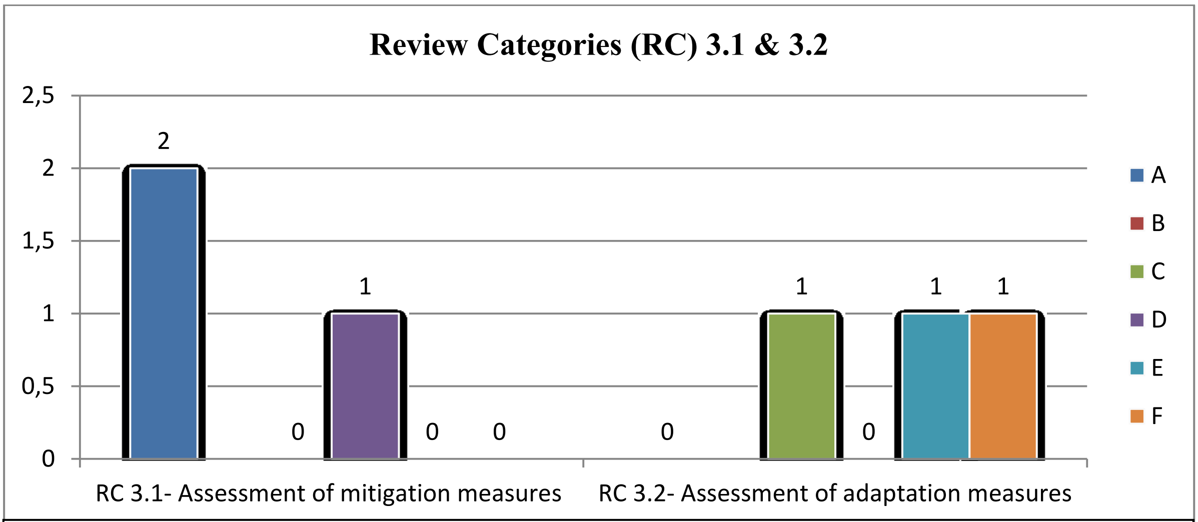
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.67 Results of review area 3 of Supplementary Planning Guidance of Highland

The review area 3 is divided into two review categories, such as review category 3.1- Assessment of mitigation measures and review category 3.2- Assessment of adaptation measures. The results of the review category 3.1 and 3.2 are shown in figure 6.68, which illustrate that in review category 3.1- Assessment of mitigation measures, the document obtained 2As, and 1D, which means that the document performed the tasks in this review category satisfactorily with an overall assessment score of B.

In terms of stating contingent plans to mitigate negative environmental effects, the document highlights the mitigation of impacts by making amendments in the finalized supplementary planning guidance to improve the environmental performance with respect to peat, soils, and constructional environmental management plans. Moreover, the document clearly and very comprehensively mentions using mitigation hierarchy as a tool to mitigate negative impacts where the impacts are first avoided, reduced, and then finally compensated.

Considering how well these tasks are performed in sub review category of review category 3.1, the overall assessment score allotted for this review category is B, which means that most of the tasks are generally satisfactory and complete with only minor omissions and inadequacies.



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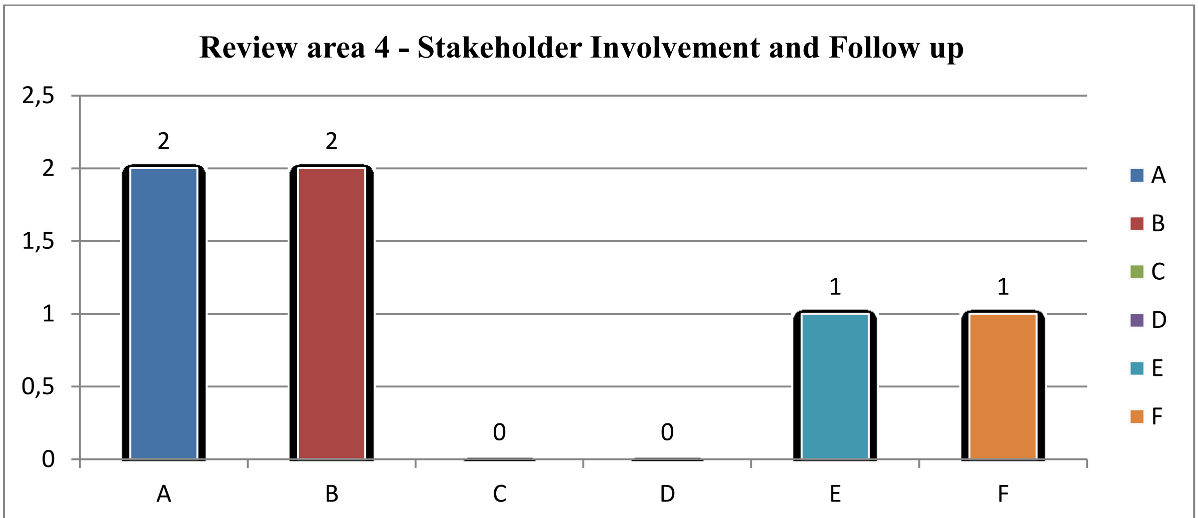
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.68 Performance of review categories 3.1 & 3.2 of review area 3 of Supplementary Planning Guidance of Highland

Review category 3.2 deals with the assessment of adaptation measures. The results of review category 3.2 are displayed in figure 6.68 showing that this review category obtained 1E, 1F, and 1C. The results show that the tasks in Highland Supplementary Planning Guidance for onshore wind energy development in review category 3.2 (Assessment of adaptation measures) are performed very incompetently since the grades obtained in this review category are mostly unsatisfactory. The analysis revealed that since the tasks related to the assessment of adaptation measures are performed unsatisfactorily, therefore the overall grade assigned for this review category is E, which means the tasks performed are not satisfactory due to significant omissions or inadequacies. The Highland Supplementary Planning Guidance does not provide any information about adaptation solutions that are technically feasible to address projected climate vulnerabilities, therefore assigning an E assessment symbol in this sub review category. The document does not mention about the integration of adaptation measures with the mitigation measures to efficiently tackle climate change effects, as a result, this sub review category also gained an assessment score of F, which indicates that the important tasks are poorly attempted therefore very unsatisfactory. However, in terms of identifying the preferred adaptation measures in the context of climate change, the Highland Supplementary Planning Guidance uses SEPA (Scottish Environment Protection Agency) guidance documents and maps for adaptation to the effects of climate change, for this sub review category the document was given a C assessment score which means the tasks can be considered just satisfactory despite omissions and/or inadequacies.

6.1.2.3.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 is based on the issues related to Stakeholder Involvement and Follow up in the Highland Supplementary Planning Guidance for onshore wind energy development. The overall analysis of this review area in Highland Supplementary Planning Guidance shows that the document provided a relatively satisfactory result in this review area with having C as an overall rating. As shown in table 6.13 as well, the overall grade allocated for this review area is C, which means the tasks can be considered just satisfactory despite omissions and/or inadequacies. Figure 6.69 demonstrates the overall analysis result of review area 4 (Stakeholder Involvement and Follow up) of Highland Supplementary Planning Guidance for onshore wind energy development. The following figure (6.69) exhibits that the document in this review area obtained 2As, 2Bs, 1E, and 1F scores at the category and sub category level.



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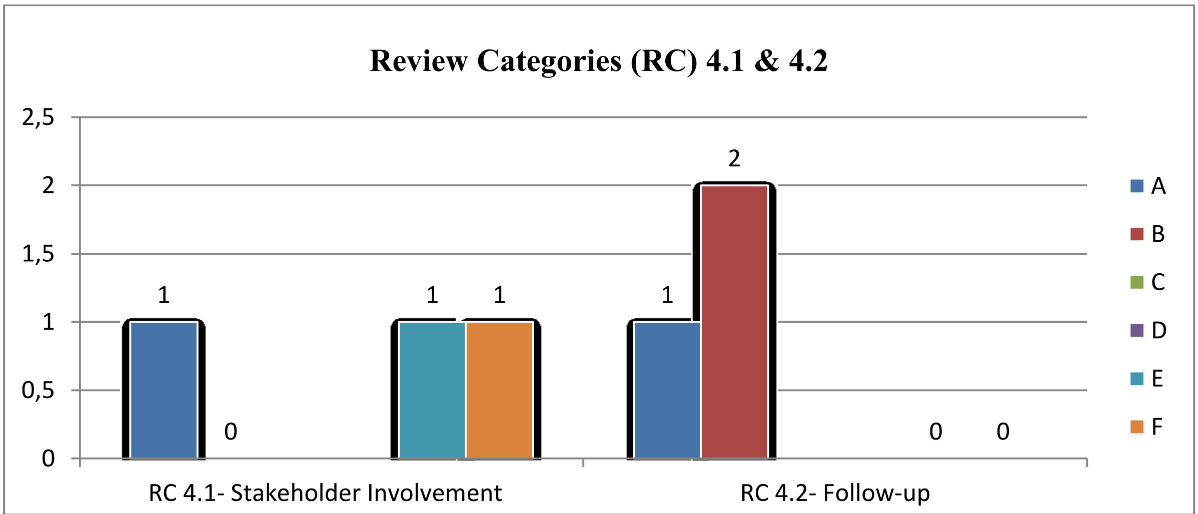
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.69 Results of review area 4 of Supplementary Planning Guidance of Highland

The review area 4 has two review categories, such as review category 4.1- Stakeholder Involvement and, 4.2- Follow-up. The results of the review category 4.1 and 4.2 are shown in figure 6.70, which shows that in review category 4.1- Stakeholder Involvement, the document obtained 1F, 1E, and 1A, which means that the document depicted just satisfactory and an average result in tasks related to stakeholder involvement. The analysis reveals that the document failed to identify relevant stakeholders other than the general public such as climate change experts, therefore obtaining an assessment score of F in this sub review category, which indicates very unsatisfactory results where the important task is completely not done. Secondly, the consultation related matters are poorly dealt with in the Highland Supplementary Planning Guidance such as no time frame is mentioned in the document about public consultation, therefore assigning an assessment symbol of E (unsatisfactory). Lastly, in the review category 4.1, the document showed a very satisfactory trait in incorporating the comments of public participation in the Highland Supplementary Planning Guidance for onshore wind energy development, due to which the document obtained an A (well performed) assessment symbol for this sub review category.

Considering all these strengths and weaknesses the overall assessment score allotted for review category 4.1 is C (see table 6.13), which indicates that the performed tasks are generally satisfactory despite omissions and/or inadequacies.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.70 Performance of review categories 4.1 & 4.2 of review area 4 of Supplementary Planning Guidance of Highland

Review category 4.2 – belongs to Follow-up such as monitoring and evaluation. The results of review category 4.2 are also displayed in figure 6.70 showing that this review category obtained 2Bs and 1A. The results of this review category show that the Highland Supplementary Planning Guidance performed the tasks satisfactorily in review category 4.2

(Follow-up). In terms of indicators used for monitoring climate change effects, the document does identify monitoring indicators in many places in the Highland Supplementary Planning Guidance, thus allocating an assessment grade of B (satisfactory) for this sub review category. In addition to that, the document also includes provisions for monitoring climate-related measures by providing information about monitoring climatic factors and also outlining its indicators. The task performed in this sub review category is also satisfactory thus assigning an assessment symbol of B for this sub review category as well.

Moreover, the Highland Supplementary Planning Guidance mentions about the methodology used for monitoring, by providing a relevant monitoring framework and also highlighting this information that for monitoring to be effective, it has to be linked to both the SEA objectives and the objectives of the Supplementary Planning Guidance. In view of how well the task is performed, an assessment score of A is given to this sub review category of review category 4.2. The overall assessment score allocated to this review category is C, which means the document in this review area is relatively satisfactory despite omissions or inadequacies.

6.1.2.4 Moray Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2015

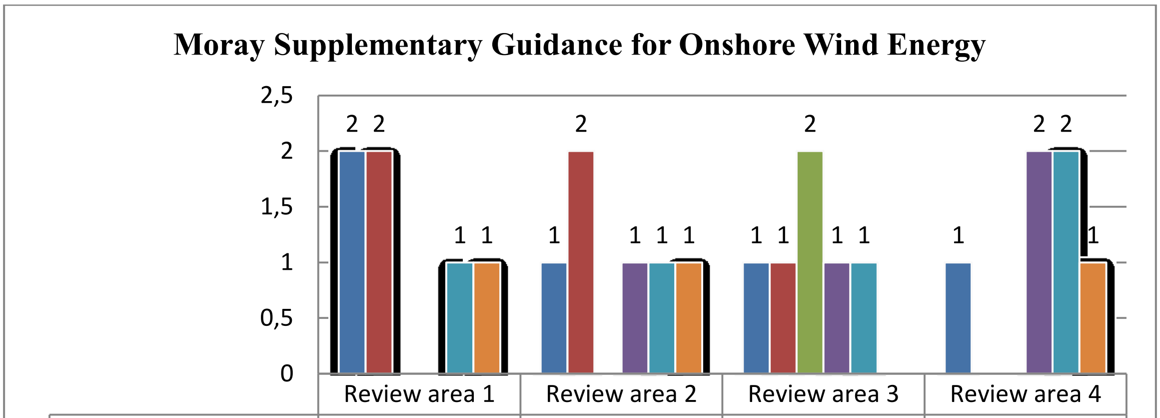
The performance of all the review areas in Moray Supplementary Guidance for onshore wind energy strategic environmental assessment, with regard to integrating climate change impacts, are found low ranked. This was because the quality of most of the review categories are below average and the strong features of the documents are found to be very limited, which ultimately presented the final assessment score of the document as D, which mean the Moray Supplementary Guidance is unsatisfactory when integrating the climate change aspects into onshore wind energy plan. Table 6.15 present the overall quality of the document in numeric form displaying the assessment values or scores in each sub review category, review category, and review area.

Grading	A	B	C	D	E	F
Assessment value	6	5	4	3	2	1
Grading range	6 or more	5 to 5.9	4 to 4.9	3 to 3.9	2 to 2.9	1 to 1.9
Overall analysis	Well performed	Satisfactory	Just satisfactory	Just unsatisfactory	Not satisfactory	Very unsatisfactory

Review area (RA)	Review category (RC)	Sub review category (SRC)	Score	Total no. of A	Total no. of B	Total no. of C	Total no. of D	Total no. of E	Total no. of F	Cumulative assessment value	Review category average	Review category grade	Grade explanation	Review area grade	Grade explanation	Review area average	Final assessment average	Final grade	Grade explanation
RA 1	RC - 1.1	SRC 1.1.1	B	0	5	0	0	2	1	8	2.7	E	Not satisfactory	C	Just satisfactory	4.2	3.6	D	Just unsatisfactory
		SRC 1.1.2	F																
		SRC 1.1.3	E																
	RC - 1.2	SRC 1.2.1	A	12	5	0	0	0	0	17	5.7	B	Satisfactory						
		SRC 1.2.2	A																
		SRC 1.2.3	B																
RA 2	RC - 2.1	SRC 2.1.1	A	6	5	0	3	0	0	14	4.7	B	Satisfactory	D	Just unsatisfactory	3.7			
		SRC 2.1.2	D																
		SRC 2.1.3	B																
	RC - 2.2	SRC 2.2.1	F	0	5	0	0	2	1	8	2.7	E	Not satisfactory						
		SRC 2.2.2	B																
		SRC 2.2.3	E																
RA 3	RC - 3.1	SRC 3.1.1	A	6	5	4	0	0	0	15	5.0	B	Satisfactory	C	Just satisfactory	4.0			
		SRC 3.1.2	B																
		SRC 3.1.3	C																
	RC - 3.2	SRC 3.2.1	C	0	0	4	3	2	0	9	3.0	D	Just unsatisfactory						
		SRC 3.2.2	E																
		SRC 3.2.3	D																
RA 4	RC - 4.1	SRC 4.1.1	E	0	0	0	3	2	1	6	2	F	Very unsatisfactory	E	Not satisfactory	2.8			
		SRC 4.1.2	F																
		SRC 4.1.3	D																
	RC - 4.2	SRC 4.2.1	E	6	0	0	3	2	0	11	3.6	D	Just unsatisfactory						
		SRC 4.2.2	D																
		SRC 4.2.3	A																

Table 6.15 Assessment Scores in Moray Supplementary Guidance: Onshore Wind Energy Strategic Environmental Assessment, 2015

The following figure 6.71 shows the performance of Moray Supplementary Guidance for onshore wind energy strategic environmental assessment in all the review areas, which exhibit significant demonstration in the quality of all the four review areas.



	Review area 1	Review area 2	Review area 3	Review area 4
A- Well performed	2	1	1	1
B- Satisfactory	2	2	1	0
C- Just satisfactory	0	0	2	0
D- Just unsatisfactory	0	1	1	2
E- Not satisfactory	1	1	1	2
F- Very unsatisfactoy	1	1	0	1

Figure 6.71 Individual performance of review areas of Supplementary Planning Guidance of Moray

The analysis of the degree of satisfactoriness which shows the strengths and the weaknesses of the document in terms of percentages along with the overall quality of the SEA document of Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment is illustrated in table 6.16.

Moray Supplementary Planning Guidance	Assessment Scores						Degree of Satisfactoriness		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of Key issues	2	2	0	0	1	1	67%	0%	33%
Review area 2- Identification and evaluation of alternatives and impact analysis	1	2	0	1	1	1	50%	17%	33%
Review Area 3 – Assessment of mitigation & adaption measures	1	1	2	1	1	0	33%	50%	17%
Review Area 4 – Stakeholder Involvement & Follow up	1	0	0	2	1	1	17%	33%	33%
Cumulative Score of all Review Areas	5	5	2	4	4	3	42%	25%	29%

Table 6.16 Degree of satisfactoriness of Supplementary Planning Guidance of Moray

Figure 6.72 indicates that based on the strengths of the document 42% of the tasks attempted could be described as satisfactory (A-B%), whereas 25% is graded as average (C-D%) where the tasks are performed just moderately. In addition to that, in terms of highlighting the climate change impacts in the document, 29% of the tasks in the document are found to be poorly attempted (E-F%).

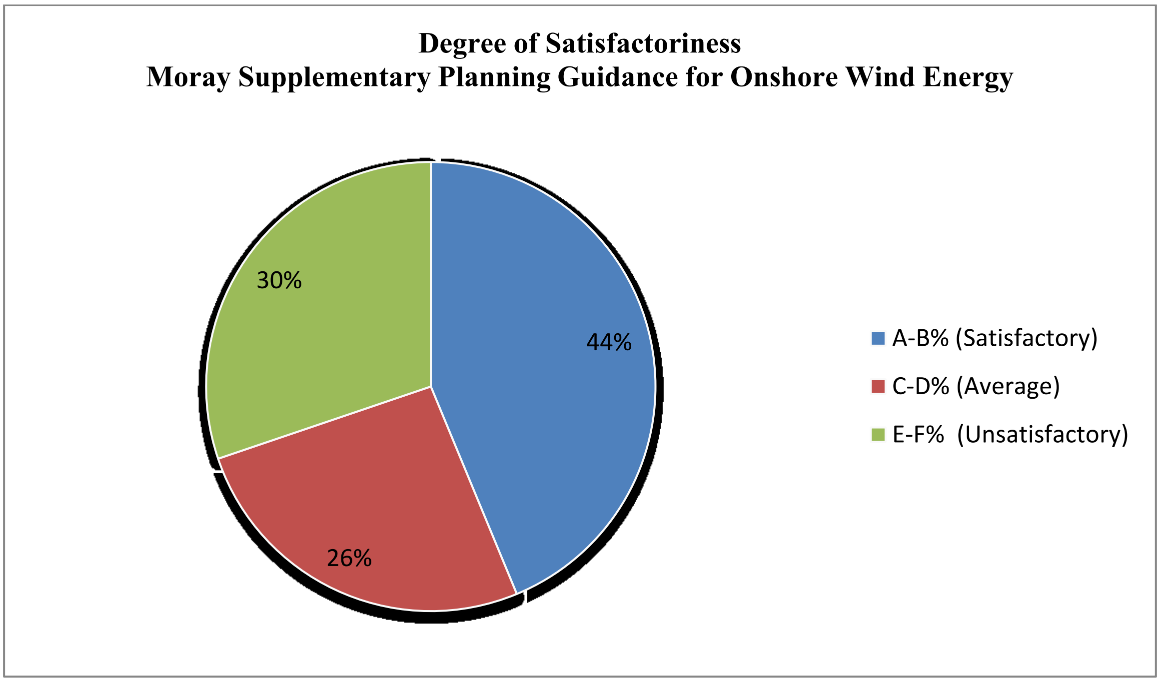
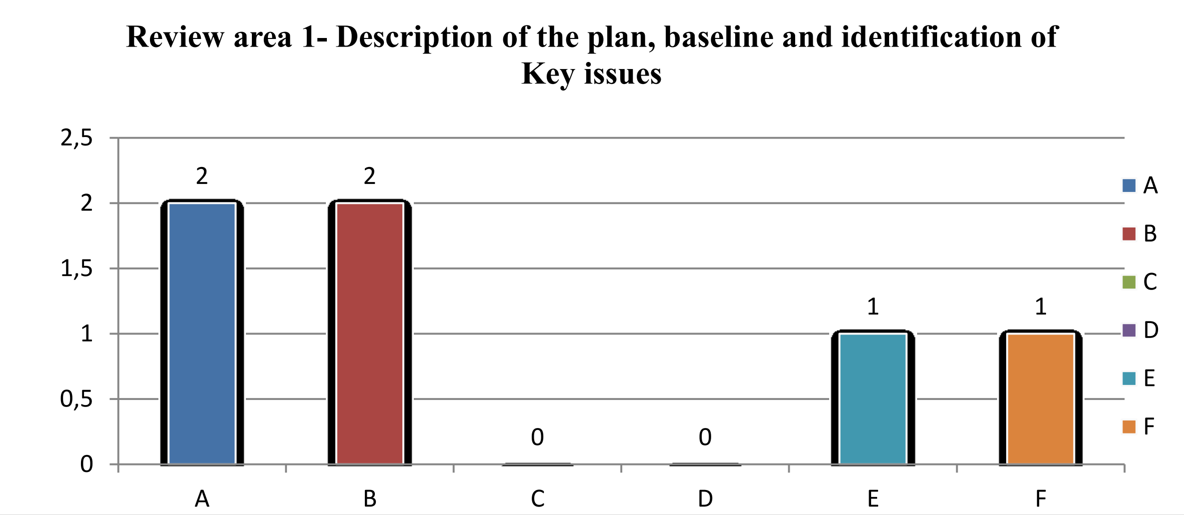


Figure 6.72 Degree of satisfactoriness of Supplementary Planning Guidance of Moray

The below section identifies both strengths and weaknesses of the document on highlighting the climate change impacts in the SEA of onshore wind energy plan of Moray Supplementary Planning Guidance.

6.1.2.4.1 Review area 1 - Description of the Plan, Baseline & Identification of Key Issues

Review area 1 focuses on the description of the plan, its baseline, and identification of key issues in the Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment. The overall analysis of this review area in this Supplementary Planning Guidance indicates that the document did not perform satisfactorily on describing the plan and its environmental baseline conditions. However, the significant concerns subject to climate change issues are well exhibited in this Supplementary Planning Guidance of Moray. On analysing this review area, it was noticed that the document showed few weaknesses due to which the overall assessment score of review area 1 for Moray Supplementary Planning Guidance is calculated as grade C (see table 6.15), which indicates that the document in review area 1 is just satisfactory, despite omissions and/or inadequacies. Figure 6.73 shows the complete assessment result of review area 1 of Moray Supplementary Planning Guidance. The below figure shows that the Moray Supplementary Planning Guidance in this review area obtained 2As, 2Bs, 1E, and 1F, thus giving the total score of C (just satisfactory) for review area 1.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.73 Result of review area 1 of Supplementary Planning Guidance of Moray

The review area 1 of this quality review package is divided into two review categories, such as review category 1.1- Plan and environmental baseline descriptions and 1.2- Identification and evaluation of key issues. Figure 6.74 present the performance of review category 1.1 (Plan and environmental baseline descriptions) and 1.2 (Identification and evaluation of key issues), showing that in review category 1.1- Plan and environmental baseline descriptions, the document obtained 1B, 1F, and 1E which means that in the Supplementary Planning Guidance, the assessment of the plan and environmental baseline descriptions are just averagely highlighted with few omissions and inadequacies. The assessment of the Moray Supplementary Planning Guidance for review area 1 revealed that the SEA process in the document is not outlined but the objective of the plan is well explained, which is supporting the Scottish Government's aim of increasing the amount of electricity generated from renewable sources. Thus, giving the document an assessment score of B in this sub review category. Moreover, the current and expected future climate baseline is also not well exhibited in the Supplementary Planning Guidance of Moray, due to which the document acquired an assessment score of F (very unsatisfactory). In terms of describing how the proposed project is vulnerable to the impacts of climate change over its life span, the document again did not provide any relevant information which gave it an assessment score of E (unsatisfactory) in this sub review category. Due to these positive and negative features of the Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment, the document scored just satisfactorily in the sub review category and review category level with an overall assessment score of C (see table 6.15), which indicates that the tasks performed are considered just satisfactory despite omission and/or inadequacies.

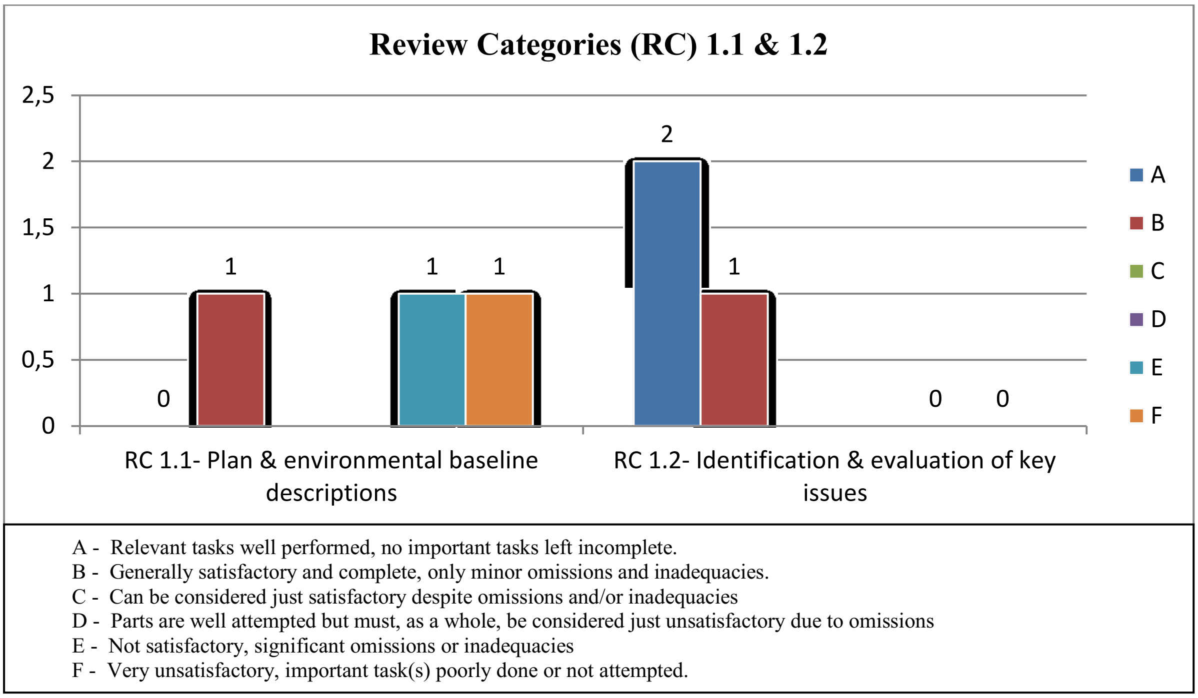
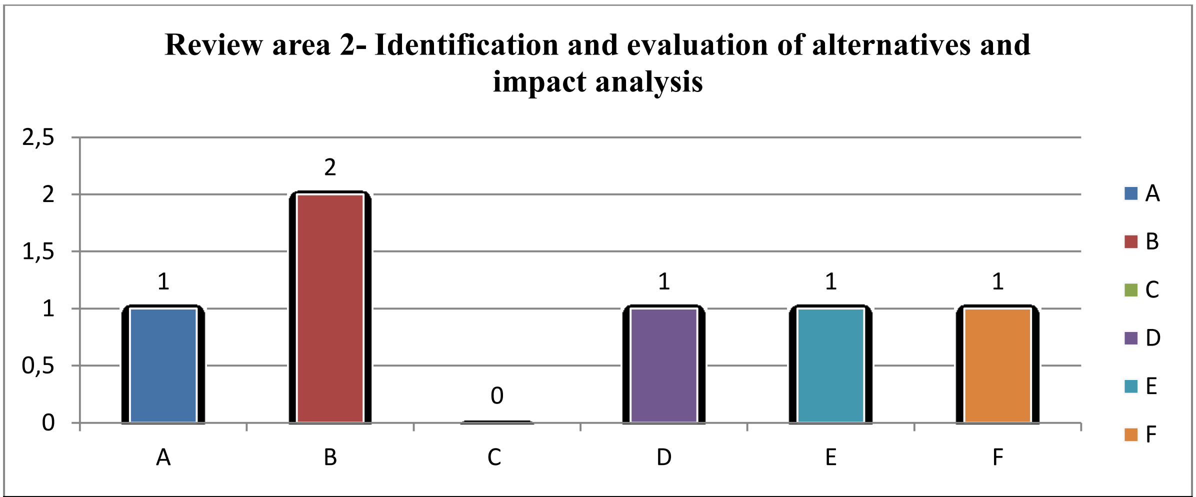


Figure 6.74 Performance of review categories 1.1 & 1.2 of review area 1 of Supplementary Planning Guidance of Moray

Review category 1.2 – deals with the identification and evaluation of key issues. The results of the review category 1.2 are also presented in figure 6.74. The analysis revealed, that the review category 1.2 (Identification and evaluation of key issues) obtained an overall assessment score of C (just satisfactory). The results of review category 1.2 show that the Supplementary Planning Guidance of Moray in this area obtained 2As and 1B, which shows that the tasks are performed adequately. The analysis revealed that the Supplementary Planning Guidance of Moray outlines the climate parameter by carefully considering the flood issues and using guidance documents of SEPA (Scottish Environment Protection Agency) for flood risk management, therefore allocating an assessment symbol of A, which means the task is well performed. In terms of identifying key issues related to climate change impacts, the document explains issues related to flood and peat lands in much detail and tackle the impacts related to flood risks and peat land very competently. This task is done very efficiently therefore an assessment score of A is allotted for this sub review category. With regard to highlighting direct threats of climate change to wind energy infrastructure, the document provided comprehensive details about the flood and plans not to build in the flood zones, therefore obtaining an assessment score of B, which means the task performed is generally satisfactory and complete, with only minor omissions and inadequacies.

6.1.2.4.2 Review Area 2 - Identification & Evaluation of Alternatives & Impact Analysis

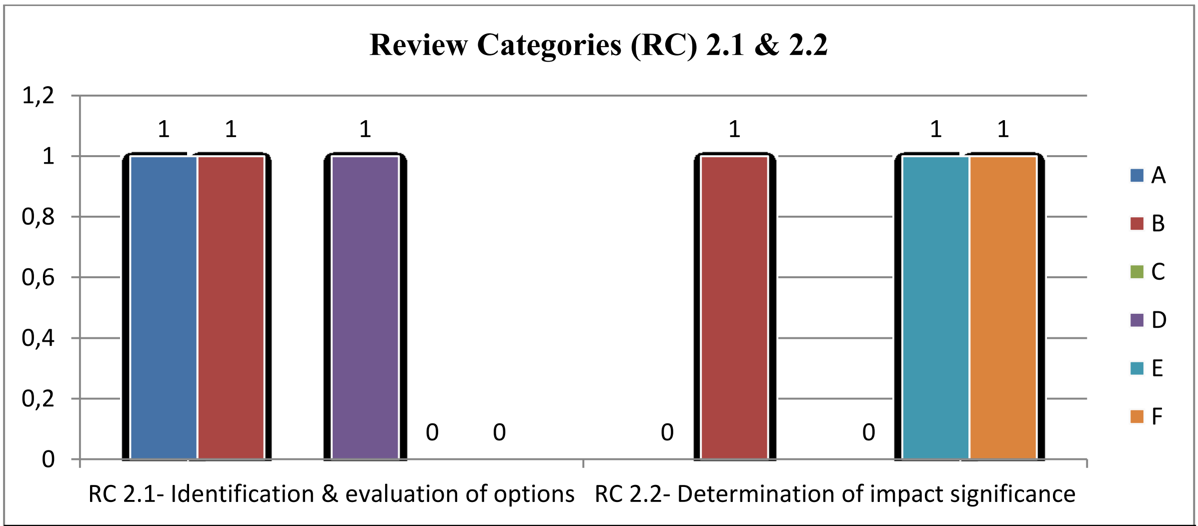
Review area 2 deals with the issues related to identification and evaluation of alternatives and impact analysis in the Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment. The overall analysis of this review area in the Moray Supplementary Planning Guidance revealed that half of the tasks performed are satisfactory and while half of them are very unsatisfactory in this review area, due to which the overall assessment score of the review area 2 (Identification and evaluation of alternatives and impact analysis) for the Moray Supplementary Planning Guidance was calculated as grade D (see table 6.15), which means the tasks are well attempted but as a whole is considered just unsatisfactory because of omissions or inadequacies. Figure 6.75 illustrates the overall analysis result of review area 2 of Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.75 Results of review area 2 of Supplementary Planning Guidance of Moray

The review area 2 is divided into two review categories, such as review category 2.1- Identification and evaluation of options and review category 2.2- Determination of impact significance. The results of the review category 2.1 and 2.2 are presented in figure 6.76, which shows that in review category 2.1- Identification and evaluation of options, the document obtained 1A, 1D and, 1B, which means that most of the tasks in this review category are satisfactory. Further analysis shows that the document considers a wide range of alternatives in terms of suitable sites for wind energy development. The suitable sites are also chosen according to the underground transmission network, the document mentions that the council prefers the transmission network to be underground and if in case underground transmission network is impracticable then other alternative option must be considered which clearly show that the alternative option chosen is the best method of connection. While choosing alternatives climate change implications are never a consideration to assess in Moray Supplementary Planning Guidance for Onshore Wind Energy. Due to this limitation observed in the review category an assessment score of grade D is given, which means this task in review category 2.1 is not well attempted and therefore is considered unsatisfactory due to omissions and inadequacies. The Moray Supplementary Planning Guidance clearly describes how reasonable alternatives are identified, considering geographical, visual impact, and landscape character of the plan. Thus giving an assessment score of B (satisfactory) in this sub review category.



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C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

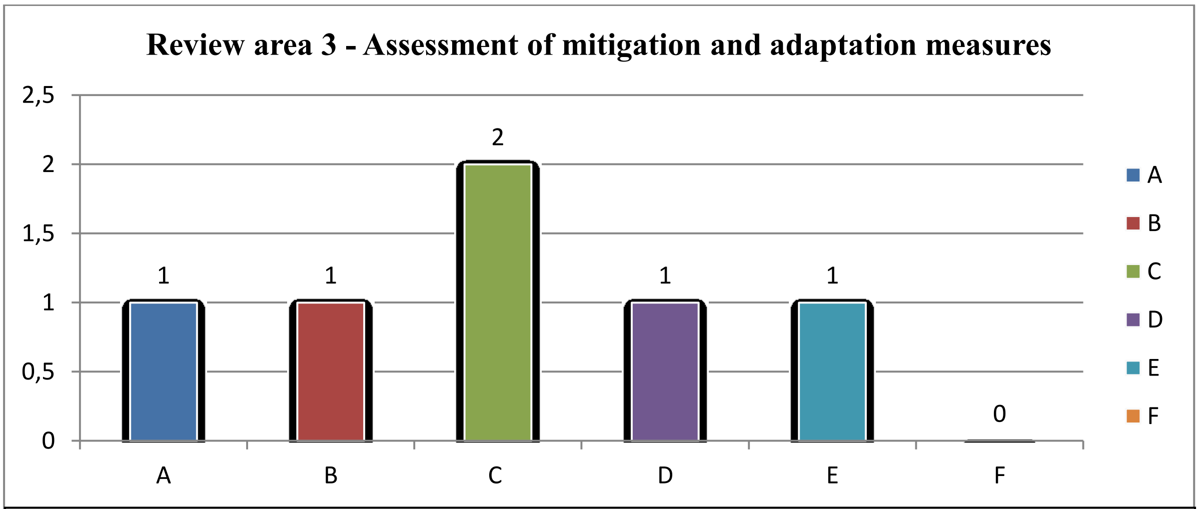
Figure 6.76 Performance of review categories 2.1 & 2.2 of review area 2 of Supplementary Planning Guidance of Moray

Considering all the above mentioned negative and positive traits in review category 2.1 (Identification and evaluation of options), the overall assessment score given is B, which means the tasks are generally satisfactory and complete, with only minor omissions and inadequacies. Review category 2.2 focuses on the issues of ´Determination of impact significance´. The results of review category 2.2 are also demonstrated in figure 6.76 showing that this review category obtained 1F, 1B, and 1E (see table 6.15), giving the overall review category a very unsatisfactory assessment symbol such as E. The in-depth analysis of this review category shows that in terms of determination of impact significance of climate change issues the document does not mention about current and historic trends in the climate of that area, thus give an assessment score of F, which indicates that important task is not attempted at all.

The document also identifies the cumulative impacts of wind farms in that area by describing them from a visual point of view. The Moray Supplementary Planning Guidance also mentions that cumulative impact assessment should provide an assessment of impacts arising or likely to arise from proposals in combination with already existing development, approved developments, and proposals pending for determination within the planning process. Thus giving this sub review category a B assessment symbol, which means that the task is generally considered as satisfactory because cumulative impacts are considered to some extent. In terms of the methodology applied in identifying and predicting climate change impacts the document failed to provide to useful information regarding this topic, due to which the document was given an assessment score of D (unsatisfactory) in this sub review category. Considering these strengths and weaknesses mentioned in this review category, the document was given a very low assessment score such as E (very unsatisfactory) in review category 2.2, which is the determination of impact significance in the Moray Supplementary Planning Guidance for Onshore Wind Energy Strategic Environmental Assessment.

6.1.2.4.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

Review area 3 deals with the assessment of mitigation and adaptation measures of the Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment. The overall analysis of this review area in Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment showed that the document has equal amounts of satisfactory and unsatisfactory tasks performed in review area 3 (Assessment of mitigation and adaptation measures), which ultimately gave an average score in this review area. As shown in table 6.15 the overall grade allocated for this review area is C, which means the document in this review area is relatively satisfactory despite omissions or inadequacies. The Moray Supplementary Planning Guidance displayed strong traits regarding the assessment of mitigation measures. However, major weaknesses are observed while assessing the adaptation measures for the wind energy Supplementary Planning Guidance. Figure 6.77 presents the overall analysis result of review area 3 of Supplementary Planning Guidance of Moray, which is the assessment of mitigation and adaptation measures. The following figure (6.77) shows that the document in this review area obtained 1A, 1B, 2C, 1D, 1E assessment scores at the category and sub category level.



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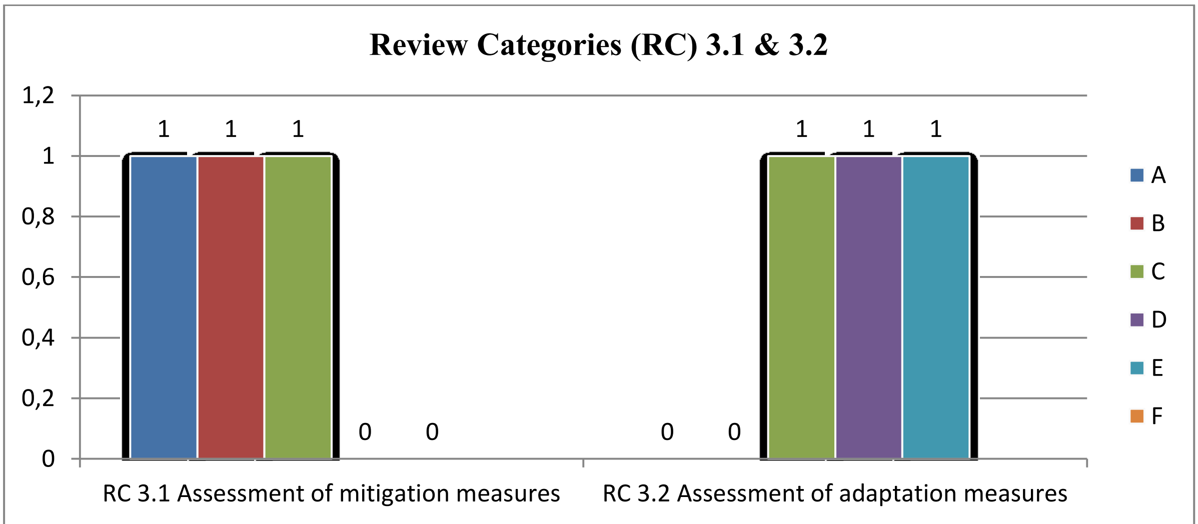
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.77 Results of review area 3 of Supplementary Planning Guidance of Moray

The review area 3 is divided into two review categories, such as review category 3.1- Assessment of mitigation measures and 3.2- Assessment of adaptation measures. Figure 6.78 illuminate the performance of review category 3.1 (Assessment of mitigation measures) and 3.2 (Assessment of adaptation measures), which specifies that in review category 3.1- Assessment of mitigation measures, the document obtained 1A, 1B and 1C which means that in the Supplementary Planning Guidance of Moray, the assessment of mitigation of impacts are highlighted very evidently in the plan as all the assessment scores are categorized as satisfactory. According to the Supplementary Planning Guidance, the document highlights the mitigation of climatic impacts on the environment by including information on mitigating effects related to peat and wetlands. The Supplementary Planning Guidance mentions that proposals should be designed in a way to avoid peat lands in order to minimize adverse impacts on hydrology, peat stability, and generation of waste peat. The document further mentions that any proposal that has the potential to affect peat must demonstrate that any significant effects on the quality of the area can be overcome by siting, design, or other mitigation. In terms of mitigation measures, the document states that in case peat lands and other carbon-rich soils cannot be avoided then applicants should include preventative/mitigation measures such as the use of floating roads and piled foundations to avoid significant drying or oxidation of peat through works such as access road construction and cable trenching. In addition to that, the document gives the reference for using a guidance document issued by SEPA on how to manage issues related to peat lands. Peat and carbon-rich soils are mentioned in great detail in the document, therefore, giving an assessment score of A in this sub review category which means the task is well attempted. In addition to that, the document mitigates the climatic impacts on the environment quite well by providing information that in areas where there are peat and carbon-rich soils. It is significant to protect these soils since carbon sequestration is important to mitigate climate change impacts. This sub review category is also performed satisfactorily, thus an assessment score of B (satisfactory) was given. The document also indicates that it considers an effective methodology to mitigate the negative impacts by using mitigation hierarchy, where measures are taken to prevent, reduce, and offset the significant impacts of the plan.



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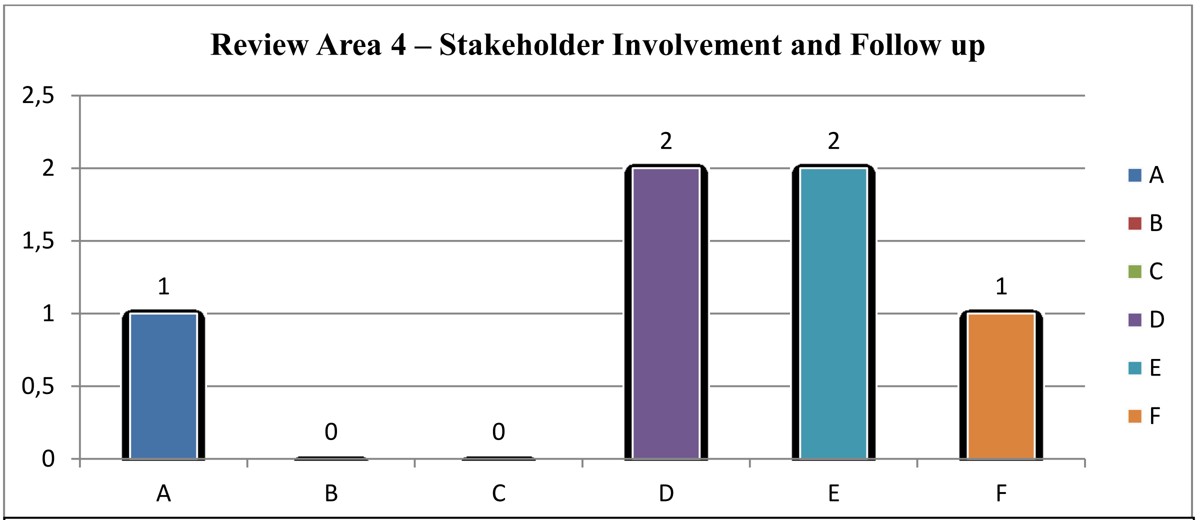
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.78 Performance of review categories 3.1 & 3.2 of review area 3 of Supplementary Planning Guidance of Moray

Review category 3.1- Assessment of mitigation measures, is the best-performed review category with an overall assessment score of B (see table 6.15), which indicates that the tasks are complete and performed satisfactorily. Review category 3.2 addresses the assessment of adaptation measures. The results of review category 3.2 are presented in figure 6.78 showing that this review category obtained 1C, 1D and 1E (see table 6.15), giving the overall review category an unsatisfactory assessment symbol such as D. On evaluating this review category it was found out that the document very subtly highlights adaptation solutions related to climate change effects such as flood areas, thus obtaining an assessment score of C (just satisfactory) in sub review category of review category 3.2. In addition to that, the Moray Supplementary Planning Guidance does not provide any evidence of incorporation of adaptation measures with the mitigation measure, therefore an assessment symbol of D is given for this sub review category and nor it identifies any preferred adaptation options in the context of climate change, thus an assessment score of E is given for this sub review category. Review category 3.2- Assessment of adaptation measures, has an overall assessment score of D (see table 6.15), which indicates that the performed tasks are unsatisfactory because of the omissions or inadequacies.

6.1.2.4.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 deals with the issues related to Stakeholder Involvement and Follow up in the Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment. The overall analysis of this review area illustrates that the document provided very poor and unsatisfactory results in this review area with having E as an overall rating, which is a very low score in this quality review package. The analysis shows that this review area is the worst performed review area of Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment from all the four review areas observed. As shown in table 6.15 as well, the overall grade allocated for this review area is E, which means the document in this review area is not satisfactory due to significant omissions or inadequacies. Figure 6.79 demonstrates the overall analysis result of review area 4 (Stakeholder Involvement and Follow up) of Moray Supplementary Planning Guidance. The following figure (6.79) demonstrates that the document in review area 4 obtained 1A, 2D, 2E, and 1F scores at category and sub category level.



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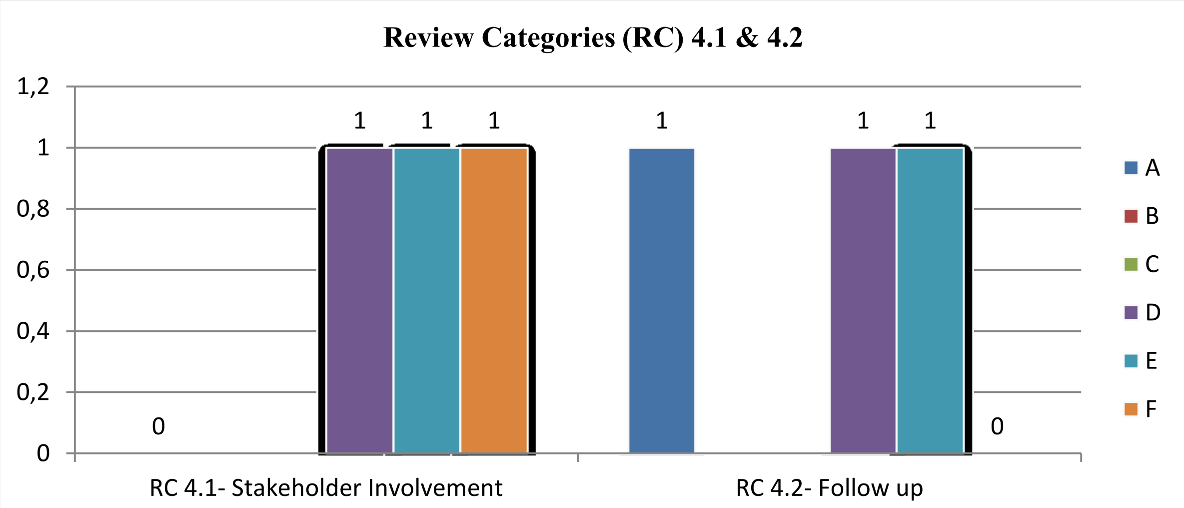
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.79 Results of review area 4 of Supplementary Planning Guidance of Moray

In Moray Supplementary Planning Guidance, review area 4 is observed as the highest frequency of unsatisfactory scores. The review area 4 is comprised of two review categories, such as review category 4.1- Stakeholder Involvement and, 4.2- Follow up. The results of the review category 4.1 and 4.2 are shown in figure 6.80, which shows that in review category 4.1- Stakeholder Involvement, the document obtained 1E, 1F, and 1D, which means that the document illustrated an extremely poor and unsatisfactory result in tasks related to stakeholder involvement. None of the grades are close to satisfactory in this review category. The analysis reveals that the document failed to identify or involve any climate change experts while preparing Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment thus giving the document an assessment score of E in this sub review category.

Secondly, the consultation related matters are poorly dealt in the document such as no time frame is stated in the document about public consultation; this gives the document an assessment score of F in this sub review category which means that important task is poorly done or not attempted at all. Lastly, in review category 4.1 the document did not provide much information about considering the comments of public participation, neither the document describes any procedure in engaging the stakeholder in the Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment. Considering all these weaknesses the overall assessment score allotted for review category 4.1 is F (see table 6.15), which indicates that the performed tasks are very unsatisfactory because the important tasks are poorly done or not attempted at all. This shows review category 4.1 is the worst performed review category in review area 4.



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B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.80 Performance of review categories 4.1 & 4.2 of review area 4 of Supplementary Planning Guidance of Moray

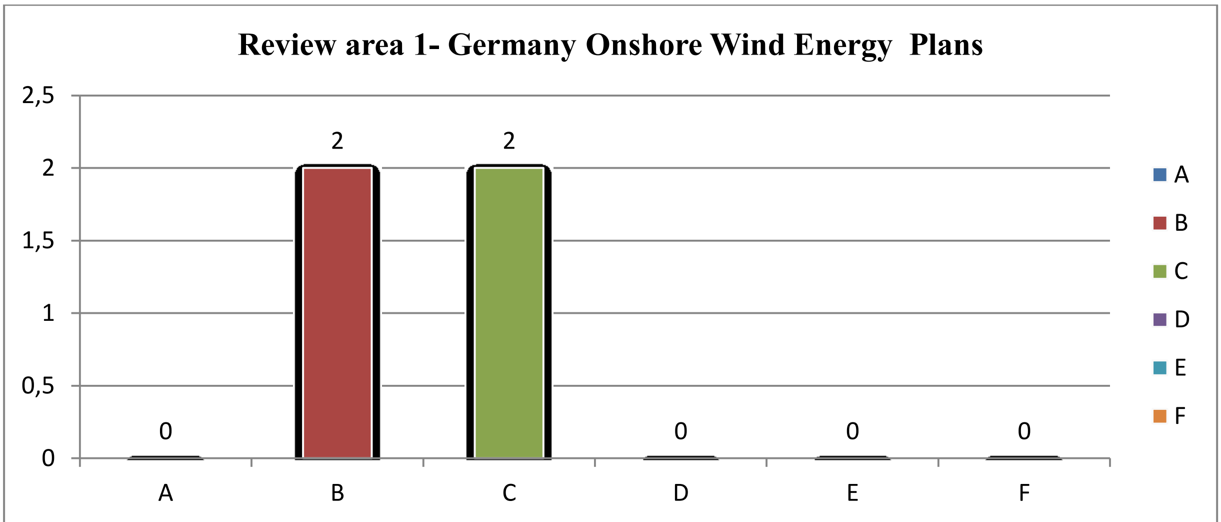
Review category 4.2 – belongs to Follow up such as monitoring and evaluation. The results of review category 4.2 are also displayed in figure 6.80 showing that this review category obtained 1E, 1D, and 1A. The results of this review category show that the Moray Supplementary Planning Guidance for onshore wind energy strategic environmental assessment performed the tasks quite unsatisfactorily in review category 4.2 (Follow up). The document fails to provide any evidence regarding the indicators used for monitoring climate change issues nor the document includes any provision for monitoring climate-related measures. However, the Supplementary Planning Guidance for Moray mentions about the methodology used for monitoring. The document mentions that the location and type of wind energy developments will be monitored on an on-going basis and incorporated into the annual local development plan monitoring report. The Supplementary Planning Guidance for Moray also includes information about post-construction monitoring and habitat management plans. Due to all these qualities, the document thus obtained an only satisfactory score in this sub review category of review category 4.2 (Follow up). But due to the other tasks poorly attempted in this review category, the overall assessment score allocated to this review category is D, which means the document in this review area is not satisfactory because of omissions or inadequacies.

6.2 Cumulative Assessment of Onshore Wind Energy Plans of Germany

The below section presents a combined and cumulative assessment of all the four wind energy plans of Germany selected for this study. Based on their performances of tasks in sub review categories, this section depicts a combined result of how the onshore wind energy plans performed in each review area in terms of climate change inclusion in the planning process.

6.2.1 Review Area 1 - Description of the Plan, Baseline & Identification of Key issues

Review area 1 was based on the description of the plan, baseline, and identification of key issues. The purpose of this review is to obtain a holistic picture of the proposed wind energy development within an existing environment and baseline conditions so as to identify, analyse, and assess all possible key issues efficiently. The overall assessment of the review area 1 (figure 6.81) shows that almost all the documents reviewed, provided a satisfactory description of the plan, baseline and identified the climate change-related key issues of the plan quite effectively. Very fewer grey areas are found in this review area as all the documents scored are from satisfactory to average in this review area.

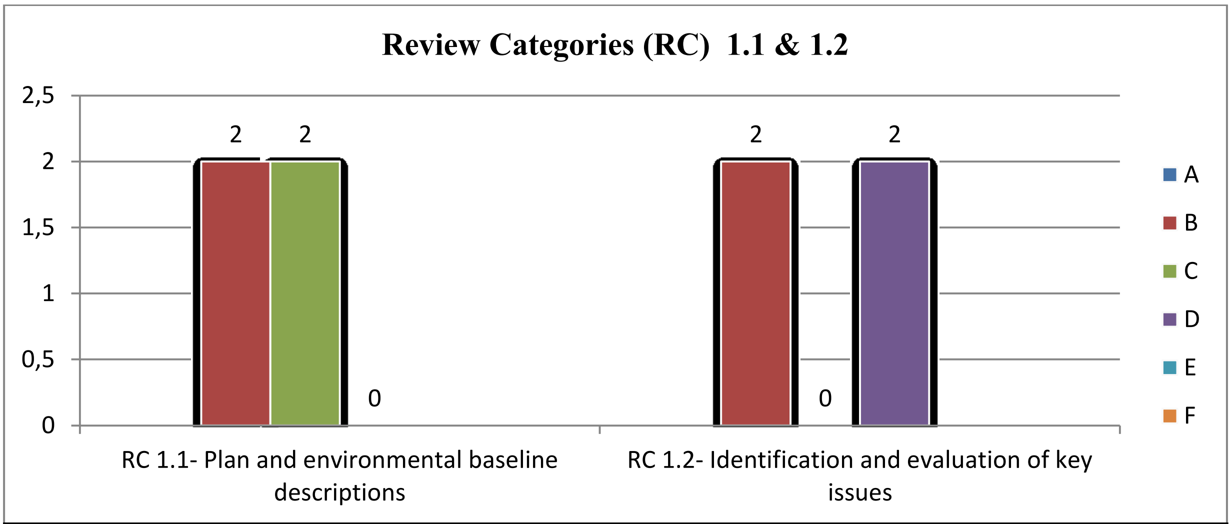


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.81 Overall performance of onshore wind energy plans of Germany in review area 1

It's clear from figure 6.81 that review area 1 which is the description of the plan, baseline and identification of key issues has very least problem area, it was found that almost all the case studies performed well in this area as two of the case studies scored satisfactory (B grade) and two are ranked as just satisfactory (C grade) in this area. Most of the case studies from Germany executed these tasks very effectively by giving enough details about the plan and identifying key issues under a separate heading which included a description of baseline condition of climate and air of that area.

Figure 6.82 provides a breakdown of review area 1 in to review category 1.1 (Characteristics of the plan and existing environment), and review category 1.2 (Identification and evaluation of key issues). The results obtained from the analysis proved that all the documents performed good and none of the documents was found to be low quality in describing its existing environment thoroughly including the historic and current climatic condition and air quality of the area and also identifying and evaluating key issues present in that area.



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B - Generally satisfactory and complete, only minor omissions and inadequacies.
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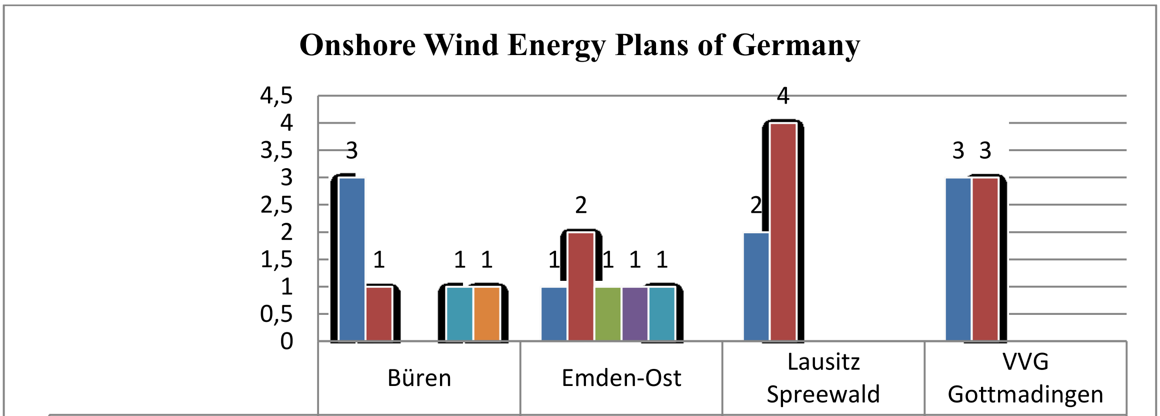
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.82 Results of review categories 1.1 & 1.2 of review area 1of onshore wind energy plans of Germany

Most of the documents provided information regarding the vulnerability of the plan to the impacts of climate change over its life span, for example, the Teilregionalplan of the Lausitz Spreewald provided detail information on consideration of flood plains in the planning to avoid any damage to the infrastructure of wind turbines. Teilflächennutzungplan of VVG Gottmadingen is another illustration of taking flood areas into consideration while selecting sites for wind turbines. More information about how other wind energy plans performed in this area is explained in much detail in the previous sections. Review category 1.2, which is the identification and evaluation of key impacts, was also satisfactorily attempted. Looking at the results of sub review categories of review category 1.2, it can be proved that most of the reports reviewed, effectively attempted all the sub review categories of the review category 1.2. These interesting high values are due to the fact that most of the documents took the climate change impacts into consideration while selecting priority areas for the wind parks.

Figure 6.83 illustrates the performance of all the case studies for review area 1. One of the very good examples is found in Teilregionalplan of the Lausitz Spreewald where the document explains flood issues in detail by explaining that due to high precipitation the area is in the risk of flood, therefore, flood plains should be avoided as well as areas with wetlands soils should also be excluded while planning for wind energy parks. The document discusses issues related to peat lands which are one of the major contributors to GHG emissions. This explains why the overall assessment of the review area 1 was scored as satisfactory. More information about how these selected case studies performed individually in review area 1 is explained in former sections of this chapter.



	Büren	Emden-Ost	Lausitz Spreewald	VVG Gottmadingen
A- Well performed	3	1	2	3
B- Satisfactory	1	2	4	3
C- Just satisfactory	0	1	0	0
D- Just unsatisfactory	0	1	0	0
E- Not satisfactory	1	1	0	0
F- Very unsatisfactoy	1	0	0	0

Figure 6.83 Individual performance of onshore wind energy plans of Germany in review area 1

In terms of the degree of satisfactoriness, percentage values are used in order to obtain the strengths and weaknesses of the document, where the average values of A and B are summed up to get A-B% (satisfactory result) and so on. Figure 6.84 presents the degree of satisfactoriness of onshore wind energy plans of Germany in review area 1 (Description of the plan, baseline, and identification of key issues). The overall degree of satisfactoriness in review area 1 for all the onshore wind energy plans of Germany is calculated as 79% (A-B%), which showed satisfactory results in review area 1 (Description of the plan, baseline & identification of key issues).

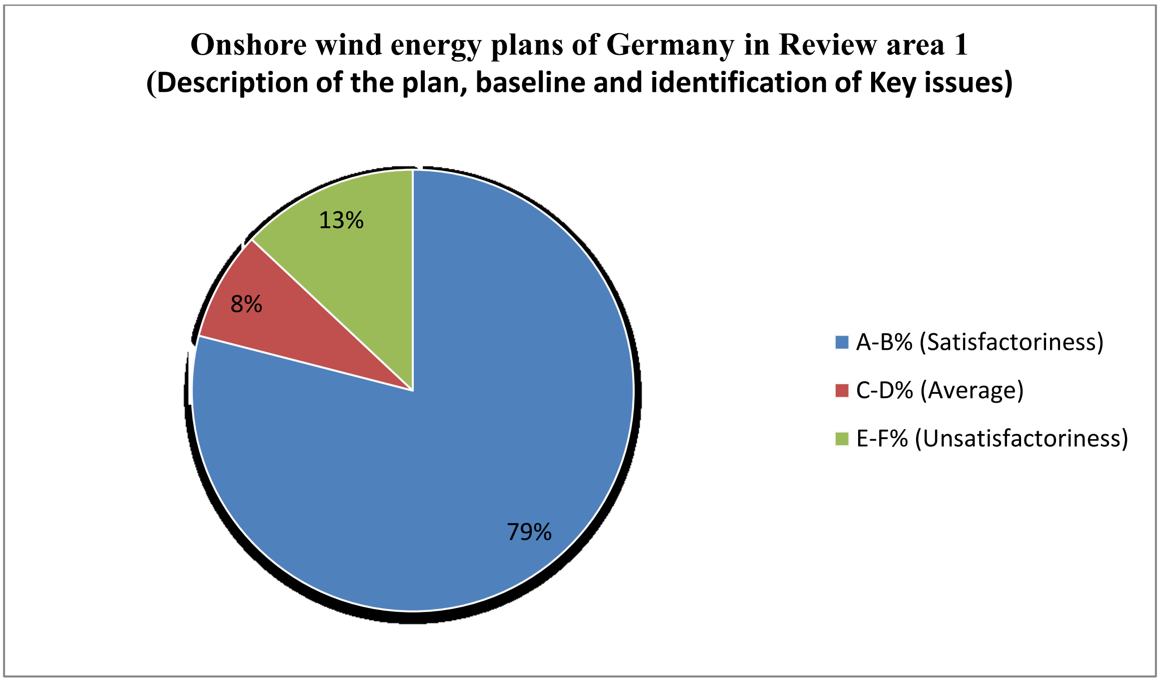
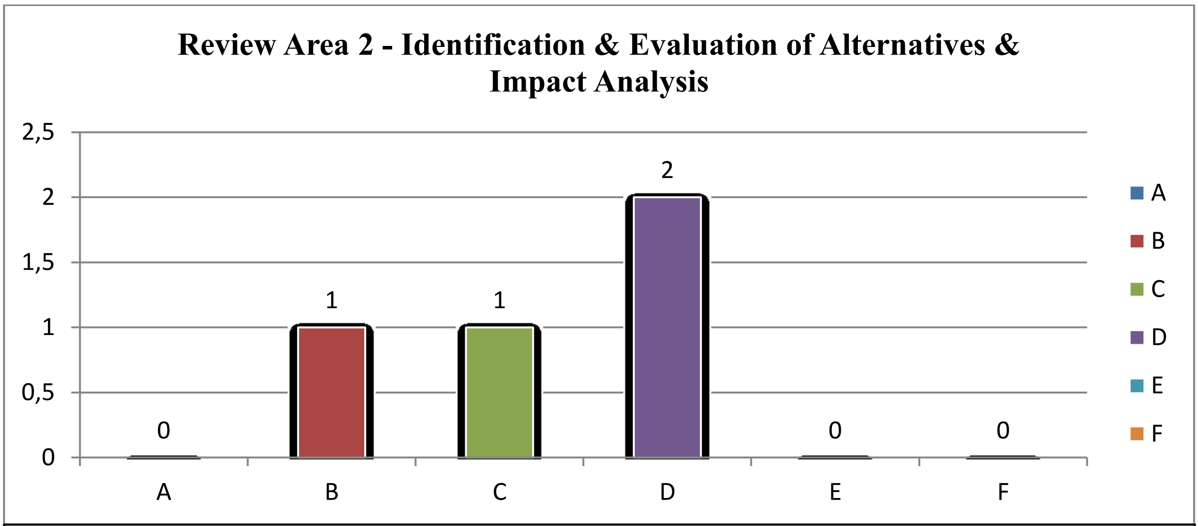


Figure 6.84 Degree of satisfactoriness for onshore wind energy plans of Germany in review area 1

However, it is also concluded that 13% of the tasks in the onshore wind energy plans of Germany in review area 1 are ranked as unsatisfactory and only a few are considered as C-D%, showing that 8% of the tasks performed are just averagely attempted in review area 1.

6.2.2 Review Area 2 – Identification & Evaluation of Alternatives & Impact Analysis

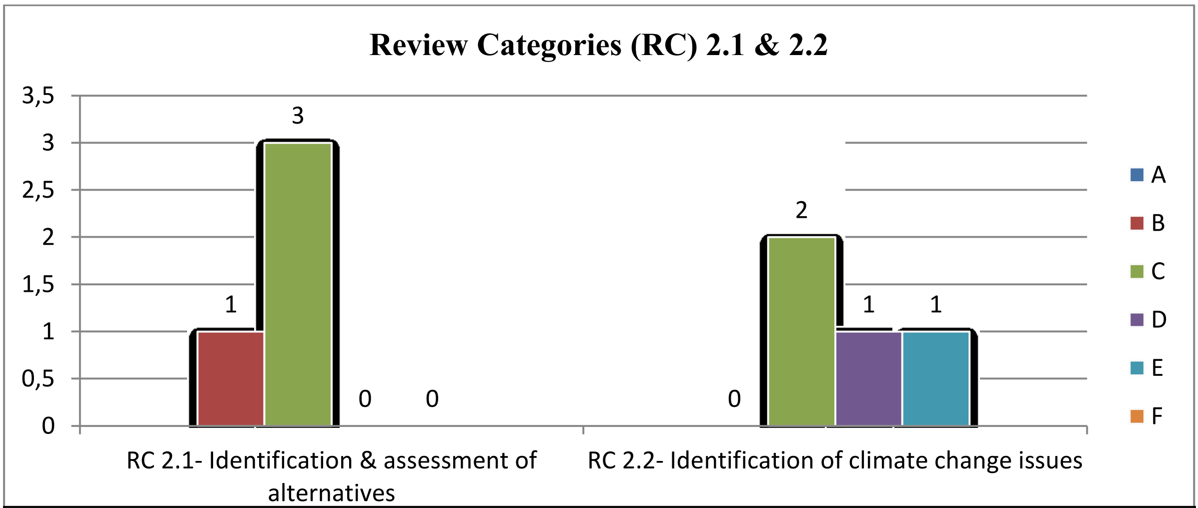
Evaluation of alternatives and prediction of impacts are the core activities of the environmental assessment process and should therefore be subject to critical review. Review area 2 consists of consideration and assessment of alternatives (review category 2.1) and identification of climate change impacts (review 2.2). The result of the overall performance of the documents is presented below in figure 6.85, which shows that there were quite a few weaknesses found in the documents in review area 2, which resulted in poor performance. Two out of four documents were graded as D in this review area in which the tasks were considered as just unsatisfactory because of omission and inadequacies in terms of climate change inclusion into the plan.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.85 Overall performance of onshore wind energy plans of Germany in review area 2

On the other hand, only one document scored a B grade which is a satisfactory result and one was graded as C which can be considered as just satisfactory despite omissions and inadequacies. The two documents that showed the satisfactory result in review area 2 are SEA onshore wind energy plans of VVG Gottmadingen and Lausitz Spreewald. These two case studies obtained higher scores in this area due to the fact that in both the documents, consideration of alternatives which is review category 2.1 is done very comprehensively. The results of the review category 2.1 (Identification & assessment of alternative options) and 2.2 (Identification of climate change issues) are presented in figure 6.86. The report mentions several priority areas for wind energy development. The suitable areas were selected after the impacts on each option are identified and one of the most interesting observation emerged from this analysis was that the document also considered climate change impacts for every option. This evidence was most visible in the Teilregionalplan of Laustiz Spreewald where the climate change implications are assessed for every option of the plan. The overall analysis of review category 2.2 (Identification of climate change issues) which is how the climate change impacts were considered in these documents highlighted that climate change impacts are identified as just satisfactorily in two documents only and the other two were found to be unsatisfactory in terms of integrating climate change impacts. One of the drawbacks in assessing climate change issues (review category 2.2) in these reports was that the impact related to climate change were identified on a very basic level since no climate models were used or mentioned in the reports to identify future wind patterns of that area or to assess the impacts of climate change on a local level.

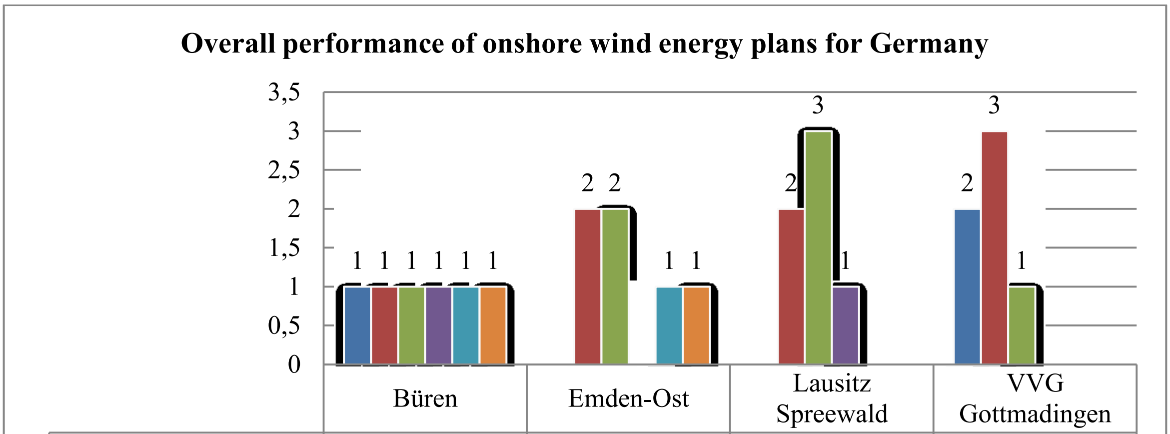


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.86 Performance of review categories 2.1 & 2.2 of review area 2 of onshore wind energy plans of Germany

Only in the Teilregionalplan of Lausitz-Spreewald the significant impacts of the plans are identified through the cause-effect matrix which included the climate change impacts as well. The reports revealed that the onshore wind energy plans in Germany presented the current and historic trend of climate in very detail in a separate section where the climatic conditions of the area are identified regarding wind speed and wind direction, air quality, temperature, humidity, and precipitation. One of the sub review categories of the review category 2.2 includes the identification of cumulative impacts of that region.

A very good example of this is presented in the Teilregionalplan of Lausitz Spreewald where the document describes how the region is affected by climate-damaging gases from power plants in nearby areas, moreover, other sources are also described which contributes in CO_2 emission. The document also provides measures to avoid these cumulative environmental effects. Figure 6.87 provides an overview of the individual performance of the onshore wind energy plans of Germany.



	Büren	Emden-Ost	Lausitz Spreewald	VVG Gottmadingen
A- Well performed	1	0	0	2
B- Satisfactory	1	2	2	3
C- Just satisfactory	1	2	3	1
D- Just unsatisfactory	1	0	1	0
E- Not satisfactory	1	1	0	0
F- Very unsatisfactory	1	1	0	0

Figure 6.87 Individual performance of onshore wind energy plans of Germany in Review area 2

VVG Gottmadingen is another good example of how it integrated impacts of climate change since it highlighted major impacts to be considered such as loss of forest or climate compensation areas and loss of carbon storage or sinks. As mentioned above the only weakness found in all the four documents of onshore wind energy plans in Germany was the absence of climate models to predict future wind patterns and climate change impacts, which hindered effective analysis of climate change impacts. The degree of satisfactoriness of onshore wind energy plans of Germany for review area 2 are shown in figure 6.88.

It is apparent from the figure that less than 50% of the tasks attempted are satisfactory in review area 2. Several issues are identified when analysing the integration of climate change issues in the onshore wind energy plans of Germany in review area 2 which revealed that only 46% (A-B%) of the tasks are considered as satisfactory in this review area and 38% (C-D%) are considered as average. While 17% of the tasks are reflected as unsatisfactory in the review area 2 due to the underrated performance of tasks in the evaluation of alternatives and prediction of impacts which is review area 2.

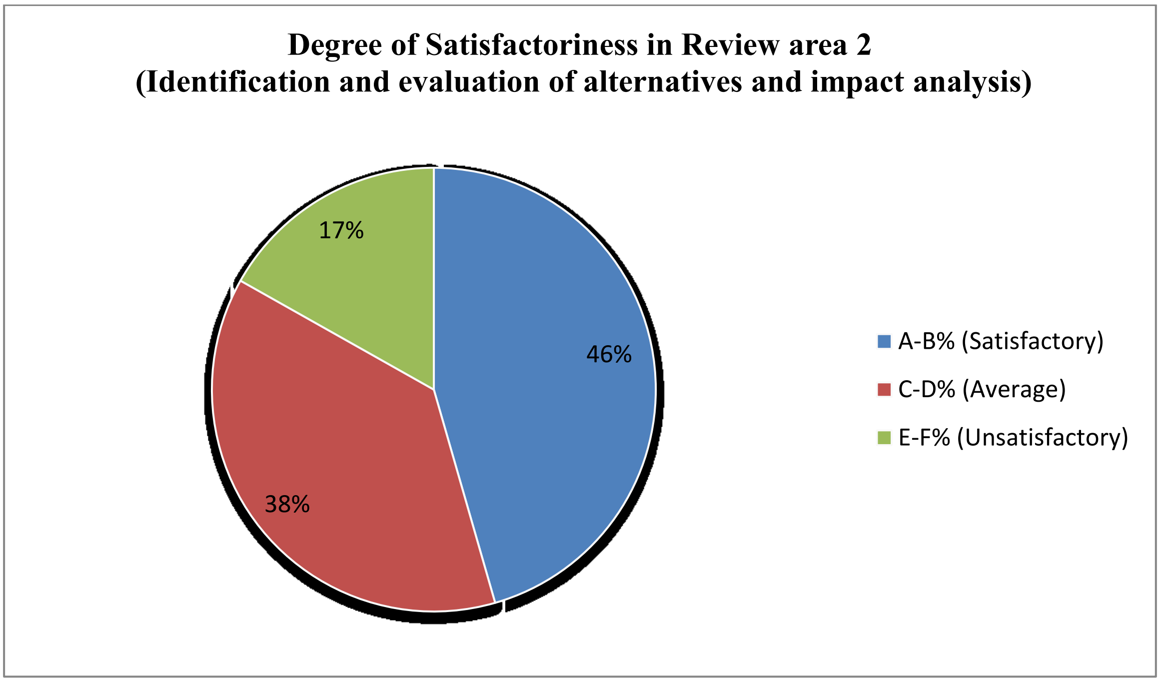
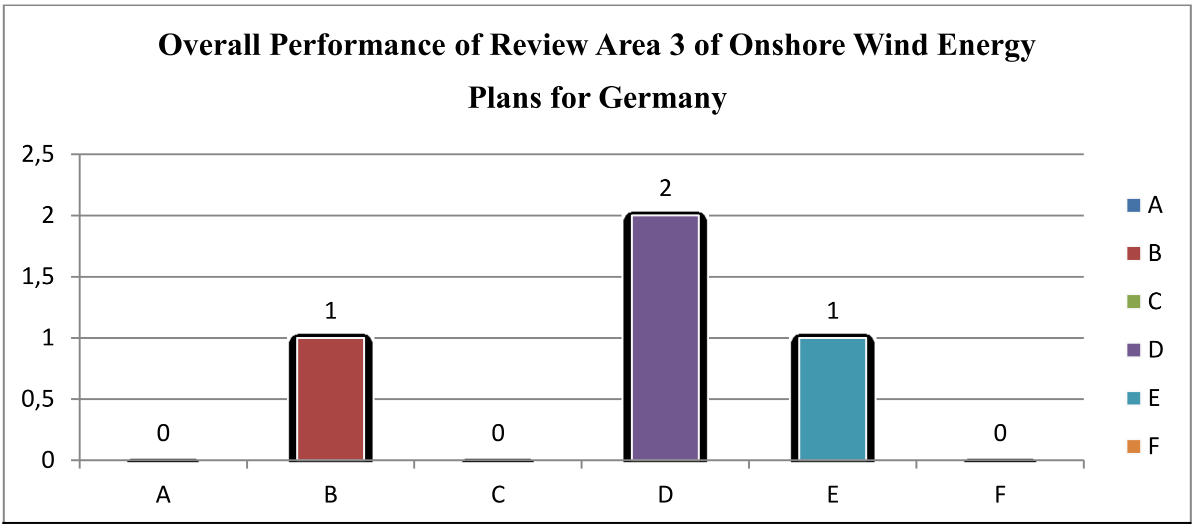


Figure 6.88 Degree of satisfactoriness of onshore wind energy plans of Germany in review area 2

6.2.3 Review Area 3- Assessment of Mitigation and Adaptation Measures

This review area is characterized by two measures that aid to tackle impacts related to climate change issues. The review area 3 is divided into two review categories such as review category 3.1 (Assessment of mitigation measures) and review category 3.2 (Assessment of adaptation measures). The overall depiction of review area 3 is presented in figure 6.89. The analysis reveals that the review area 3 has few robustness and more weaknesses. The study of all the onshore wind energy plans of Germany showed that most of the documents were graded as unsatisfactory and only one of the documents is ranked as satisfactory.

As discussed above there are more deficiencies in this review area which resulted in poor performance of documents in terms of assessing mitigation and adaptation measures, since three of the documents reviewed, provided poor mitigation and adaptation of climate change impacts. According to the documents reviewed one of the main strengths of the documents about review 3.1 (Assessment of mitigation measures) is that out of four documents reviewed three of them used mitigation hierarchy to prioritise impacts where mitigation measures are used to prevent, reduce and offset adverse effects.

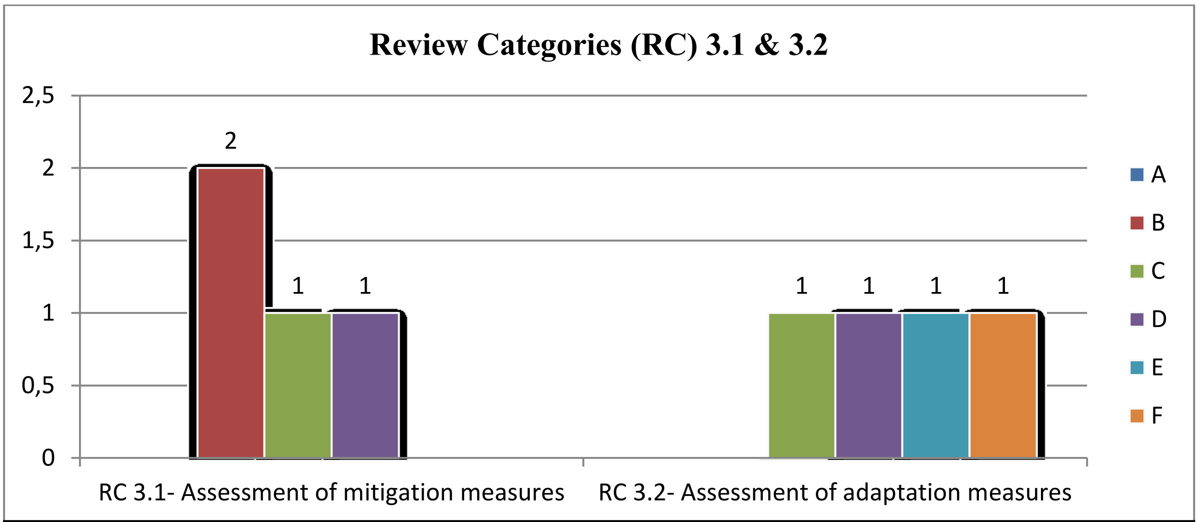


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.89 Overall performance of onshore wind energy plans of Germany in review area 3

Only in one document, there is not much information about how the mitigation measures are planned. Keeping the mitigation hierarchy into consideration most of the documents included shreds of evidence where the mitigation of climatic impacts on the environment as well as on the wind farms was identified. For example, the Teilflächennutzungsplan of Emden Ost has a very good example where the climatic impacts are mitigated on wind turbines as well. The document has evidence where it explains how the wind turbines are automatically shut down in case there is an extreme weather condition such as a storm.

In Teilregionalplan Lausitz Spreewald the document includes information about heavy rainfall sessions in few specifics areas in that region and therefore suggest not to build wind farm as they will be vulnerable to flood. The same example can also be found in Teilflächenutzungsplan VVG Gottmadingen. This explains why the review area 3.1 (Assessment of mitigation measures) was comparatively well performed than review category 3.2. The results of the review category of 3.1 (Assessment of mitigation measure) and 3.2 (Assessment of adaptation measure) of all the four case studies are presented in figure 6.90.



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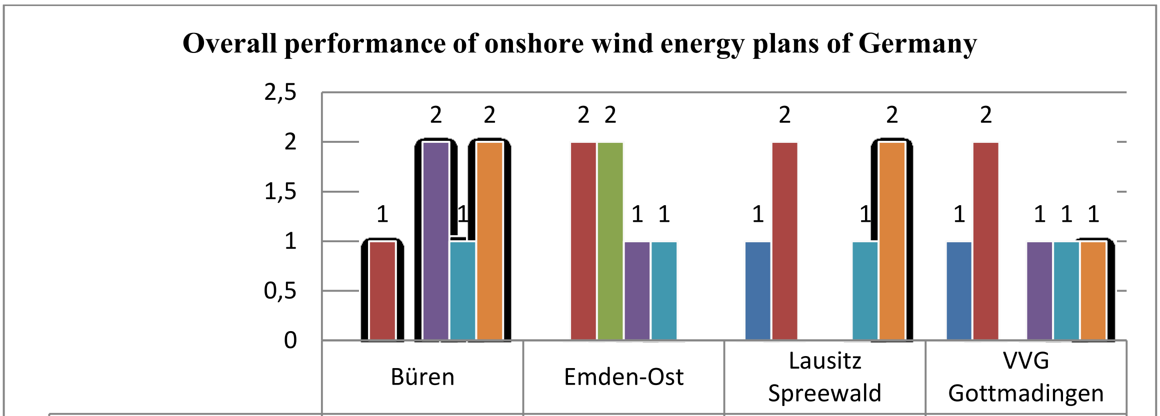
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.90 Performance of review categories for review area 3.1 & 3.2 of Onshore wind energy plans of Germany

Review category 3.2 (Assessment of adaptation measure) was extremely unsatisfactorily attempted since the documents provided poor evidences of adaptation to climate change impacts. When it comes to considering adaptation solutions that are technically feasible to address projected climate vulnerabilities none of the documents provided any reasonable proofs. However, an example of using engineering adaption measures in terms of extreme weather events is presented in Teilflächennutzungplans of VVG Gottmadingen where the document highlights the use of Enercon E-82 and E101.

These models of wind turbines are manufactured in Germany and are considered as a state of the art wind turbines, which are capable of producing greater wind energy when there is high wind speed. Figure 6.91 provides the results obtained from all the case studies in terms of their performances based on how each document attempted the task in review area 3 which is the assessment of mitigation and adaptation measures.



	Büren	Emden-Ost	Lausitz Spreewald	VVG Gottmadingen
A- Well performed	0	0	1	1
B- Satisfactory	1	2	2	2
C- Just satisfactory	0	2	0	0
D- Just unsatisfactory	2	1	0	1
E- Not satisfactory	1	1	1	1
F- Very unsatisfactory	2	0	2	1

Figure 6.91 Individual performance of onshore wind energy plans of Germany in review area 3

One of the biggest weaknesses encountered in this review area is that the documents failed to provide any examples where the adaptation and mitigation are integrated in order to better tackle the impacts of climate change. Only in one document such as Teilflächenutzungsplan of Emden Ost, the document provides information where the planner took the material of blades, the height of the turbines, and technological adaptation measures into consideration. In the same document, adaptation options are discussed in the context of climate change by keeping wind speed and storm into consideration. The turbines are designed with a specific height taking the wind speed of Emden Ost into consideration.

Out of all the documents, Teilflächenutzungsplan Emden Ost performed comparatively better than the rest in review area 3 (Assessment of mitigation and adaptation measures). Figure 6.92 illustrates the degree of satisfactoriness of wind energy plans of Germany in review area 3, which indicates that 42% (A-B%) of the documents could be described as satisfactory, while there are no significant differences seen when it comes to tasks considered as average and unsatisfactory since 29% (C-D%) are graded as average and another 29% (E-F%) of the tasks in all the four documents are poorly attempted and considered as unsatisfactory.

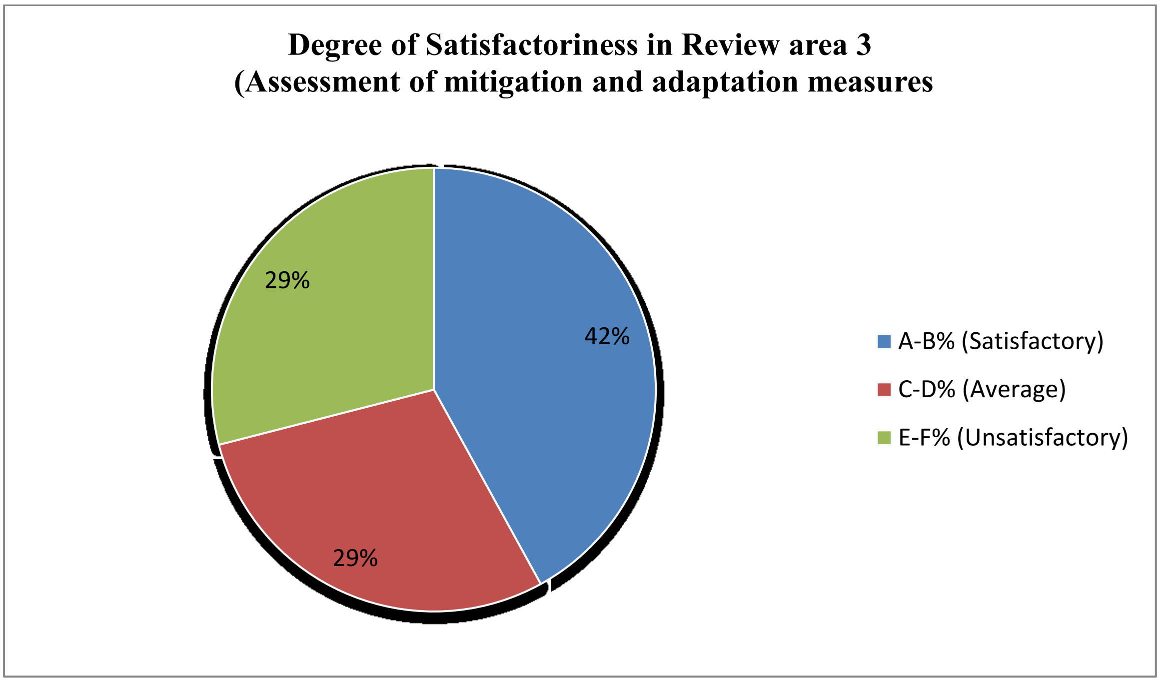
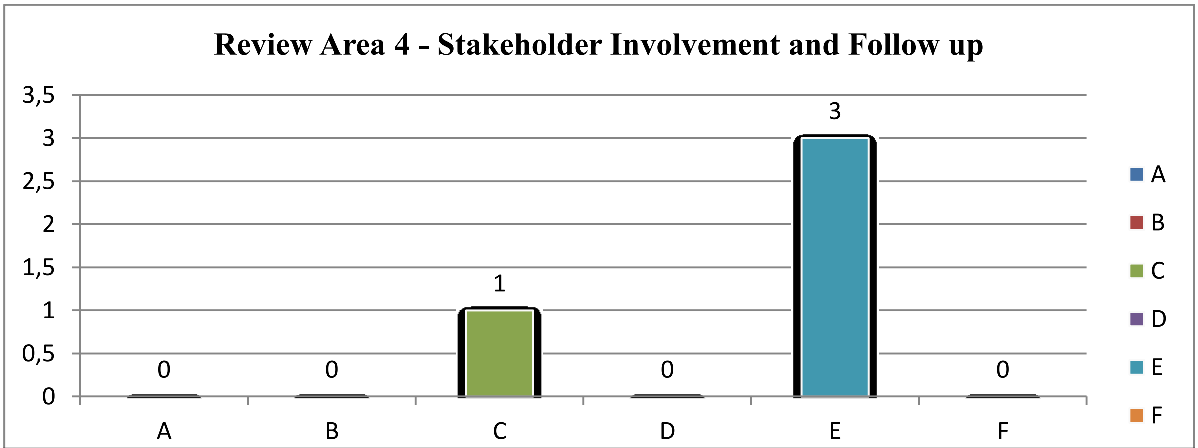


Figure 6.92 Degree of Satisfactoriness of onshore wind energy plans of Germany is review area 3

6.2.4 Review Area 4 – Stakeholder Involvement and Follow up

The review area 4 is about stakeholder involvement and follow up. Figure 6.93 shows an overview of the performance of documents in review area 4, which shows that the documents performed almost unsatisfactorily in this area. The graph interprets that three of the documents were graded as E (not satisfactory) in this review area and only one is graded as C, which considered as just satisfactory despite omissions and inadequacies of the tasks.



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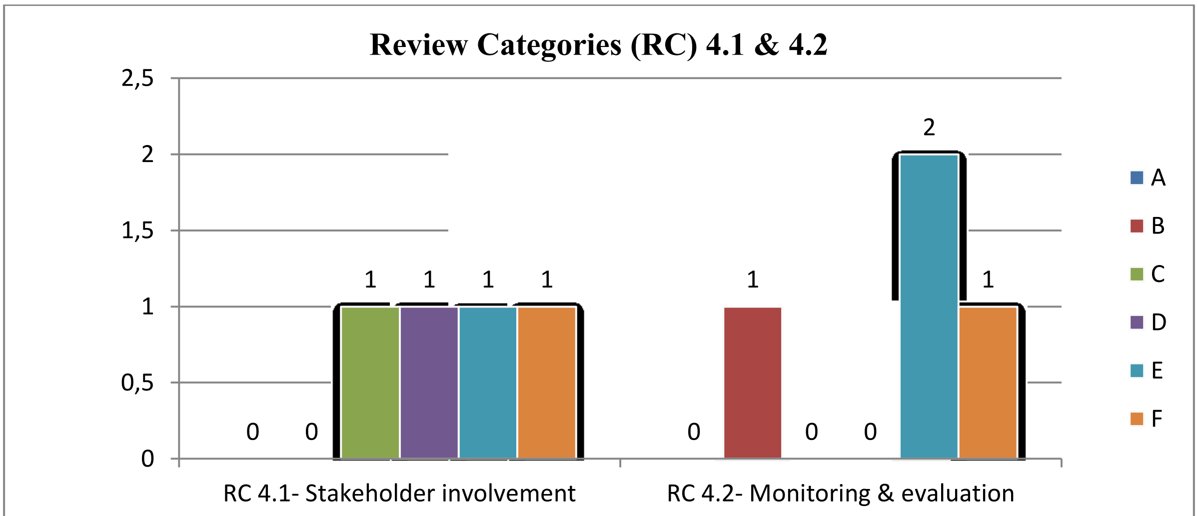
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.93 Overall performance of onshore wind energy plans of Germany in review area 4

Like other review areas this review area is also divided into two review categories, such as 4.1 (stakeholder involvement) and review category 4.2 (Follow up). Figure 6.94 provides the breakdown and the analysis of review category 4.1 and review category 4.2. The analysis shows that both the review categories were poorly attempted. The analysis shows a very unconvincing performance of the documents in the review category 4.1 (stakeholder involvement). The main weakness of review category 4.1 resulted from the non-acknowledgment of the climate change experts in the entire wind energy plan-making process. None of the documents considers climate change experts apart from the general public thus lacking very important decisions related to climate change issues.

In comparison to the other three documents, Lausitz Spreewald performed relatively well in this area. From all the sub review categories in review area 4, the document only received one D grade in the review category 4.1 due to not acknowledging climate change experts, nor referencing them anywhere in the report. However, Teilflächennutzungsplan Emden Ost includes information about involving pollution control experts along with environmental specialists to take important decisions but no climate change experts are consulted in the plan-making process. Additionally, the analysis shows that only two of the documents out of four clearly defined the time frame of the consultation process in their reports such as Teilregionalplan Lausitz Spreewald and Teilflächenutzungsplan Emden Ost.



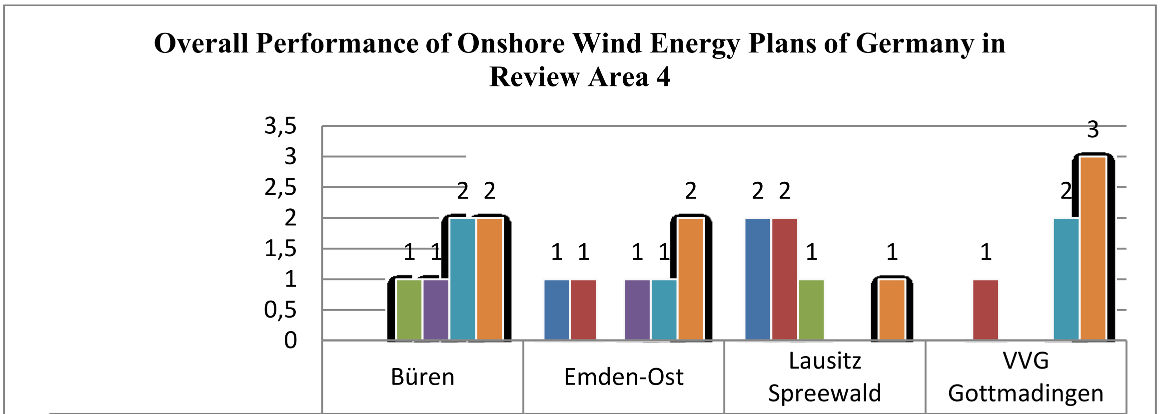
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.94 Performance of review categories 4.1 & 4.2 of review area 4 of Onshore wind energy plans of Germany

The other two performed inadequately in this area and included no information about stakeholder consultation. Regarding the comments of the public and there extend of taking them into consideration very few documents satisfactorily attempted this task. Teilflächenutzungsplan Büren and Teilregionalplan Lausitz Spreewald are graded as B in this sub review category as the documents include information about the number of comments received from stakeholders and highlights how the comments were taken into consideration. Teilflächenutzungsplan VVG Gottmadingen was the only document that performed very poorly in the entire review category 4.1 and obtained an F (Very unsatisfactory) in all the sub review categories of review category 4.1.

Review category 4.2 addresses the matters of follow up such as monitoring and evaluation in the reports. The graph presented in figure 6.94 shows that this review category was incompetently performed, most of the documents were graded as poor. However, one of four documents performed very well and was graded as B. One of the biggest weaknesses encountered in this review category was that most of the documents lacked any provision for monitoring climate-related measures. The documents did not include any information about forecast models to monitor and predict changes in the weather, wind, and climate.

Since the life expectancy of these huge turbines are more than 20 years, therefore, it is fundamentally important to have a monitoring system to monitor the effects of climate change in future terms as climate variability increases during time and historical patterns shift. Regarding indicators used for monitoring climate change for instance, Teilregionalplan of Lausitz Spreewald includes information about indicators related to monitoring climate change impacts such as keeping track of data related to precipitation and temperature along with flood retention areas. It was found that the reports performed comparatively fair in review category 4.2 (Follow up). The overall performances of all the case studies of onshore wind energy plans of Germany are presented in figure 6.95.



	Büren	Emden-Ost	Lausitz Spreewald	VVG Gottmadingen
A- Well performed	0	1	2	0
B- Satisfactory	0	1	2	1
C- Just satisfactory	1	0	1	0
D- Just unsatisfactory	1	1	0	0
E- Not satisfactory	2	1	0	2
F- Very unsatisfactory	2	2	1	3

Figure 6.95 Individual performance of onshore wind energy plans of Germany in review area 4

The above figure shows that most of the documents did not perform well in review categories 4.1 (Stakeholder involvement) and 4.2 (Follow up) and this had a great influence on the overall quality of the review area 4, except Teilregionalplan Lausitz Spreewald which showed relatively better performance in review area 4 (stakeholder involvement and follow up) than the rest of the case studies of onshore wind energy plans in Germany.

In terms of the degree of satisfactoriness, the overall quality of the SEAs of wind energy plans of different states of Germany in review area 4 shown in figure 6.96 is not so satisfactory. The figure indicates that the majority of the documents attempted the tasks related to review area 4 in a very unsatisfactory way since 54% (E-F%) of the documents are described as unsatisfactory and only 29% (A-B%) are ranked as satisfactory. While 17% (C-D%) of the tasks in the documents are just averagely attempted with omission and inadequacies.

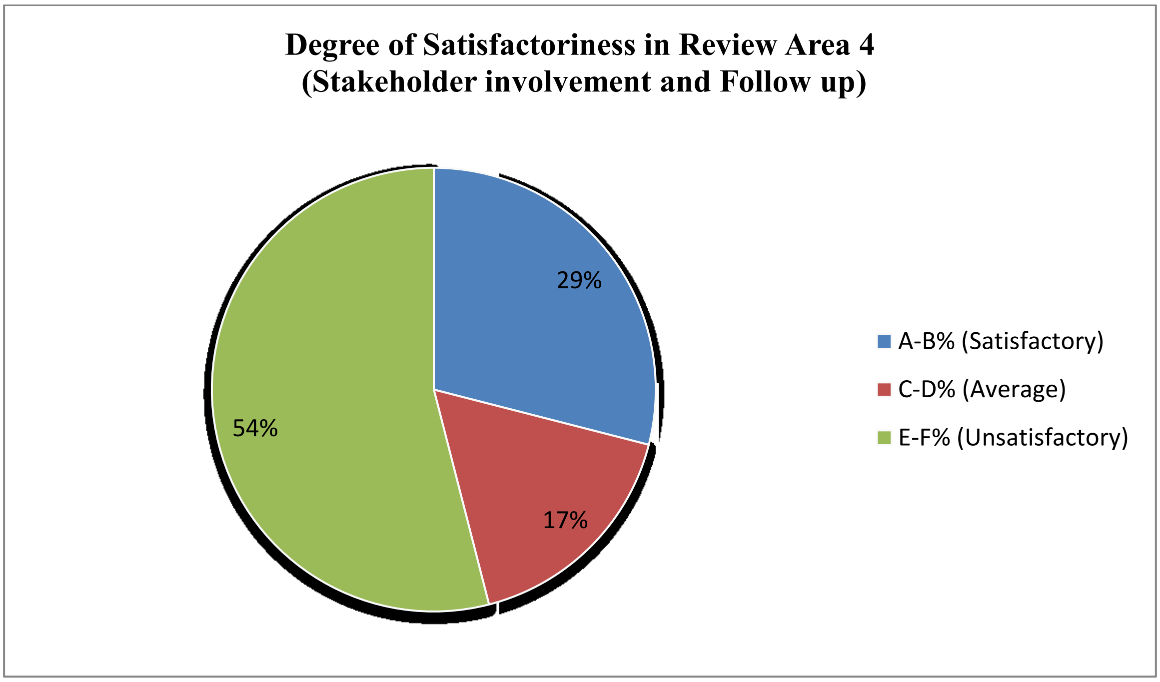


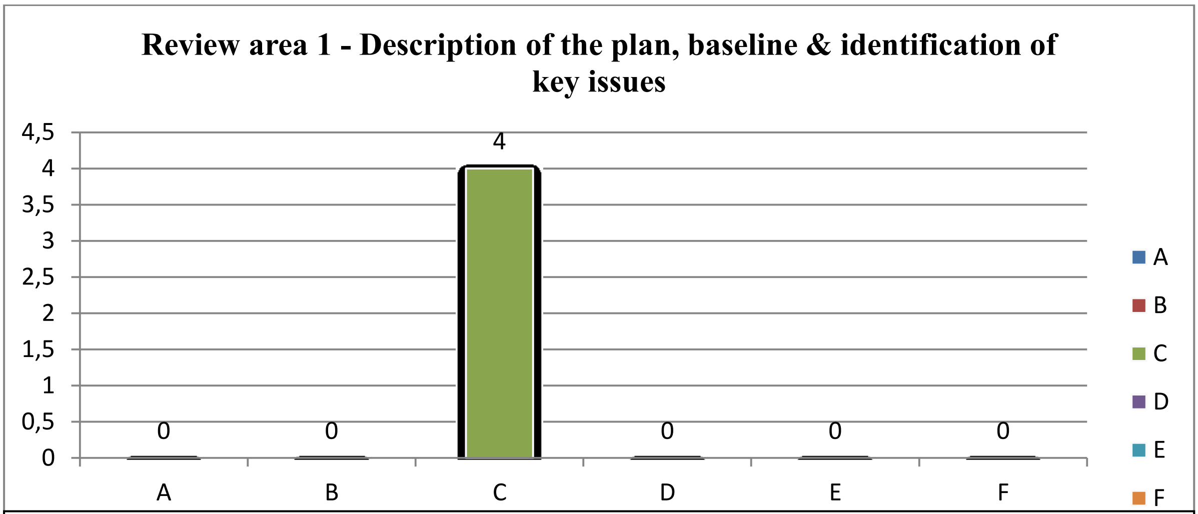
Figure 6.96 Degree of satisfactoriness of onshore wind energy plans in Germany in review area 4

6.3 Cumulative Assessment of Onshore Wind Energy Plans of Scotland

This section represents a cumulative analysis of all the four wind energy plans of Scotland which are selected for this study. According to the performances of tasks of the onshore wind energy plans of Scotland in sub review categories of all the four review areas, this section illustrates a combined result of how the onshore wind energy plans performed in each review area of the quality review package.

6.3.1 Review Area 1- Description of the Plan, Baseline & Identification of Key Issues

Review area 1 refers to the criteria where analysis is carried out to find whether the documents in terms of climate change aspects include the description of the plan, baseline, and identification of the key issues. This review area describes a brief overview of the SEA report with an intention to consider and evaluate all possible key issues significantly. Figure 6.97 shows the overall representation of the review area 1 which shows that all the documents were graded as C in review area 1 (Description of the plan, baseline, and identification of key issues), which means the tasks attempted by all the four documents in this review area are just satisfactory despite omissions and inadequacies.

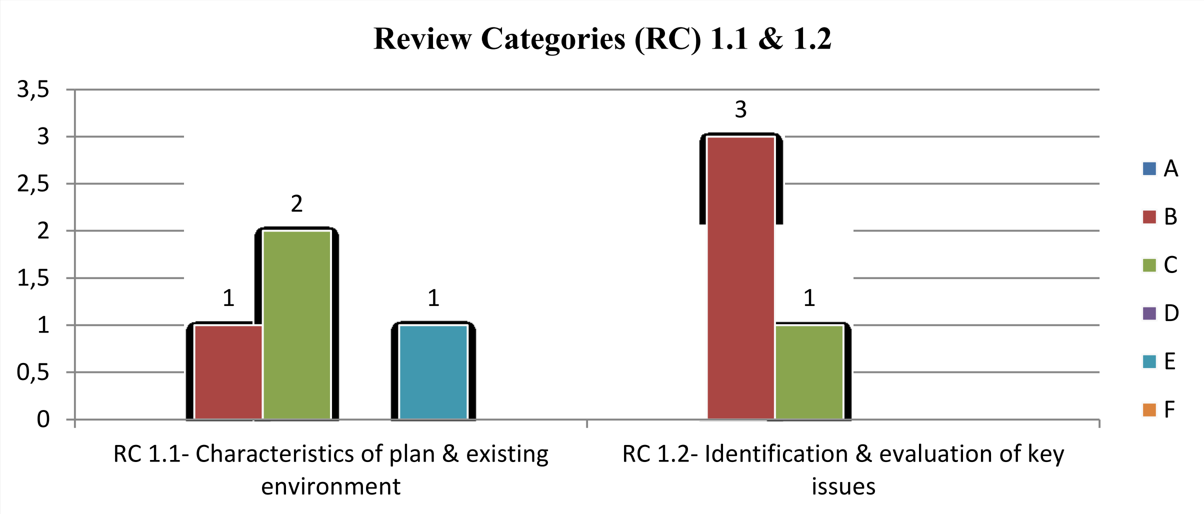


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.97 Overall performance of onshore wind energy plans for Scotland in review area 1

This insinuates that all the documents just provided an average description of the plan, baseline data, and recognised key issues of the plan on a very basic level. The shortfalls found in most of the case studies from Scotland are that the baseline description in the reports are quite inadequately performed. The current and future climatic conditions of that area are never a consideration. No information was provided in the reports about the historic, current, and future climate trends of the area. Due to the fact that these giant energy infrastructures are subject to long term planning, therefore, it is important to keep track of the changing climate to explore the potential of the impacts of climate change on the wind energy infrastructure.

Review area 1 is further split into two review categories, which are further divided into three sub review categories each. Review category 1.1 demonstrates the characteristics of the plan and existing environment and review category 1.2 shows the identification and evaluation of key issues. The results of review category 1.1 (characteristics of the plan and existing environment) and 1.2 (identification and evaluation of key issues) are displayed in figure 6.98, which shows that major deficiencies are reflected in review category 1.1 as compared to review category 1.2 due to not mentioning the information about baseline and not considering the climatic condition of the area. None of the onshore wind energy plans of Scotland have discussed or mentioned the current, historic, and future trends in climatic conditions.

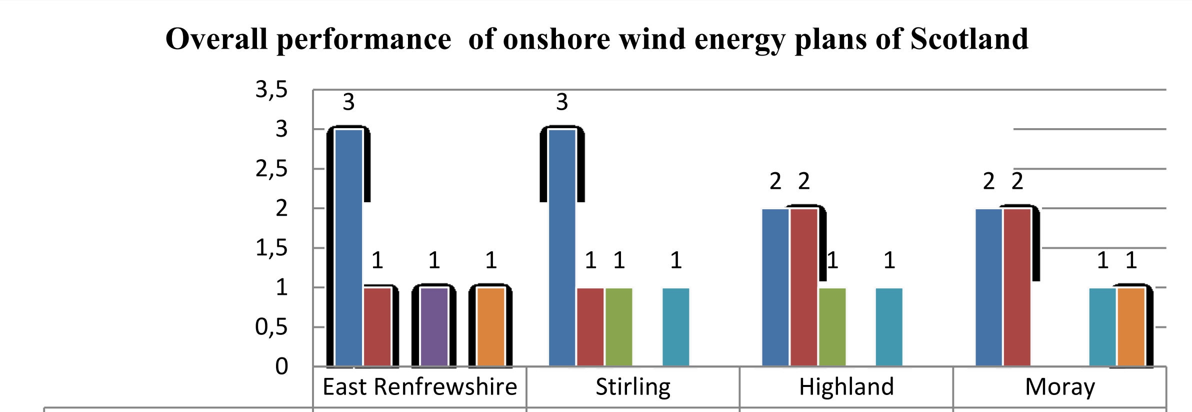


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.98 Performance of review categories 1.1 & 1.2 of review area 1of onshore wind energy plans of Scotland

The documents in review category 1.2 performed relatively better than review category 1.1, which is the identification and evaluation of key issues. From the graph above, we can see that the documents performed reasonable, with three of the documents graded as B, which means the tasks attempted are satisfactory and complete and one document is graded as C, which also means the document is just satisfactory despite few omission and inadequacies. From the analysis, it is apparent that the document identified the key issues related to climate change very effectively. What is interesting in this data is that flood is considered as one of the major issues in this review area and is managed very competently with flood risk management plans, flood maps, and guidance documents related to the flood.

All the documents mention using guidance documents from SEPA related to managing flood. The wind energy SEA report of the Stirling council mentions that if flood risk is identified in the region than a flood risk assessment should be carried out. Other than that, peat and carbon-rich soils are also issues that were taken into consideration in the SEAs of Scotland's onshore wind energy plans. The documents also mention the use of guidance documents by relevant authorities to deal with issues of peat and carbon-rich soils because areas with peat issues need to be considered very carefully, once disturbed they may have a drastic effect on the environment in terms of GHG emissions. Figure 6.99 outlines the overall performance of all the four onshore wind energy plans of Scotland in review area 1.



	East Renfrewshire	Stirling	Highland	Moray
A- Well performed	3	3	2	2
B- Satisfactory	1	1	2	2
C- Just satisfactory	0	1	1	0
D- Just unsatisfactory	1	0	0	0
E- Not satisfactory	0	1	1	1
F- Very unsatisfactoy	1	0	0	1

Figure 6.99 Individual Performance of onshore wind energy plans of Scotland in review area 1

According to the analysis, almost all the wind energy plans identify the extreme weather events on wind energy infrastructure with respect to flood, however not more information is given in the documents about the identification of direct threat to wind turbines due to extreme weather events. The East Renfrewshire renewable energy SEA report has a separate scoping report where the key environmental impacts are identified in much detail. It also has a separate report for the baseline environmental state of the East Renfrewshire area where the quality of air is monitored and a range of pollutants are assessed. Similarly, the Stirling council and Highland council both also have a separate report for identifying the state of the environment of the Stirling area and Highland area called as the State of the Environment (SoE) report including baseline information for SEA.

Figure 6.100 displays a visual representation of the degree of satisfactoriness of onshore wind energy plans of Scotland for review area 1 (Description of the plan, baseline, and identification of key issues). The figure mainly indicates the strengths and weaknesses of the onshore wind energy plans of Scotland in review area 1 (Description of the plan, baseline, and identification of key issues), it is concluded that almost 67% of the tasks in the documents could be described as satisfactory (A-B%). However, 21% (E-F%) are ranked as unsatisfactory with major omissions along with inadequacies and only 13% (C-D%) of the tasks are just averagely attempted in this review area.

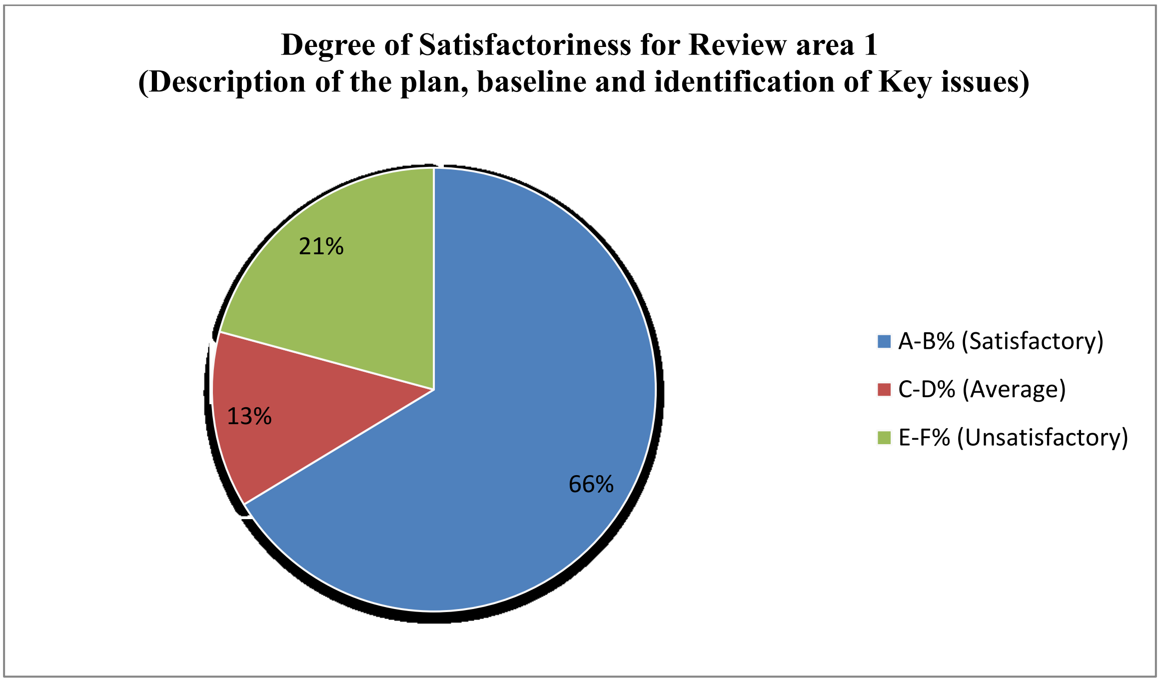
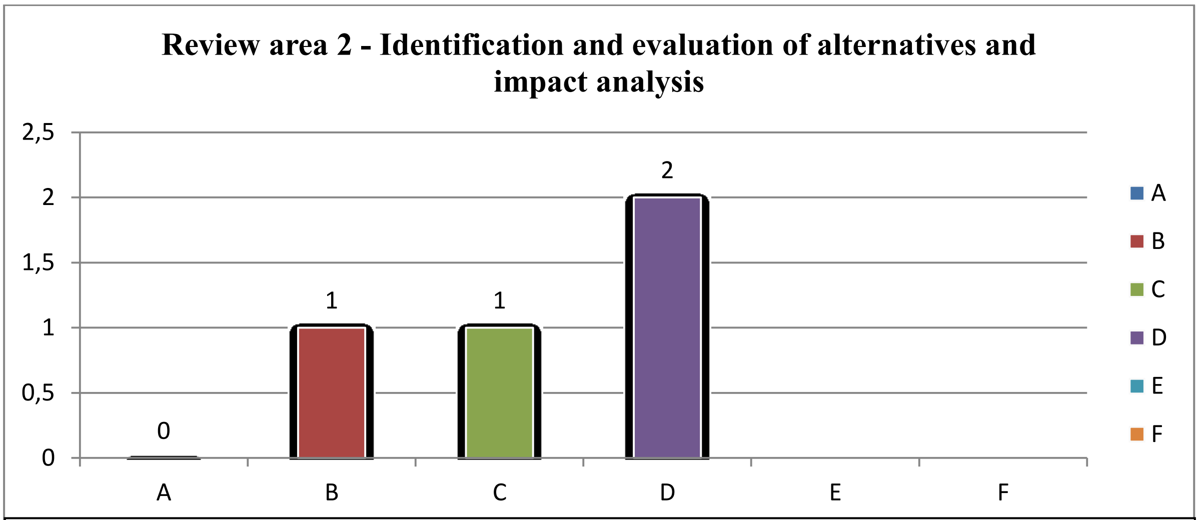


Figure 6.100 Degree of satisfactoriness of onshore wind energy plans of Scotland in review area 1

6.3.2 Review Area 2 – Identification Evaluation of Alternatives & Impact Analysis

Review area 2 addresses the consideration and assessment of alternatives and the identification of climate change issues. Figure 6.101 presents the overall analysis of the review area 2, which shows out of four onshore wind energy plans of Scotland only one document is graded as B, which means it is considered as complete and satisfactory in terms of integrating climate change issues into the plan. Moreover, one document is ranked as C in which the tasks are just satisfactorily attempted despite omission and/or inadequacies. The analysis also reveals that almost two documents failed to attempt the tasks satisfactorily hence they are graded as D which means the tasks are well attempted but as a whole is considered just unsatisfactory because of omissions or inadequacies.

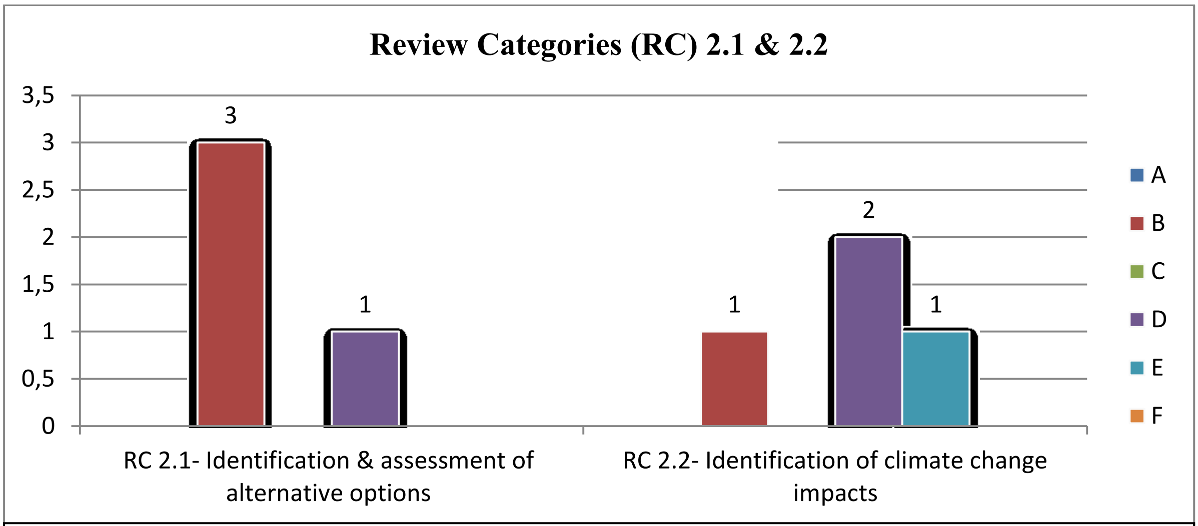


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.101 Overall Performance of onshore wind energy plans of Scotland in Review area 2

Review area 2 is also divided into two review categories such as review category 2.1 (Identification and assessment of alternative options) and review category 2.2 (Identification of climate change impacts). The individual performances of these review categories are shown in figure 6.102. The analysis of the onshore wind energy plans of Scotland shows that very few grey areas are found in the review category 2.1 (Identification and assessment of alternative options) since only one document showed unsatisfactory results while assessing climate change implications in considering alternatives. The rest of the tasks in this review category are satisfactorily attempted by almost all of the documents in onshore wind energy plans of Scotland.

Review category 2.2 addresses the identification of climate change impacts. It can be seen from the analysis of the documents that the climate-related implications are assessed quite unsatisfactorily during the whole SEA process in onshore wind energy plans of Scotland. Most of the documents failed to identify the current and historic trends in climate and also no methodology was adopted in identifying and predicting climate change impacts of that area. As discussed earlier one of the main concern, Scotland faces with regard to climate change are the flood issues along with peat and carbon-rich soils. Scotland's onshore wind energy documents manage these issues very well with the help of proper guidance documents and risk assessments.



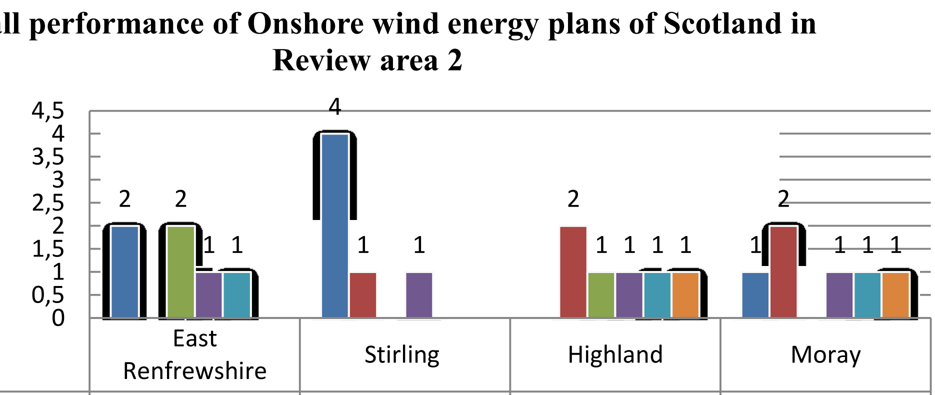
A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.102 Performance of review categories 2.1 & 2.2 of review area 2 of onshore wind energy plans of Scotland

The SEA document of Stirling council mentions relevant guidance documents that give clear instruction on how to deal with carbon-rich soil such as;

- Developments on peat lands, Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste 2014 (Scottish Government, 2014a)
- Guidance on developments on peat lands – Peat land Survey 2017 (Scottish Government, SEPA, SNH, 2017)
- Good practice during wind farm construction guidance, 2015 (Scottish Government, SNH, 2015)
- Regulatory Position Statement – Developments on Peat, 2010 (SEPA, 2010)

Figure 6.103 present the individual performance of the onshore wind energy plans of Scotland. The performance of the SEA report of the wind energy development of East Renfrewshire was noticed to be above satisfactory following the SEA report of wind energy development of the Highland council, which was also satisfactory. In both cases, a wide range of alternatives options were identified. In the SEA report of the Highland council, reasonable alternatives are assessed using assessment matrixes. The only drawback in this case study was that climate change implications are not assessed while considering alternatives. East Renfrewshire presents a very good example when it comes to assessing the climate change impact during alternative consideration. The document provides information about considering carbon-rich soil when considering alternatives and also states to include assessment of its effect. This evidence is not found in any other of the onshore wind energy plans of Scotland.



	East Renfrewshire	Stirling	Highland	Moray
A- Well performed	2	4	0	1
B- Satisfactory	0	1	2	2
C- Just satisfactory	2	0	1	0
D- Just unsatisfactory	1	1	1	1
E- Not satisfactory	1	0	1	1
F- Very unsatisfactoy	0	0	1	1

Figure 6.103 Individual performance of onshore wind energy plans of Scotland in review area 2

According to the analysis, it was revealed that almost all the documents performed below average when it comes to usage of methods in identifying and predicting climate change impacts because the documents have a very primitive approach in identifying these complex climate change impacts. None of the documents provides any information about using any climate models to identify these effects or to predict future wind patterns of that area. With regard to cumulative impacts, most of the onshore wind energy plans of Scotland did not consider the climate change impacts caused by the cumulative effects of the wind turbines.

The cumulative impacts are considered but in terms of noise and visual impacts. Figure 6.104 shows the visual representation of the degree of satisfactoriness of all the onshore wind energy plans of Scotland in review area 2, which reveal very interesting results. According to the figure, almost 50% (A-B%) of the tasks in these documents in review area 2 are described as satisfactory. While 29% (C-D%) of the tasks are just averagely attempted and 21% (E-F%) of the tasks related to integrate the climate change aspects in review area 2 are unsatisfactory and poorly attempted.

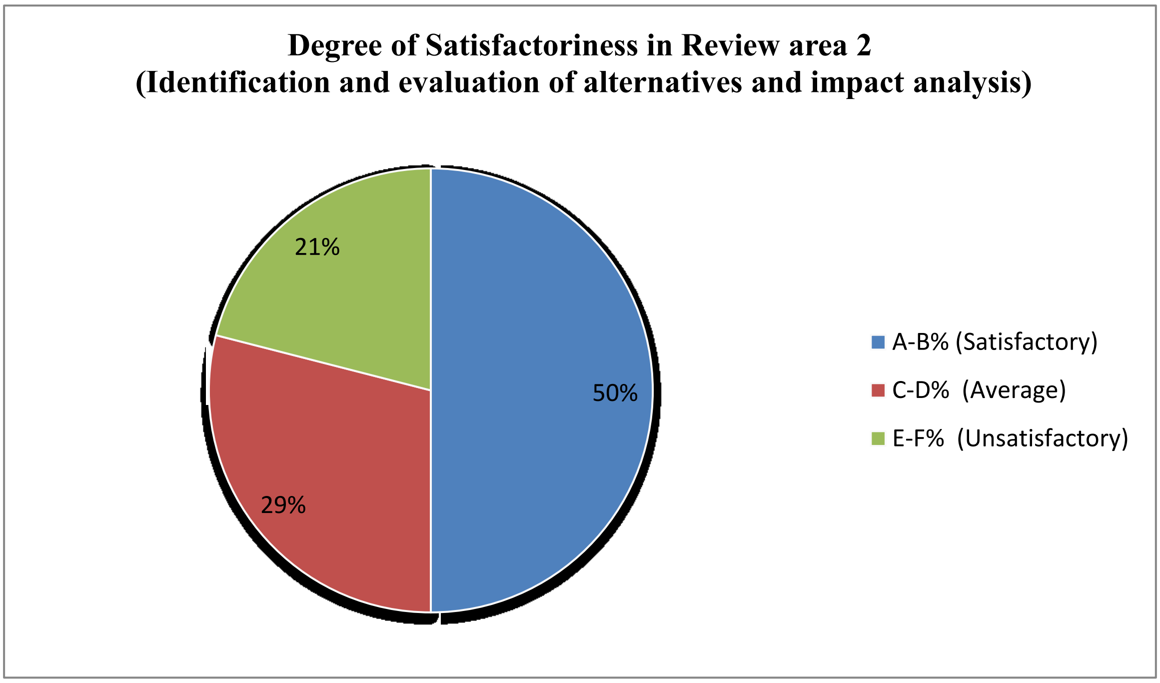
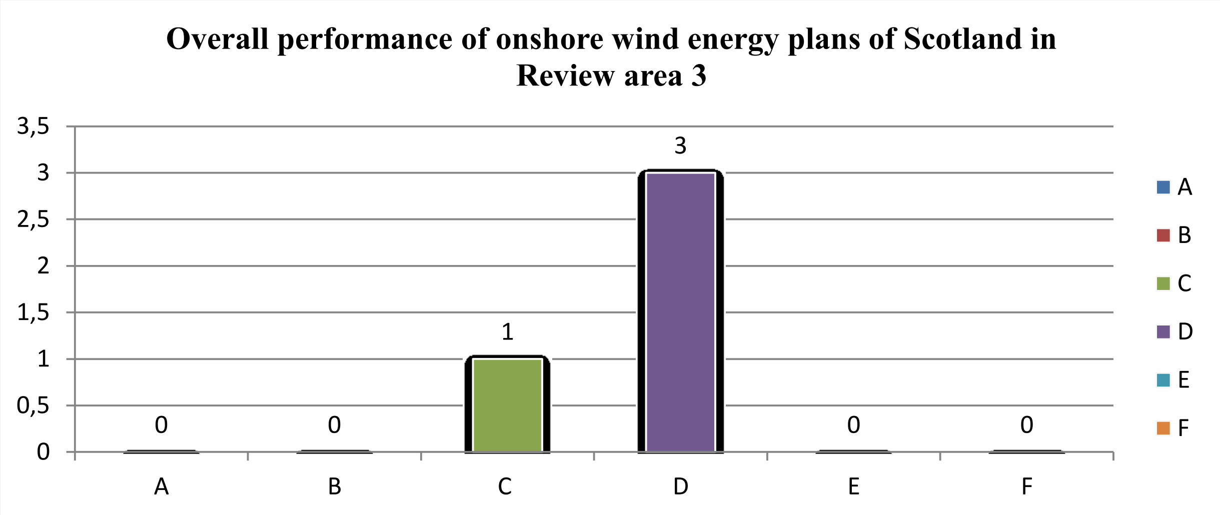


Figure 6.104 Degree of satisfactoriness of onshore wind energy plans of Scotland in review area 2

6.3.3 Review Area 3 – Assessment of Mitigation and Adaption Measures

This review area deals with two of the most common strategies, which aim to reduce the impacts of climate change such as mitigation and adaptation. Where mitigation measures aim to avoid the unmanageable impacts and the adaptation aims to manage the unavoidable impacts. Figure 6.105 present the performance of the review area 3, which is the assessment of mitigation and adaptation measures in onshore wind energy plans in Scotland. This figure illustrates that the documents performed below average when mitigating and adapting the climate change impacts with regard to onshore wind energy planning.

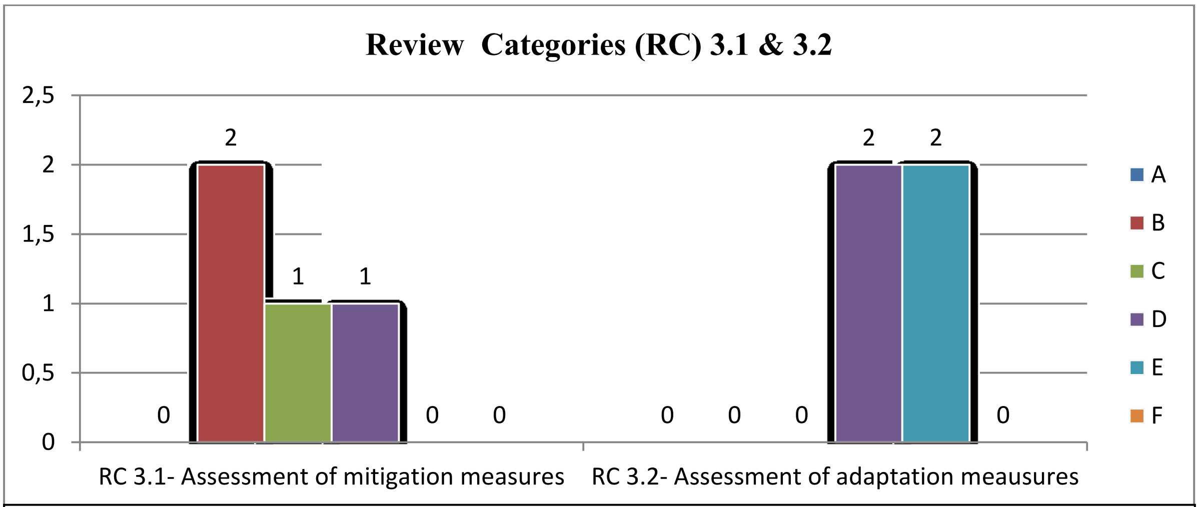
According to the analysis of this review area and based on the task performed it was noticed that out of four onshore wind energy plans of Scotland three of them are graded as D and are considered as just unsatisfactory, while only one of them was ranked as C, which means the document is considered as just satisfactory despite omissions and inadequacies. These grading values show that the onshore wind energy plans of Scotland failed to satisfactorily document the aspects related to mitigation and adaptation of climate change impacts while planning for onshore wind energy development.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.105 Overall performance of onshore wind energy plans of Scotland in review area 3

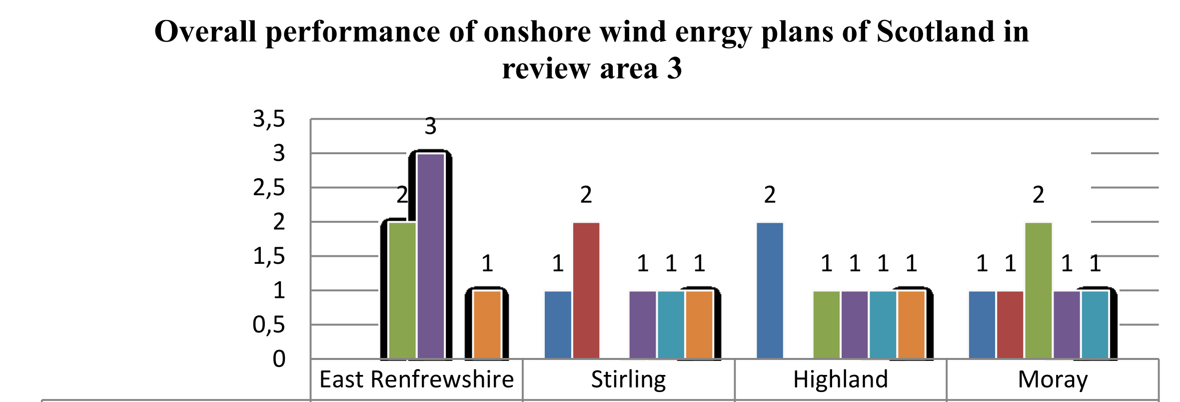
This review area has two review categories such as review category 3.1- Climate change mitigation and review category 3.2- Climate change adaptation. Figure 6.106 shows the performance of the documents in these two review categories such as assessment of climate change mitigation and assessment of climate change adaptation. This figure outlines how the onshore wind energy plans of Scotland carried out tasks related to review category 3.1 (Assessment of mitigation measures) and review category 3.2 (Assessment of adaptation measures). Based on the tasks performed in the review category 3.1 (Assessment of mitigation measures), it is clear from the figure that review category 3.1 performed comparatively better than review category 3.2 (Assessment of adaptation measures) as it showed robustness when it comes to mitigating those impacts related to climate change impacts. From the graph below we can see that the documents performed rationally in the review category 3.1 (Assessment of mitigation measures), with two documents graded as B (satisfactory and complete), one as C (Just satisfactory) and only one as D which means the tasks are well attempted but as a whole is considered just unsatisfactory because of omissions or inadequacies. Review category 3.2 focuses on the assessment of the adaptation measures of the climate change impacts in the SEAs of the onshore wind energy plans in Scotland. The graph below (figure 6.106) illustrates the performance of the documents in review category 3.2 which shows that majority of the documents did not perform well in this area. Based on the tasks performed in this review category, four out of two documents are graded as D, which means the tasks are just unsatisfactory because of omissions or inadequacies.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.106 Performance of review categories 3.1 & 3.2 of review area 3 of onshore wind energy plans of Scotland

The remaining two documents are ranked as E, which means the tasks performed are not satisfactory due to significant omissions or inadequacies. In this review category, the reviewed documents showed that the effects of climate change and the adaptation measures required are not adequately assessed and are poorly considered in most of the documents. The onshore wind energy plans of Scotland provided evidence that guidance documents are used when dealing with mitigating the climate change impacts such as the SEA document of the Moray council includes information on mitigating effects related to peat and wetlands. Special consideration was given to areas where the peat and carbon-rich soils were suspected to avoid significant drying or oxidation of peat during road construction and transmission lines (cable) trenching. The reviewed documents also showed that climate change impacts are mitigated on the environment as well as on the wind farms. One of the discrete reason emerges from this fact is that the Scotland floods are always on the rise therefore the country adopt careful consideration of flood risks to avoid future damages to its wind energy infrastructures. This is also reflected in the SEA documents, because most of the SEA reports reviewed, mentioned about considering guidance documents related to flood issues along with flood risk management plans. The area where the documents just performed average is the use of a mitigation hierarchy where the impacts are supposed to be prevented, reduced, and as fully as possible offset any significant adverse effects on the environment of the implementing plan or programme. This approach was only found in one document, which was of Highland council, where the mitigation hierarchy is explained in detail on how to achieve no overall negative impact on the plan. Figure 6.107 provides an overview of the individual performance of the onshore wind energy plans of Scotland in review area 3 (Assessment of mitigation and adaptation measures). None of the documents identifies the adaptation measures in the context of climate change.



	East Renfrewshire	Stirling	Highland	Moray
A- Well performed	0	1	2	1
B- Satisfactory	0	2	0	1
C- Just satisfactory	2	0	1	2
D- Just unsatisfactory	3	1	1	1
E- Not satisfactory	0	1	1	1
F- Very unsatisfactoy	1	1	1	0

Figure 6.107 Individual performance of onshore wind energy plans of Scotland in review area 3

The major limitation found in this area was integrating the mitigation measures with the adaptation measure. This practice was not so clearly evident in any of the reviewed documents. The analysis of the assessment of adaptation measures also reveals that the technical or engineering adaptive measures are mostly ignored in these documents because in none of the reports there is any discussion about height or the design of the rotors of the turbine so as to generate more energy when the wind speed is low or high.

The results obtained from analysing the degree of satisfactoriness are set out in figure 6.108. These outcomes suggest that there are no significant differences between the satisfactoriness and un-satisfactoriness of tasks attempted in this review area to mitigate and adapt the climate change impacts in the onshore wind energy plans of Scotland. The figure reveals that only 29% (A-B%) of the tasks in the document could be described as satisfactory. While 25% (E-F%) of the tasks performed are considered as unsatisfactory. However, almost 46% (C-D%) of the tasks, in the onshore wind energy plans of Scotland, attempted are averagely attempted which are neither so satisfactory nor so unsatisfactory.

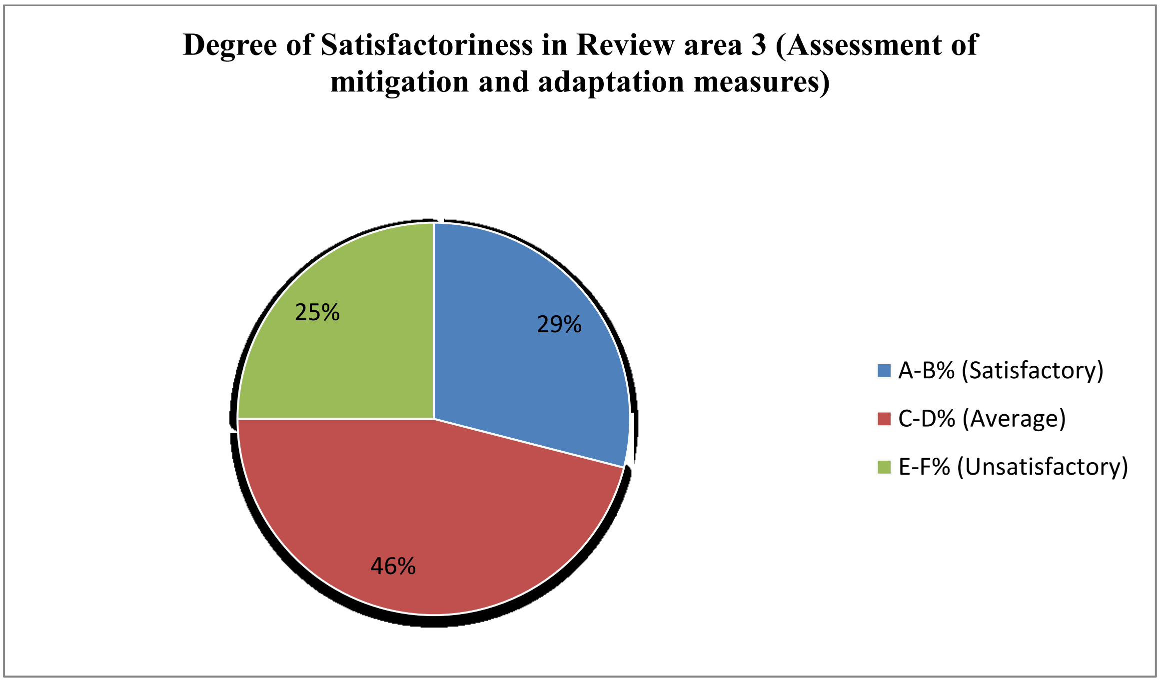
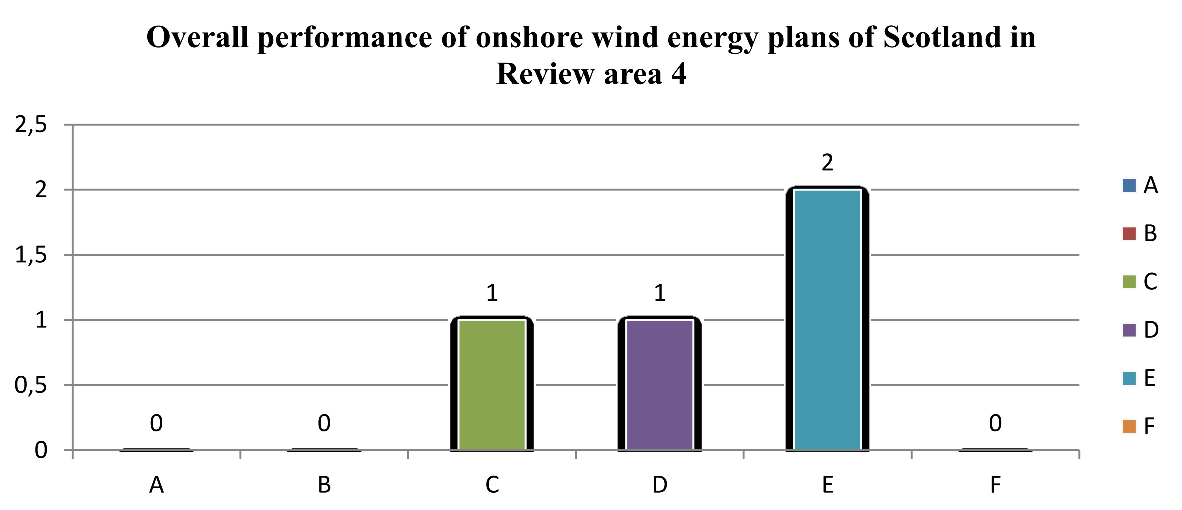


Figure 6.108 Degree of satisfactoriness of onshore wind energy plans of Scotland in review area 3

6.3.4 Review Area 4 – Stakeholder Involvement and Follow up

Review area 4 is about the concerns related to stakeholder involvement and follow up. Like the rest of the review areas, this review area is also divided into two review categories such as review category 4.1- Stakeholder involvement and review category 4.2- Follow up. The overall illustration of this review area is presented in the graph in figure 6.109. The analysis showed that this review area is poorly performed by the onshore wind energy plans of Scotland since almost three of the documents show unsatisfactory results.

The analysis reveals that this review area consists of very little strengths and more deficiencies due to poorly attempting the tasks related to stakeholder involvement and follow up. The study of all the onshore wind energy plans of Scotland in this review area showed that the majority of the documents are considered unsatisfactory and only one document is ranked as just satisfactory where the tasks are attempted averagely with omissions and inadequacies.

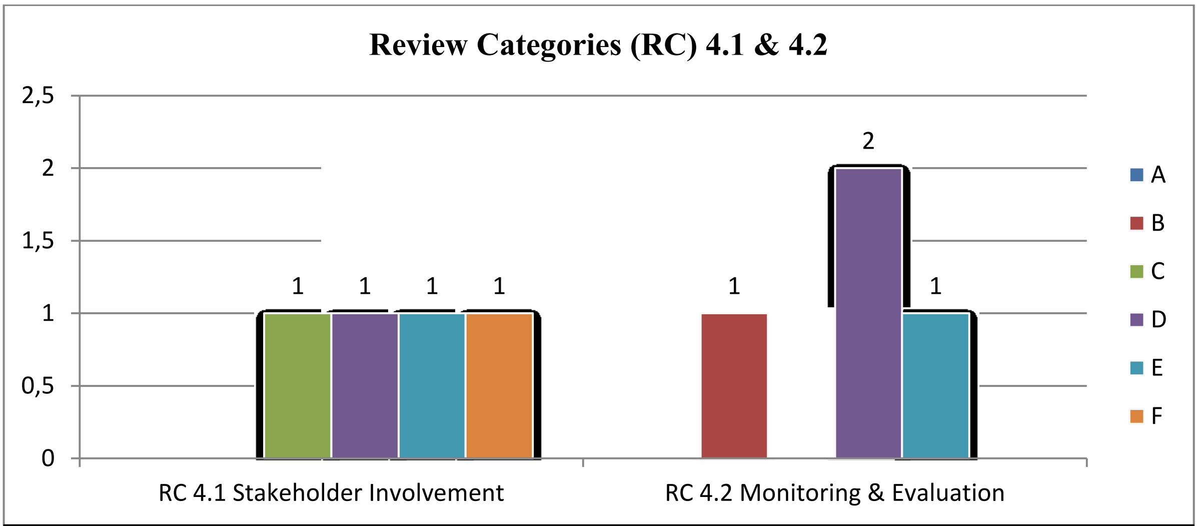


A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.109 Overall performance of onshore wind energy plans of Scotland in review area 4

Based on the tasks performed by the onshore wind energy plans of Scotland in review area 4 (Stakeholder involvement and follow up) the analysis reveals that two documents are ranked as E, which means that the tasks performed in this review area are not satisfactory due to significant omissions or inadequacies, and one is graded as D which shows that the tasks are well attempted but as a whole is considered just unsatisfactory because of omissions or inadequacies. The analysis also shows that one document out of these four is ranked as C where the tasks are just averagely attempted which are neither very satisfactory nor unsatisfactory. This review area has some major limitations with respect to review category 4.1, which is stakeholder involvement.

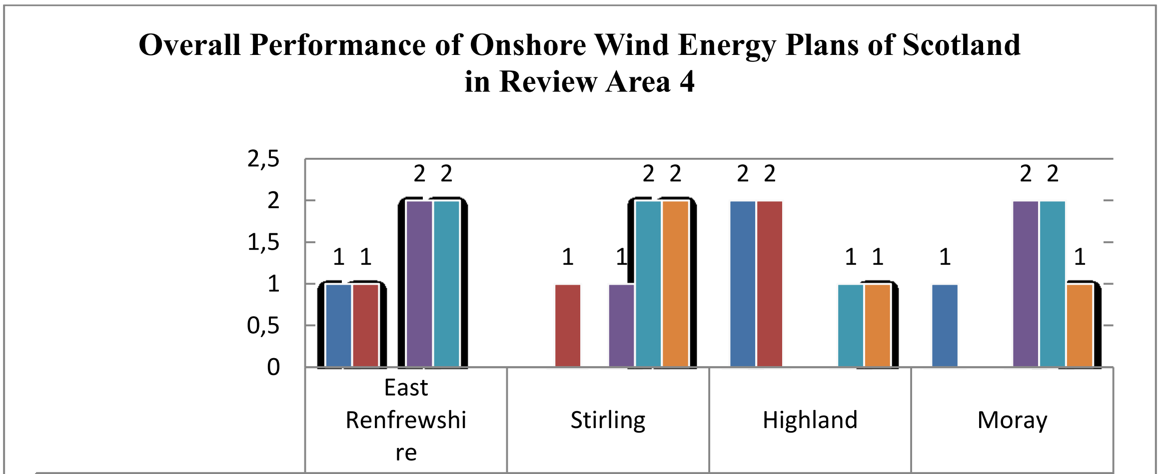
The graph presented in figure 6.110 shows that this review category is poorly performed, as most of the documents failed to attempt the tasks satisfactorily. One of the major weaknesses encountered in the review category 4.1 (Stakeholder involvement) is with regard to identifying stakeholders other than the general public. The reports did not have any evidence of considering climate change experts during the whole process. Other than that, the information regarding the time frame of the stakeholder consultation was also ignored in the reports. Except for one which is a SEA report of onshore wind energy in East Renfrewshire, which mentioned that a six week consultation period was given for stakeholder involvement.



A - Relevant tasks well performed, no important tasks left incomplete.
B - Generally satisfactory and complete, only minor omissions and inadequacies.
C - Can be considered just satisfactory despite omissions and/or inadequacies
D - Parts are well attempted but must, as a whole, be considered just unsatisfactory due to omissions
E - Not satisfactory, significant omissions or inadequacies
F - Very unsatisfactory, important task(s) poorly done or not attempted.

Figure 6.110 Performance of review categories 4.1 & 4.2 of review area 4 of onshore wind energy plans of Scotland

None of the documents provided any information about the stakeholder comments such as whether or not they were taken into consideration or what action was taken after the comments of the public. This information was only noticed in Supplementary Planning Guidance of Highland for onshore wind energy development, where the document demonstrates that the Supplementary Planning Guidance includes information about stakeholder comments and also information about how the Highland council will take on board with these comments. In most cases, the Supplementary Planning Guidance of onshore wind energy development of Scotland did not include all this information in their environmental statements. They are separately prepared and made available to the public. All the stakeholder consultation analysis documents are readily accessible on the council's websites. These reports present an analysis of the responses to the consultation on a draft onshore wind policy statements. Review category 4.2 focuses on the issues related to follow up such as monitoring and evaluation activities of the plan. It can be seen from the data in figure 6.110 that the documents comparatively attempted the tasks in this review category effectively than review category 4.1 (Stakeholder involvement). However, there are also shortcomings in the review category 4.2 (Follow up), since only one document attempted the tasks in this review category satisfactorily, hence ranked as B, while the rest of the three documents are graded as below average in this review category. The results of the distinctive performance of the Supplementary Planning Guidance of onshore wind energy development of Scotland in review area 4 are highlighted in figure 6.111.



	East Renfrewshire	Stirling	Highland	Moray
A- Well performed	1	0	2	1
B- Satisfactory	1	1	2	0
C- Just satisfactory	0	0	0	0
D- Just unsatisfactory	2	1	0	2
E- Not satisfactory	2	2	1	2

Figure 6.111 Individual performance of onshore wind energy plans of Scotland in review area 4

The assessment of all the onshore wind energy plans of Scotland in review area 4 (stakeholder involvement and follow up) showed very interesting results. All the documents performed the tasks satisfactorily as well as unsatisfactorily in this review area (see figure 6.111). The Highland onshore wind energy plan mentions about determining indicators for monitoring climate change impacts and also includes information about improving the list of the monitors as compared to the old monitors in the previous environmental report. Additionally, the document includes the provision and a framework for monitoring climatic factors. Apart from the Highland council, the Supplementary Planning Guidance of the Stirling council also incorporates provisions for monitoring climate-related factors. However, the document does not mention any framework for monitoring climatic factors. This task was well attempted in the supplementary planning guidance of the onshore wind energy plan of Moray council where the document gives reference to a separate monitoring report where the impacts are monitored in a more comprehensive method. The rest of the tasks in Moray Supplementary Guidance of the onshore wind energy plans are mostly inadequately or averagely performed. Figure 6.112 demonstrates the degree of satisfactoriness of the onshore wind energy plans of Scotland in review area 4 (stakeholder involvement and follow up). According to the analysis of the degree of satisfactoriness of the onshore wind energy plans of Scotland in this review area, which is based on the performance of the tasks in the documents, it is revealed that the onshore wind energy plans of Scotland did not attempt the tasks so effectively in review area 4 (stakeholder involvement and follow up), since the documents performed a majority of the tasks unsatisfactory.

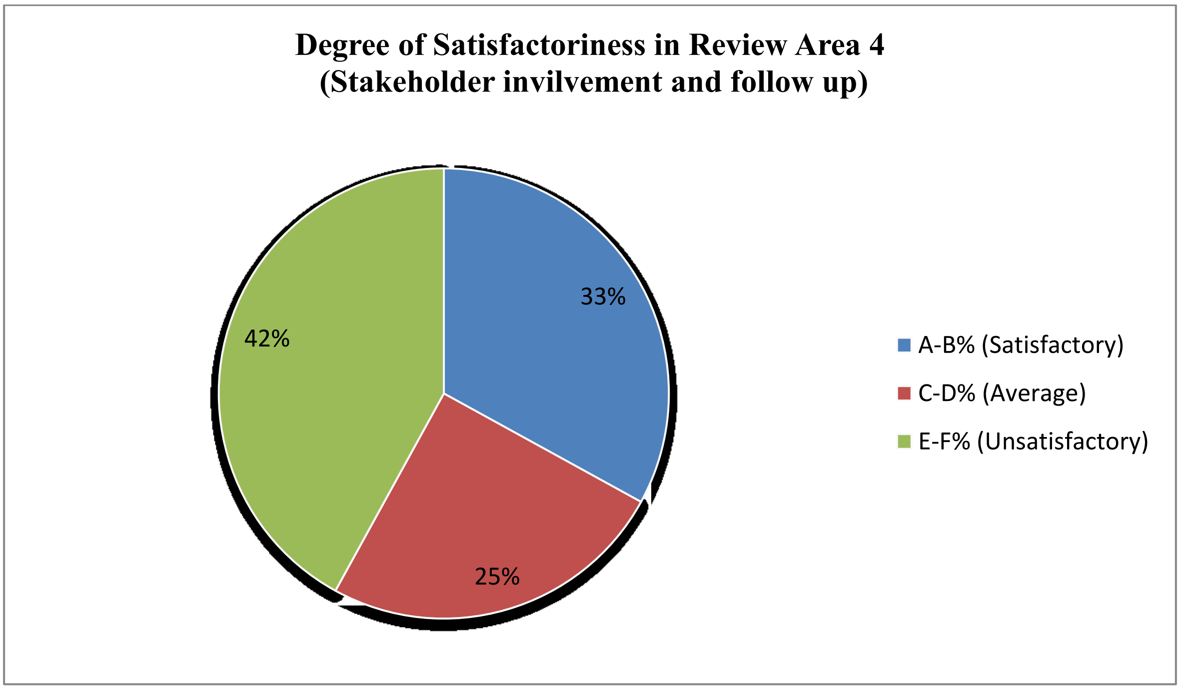


Figure 6.112 Degree of satisfactoriness of onshore wind energy plans of Scotland in review area 4

Figure 6.112 also illustrates that almost 42% (E-F%) of the tasks the documents attempted in this review area are unsatisfactory and only 33% (A-B%) of the tasks in the documents are considered satisfactory. While 25% (C-D%) of the tasks the documents attempted in review area 4 are just averagely performed in terms of climate change integration into planning for onshore wind energy development.

6.4 Summary of the Findings of SEA Quality Review Package

The main purpose of developing the review package is to establish a sufficiently high, yet practical standard for onshore wind energy plans to improve the quality of the SEAs in terms of climate change integration. The review category grades in each review area, which are based on the performance of each task, are used to identify the extent to which the climatic factors are accounted for while planning for onshore wind energy developments. A summary of all review areas results applied on wind energy plans of Germany and Scotland are presented in table 6.17 which shows how individual case studies were graded based on their performance in each review area.

A	B	C	D	E	F	Germany				Scotland			
Review Topics of the Quality Assessment Tool						**Büren**	**Emden Ost**	**Lausitz Spreewald**	**VVG Gottmadingen**	**East Renfrewshire**	**Stirling**	**Highland**	**Moray**
Review area 1- Description of the plan, baseline & identification of Key issues						C	C	B	B	C	C	C	C
Review category 1.1- Characteristics of plan & existing environment						C	C	B	B	B	C	C	E
Sub Review Category 1.1.1- The document should outline the contents, SEA process & main objectives of the plan.						A	A	A	A	A	A	A	B
Sub Review Category 1.1.2- Describe current & expected future climate baseline						A	B	B	A	D	E	B	F
Sub Review Category 1.1.3- Describe how the proposed project is vulnerable to the impacts of climate change over its life span.						E	D	B	B	A	A	E	E
Review category 1.2- Identification & evaluation of key issues						D	D	B	B	C	B	B	B
Sub Review Category 1.2.1- Outlines the climate parameter of most interest to the project						B	C	B	B	B	B	B	A
Sub Review Category 1.2.2- Assessment or identify key issues related to climate change impacts						A	B	A	A	A	A	A	A
Sub Review Category 12.3- Identify direct threat to wind turbines						F	E	B	B	F	C	C	B
Review area 2- Identification and evaluation of alternatives and impact analysis						D	D	C	B	C	B	D	D
Review category 2.1 – Identification & assessment of alternative options						C	C	C	B	B	B	D	B
Sub Review Category 2.1.1 – A wide range of alternative options are identified						B	C	B	A	A	A	B	A
Sub Review Category 2.1.2 - Climate change implications are assessed while considering alternatives						C	B	D	B	C	B	F	D

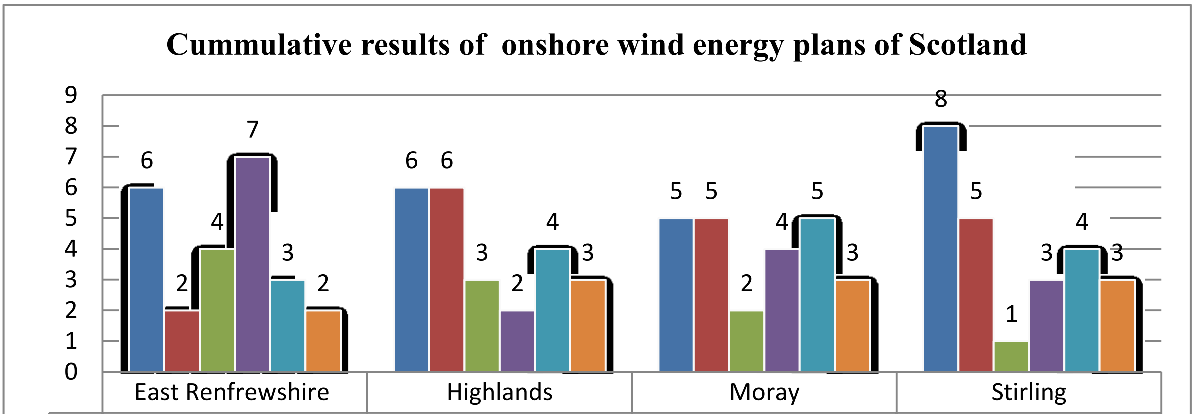
Sub Review Category 2.1.3 - Describes how reasonable alternatives were identified	D	C	C	A	A	A	B	B
Review category 2.2 – Identification of climate change impacts	D	E	C	C	D	B	D	E
Sub Review Category 2.2.1 – Identifying current and historic trends in the climate of that area or region	A	B	B	B	C	D	C	F
Sub Review Category 2.2.2 - Identify the cumulative impacts of the wind farms	F	E	C	C	D	A	D	B
Sub Review Category 2.2.3 - Methods used in identifying and predicting climate change impacts should be explained	E	F	C	B	E	A	E	E
Review Area 3 – Assessment of mitigation & adaption measures	E	D	D	B	D	D	D	C
Review category 3.1 – Evaluation of mitigation measures	D	C	B	B	D	C	B	B
Sub Review Category 3.1.1 – The document should state-contingent plans to mitigate impacts where monitoring reveals adverse effects	D	C	A	A	C	A	A	A
Sub Review Category 3.1.2 - Mitigation of climatic impacts on the environment as well as on the wind farms	F	B	B	B	D	B	D	B
Sub Review Category 3.1.3 - When negative impacts on the environment are unavoidable mitigation hierarchy should be applied	B	B	B	B	D	E	A	C
Review category 3.2 – Evaluation of adaptation measures	E	D	F	C	E	D	E	D
Sub Review Category 3.2.1 – Describing adaptation solutions which are technically feasible to address projected climate vulnerabilities	E	D	F	A	D	B	E	C
Sub Review Category 3.2.2 - Integration of adaptation measures with the mitigation measures for climate change effects	F	E	F	C	F	F	F	E
Sub Review Category 3.2.3 - Identifying the preferred adaptation measures in the context of climate change	D	C	E	C	C	D	C	D
Review Area 4 – Stakeholder Involvement & Follow up	E	D	C	E	D	E	C	E
Review category 4.1 – Stakeholder consultation	E	C	C	F	D	E	C	F
Sub Review Category 4.1.1 – Identifying applicable stakeholder apart from the general public for e.g. climate change experts	F	D	F	F	D	F	F	E

Sub Review Category 4.1.2 - Clearly defining the time frame of the consultation	E	A	A	E	A	E	E	F
Sub Review Category 4.1.3 - The document should include information about comments from public participation	C	B	B	F	E	D	A	D
Review category 4.2 – Monitoring & evaluation	E	F	B	E	D	E	B	D
Sub Review Category 4.2.1 – Identifying if the document mentions indicators used for monitoring climate change	E	F	C	F	B	F	B	E
Sub Review Category 4.2.2 - Includes provision for monitoring climate-related measures	F	F	B	E	E	B	B	D
Sub Review Category 4.2.3 - Shall explain how monitoring is done, in order to be able to undertake appropriate remedial actions	D	E	A	B	D	E	A	A

Table 6.17 Results of review areas as applied to onshore wind energy plans of Scotland and Germany

The results show that the SEA documents of both countries have equal amounts of strengths and weaknesses in their SEA procedural methodology in terms of climate change integration. A cumulative analysis of all the onshore wind energy plans of Germany and Scotland are presented in figure 6.113 (for Scotland) and figure 6.114 (for Germany) respectively. The assessment of the onshore wind energy plans of Scotland and Germany revealed that half of the SEA documents of both the countries are considered as satisfactory while taking climate change impacts into account, however further analysis shows that the SEA process still needs improvements in order to facilitate the integration of climatic factors at various stages of the planning process. Table 6.19 indicates that both the countries showed satisfactory as well as unsatisfactory outcomes in their SEA documents. A number of interesting differences and similarities are revealed while comparing the results of both countries. A more detailed comparative analysis of how the countries performed in each review area is described below;

Review area 1 addresses how well the plan is described, to what extent the climatic factors are considered while describing plans baseline condition and how the key issues related to climate change impacts are identified. Comparing the two results of review area 1 from Germany and Scotland revealed that Germany´s SEA process for the onshore wind energy plans when considering the climate change aspects is slightly more efficient than the Scottish SEA documents. The fact that all the German SEA documents followed a comprehensive method when describing the plan baseline condition may explain this result. The air and climatic condition of the plan area are assessed while formulating the baseline condition whereas in the Scottish documents only one document (East Renfrewshire) includes a small sentence while outlining the baseline data about the reduction in the quality of air in the plan area. These results suggest that there is a strong need in the Scottish SEA documents to incorporate the climatic conditions of that area while outlining the baseline conditions. In contrast to the result of outlining the climate and air conditions in the baseline analysis, identification of key issues that are related to climate change are very effectively identified in Scottish SEAs. On the other hand, the German SEA documents in this review area also performed satisfactorily but not at the level of SEAs conducted in Scotland. There are several possible explanations for this result, one of that might be the carbon-rich soils and peat land areas in Scotland, which have a huge potential to play a role in climate change. Therefore, assessing the soil type of the plan area is also a crucial part of the SEA process while preparing the report. Another rationale for this result could be the metrological conditions of Scotland, as flood is considered as a very serious issue in Scotland. The Scottish government has introduced a flood line to keep the public informed about any future flood warning in their respective area (SEPA, 2018). This also explains why the Scottish planners consult guidance documents related to flood and also formulate a flood risk management plan while carrying out SEA for onshore wind energy plans.



	East Renfrewshire	Highlands	Moray	Stirling
A	6	6	5	8
B	2	6	5	5
C	4	3	2	1
D	7	2	4	3
E	3	4	5	4
F	2	3	3	3

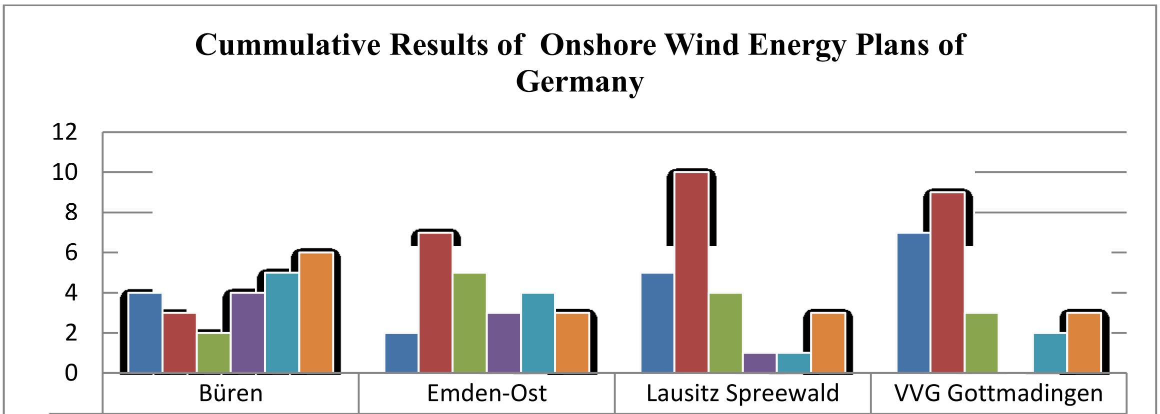
Figure 6.113 Cumulative results of onshore wind energy plans of Scotland

Likewise, Germany also considers the flood plains while planning for wind energy farms. However, the flood issues in Germany are not as serious as in Scotland. This discrepancy could be attributed to the improved flood risk management after a severe flood event that occurred in 2002 and in 2013 which affect most parts of Germany (Thieken et al., 2016). Germany now has a more efficient integrated flood risk management system for the mitigation of climate change impacts.

Review area 2 deals with consideration and evaluation of alternatives and identification of climate change related issues and impacts in the onshore wind energy development plans. The results obtained from German and Scottish onshore wind energy plans revealed some very interesting results. The overall analysis of this review area revealed that the integration of climate change impacts in both the countries in this review area is carried out almost unsatisfactory. In Scotland only one document in this review area has performed satisfactory, two of them are ranked as unsatisfactory and one is considered as just satisfactory despite omissions and inadequacies. Similarly, in Germany as well the results are analogous to Scotland in this review area.

The results from German and Scottish wind energy plans revealed that the alternatives are assessed in a very less comprehensive manner. However, few evidences are highlighted in Germany and Scotland as well, where each alternative is tested against different impacts. Together with those impacts climate change impacts are one of them. Yet in this review category, the documents are not considered as very efficient in integrating climate change impacts. A possible explanation for these results may be the lack of adequate consideration of climatic aspects because the climate change impacts are identified at a very basic level. No climate models are considered while assessing alternatives. In the case of Scottish onshore wind energy plans, while selecting reasonable alternatives, the Scottish SEAs considered assessing the alternatives through an assessment matrix. However, not in all the documents, the climate change implications are taken into consideration but only in a few. As previously mentioned carbon-rich soils and peat land areas hold significant place when it comes to Scottish land use planning since Scotland has about 60% of the UK´s peat lands (Marsden and Ebmeier, 2012).

The Scottish government has published a National peat land plan which highlights, how significant peat lands are to Scotland (SNH, 2017). This significance of peat land are also reflected in Scotland´s onshore wind energy plans by considering the fact that the development of wind farms has the potential to disturb the peat layer inside the soil which can lead to a high amount of carbon sequestration. Therefore, in order to effectively deal with peat and carbon-rich soils, the Scottish government has issued a number of guidance documents for the planners that outline instructions on how to deal with peat and carbon-rich soils when planning for onshore wind farms. The second climate change issue that holds a major significance in a place like Scotland are the flood issues, which is also very extensively taken into consideration. Moreover, the approach of Germany for considering climate change impacts in impact analysis stage is similar to that of Scotland as none of the countries considers using any climate model while analysing the impacts for the onshore wind farms. A possible rationale for taking climate models into account while predicting impacts for onshore wind energy farms is that these enormous wind energy infrastructures are considered for long term planning, therefore, its relevant to use climate models in order to understand the correlation between wind turbines and the atmosphere.



	Büren	Emden-Ost	Lausitz Spreewald	VVG Gottmadingen
A	4	2	5	7
B	3	7	10	9
C	2	5	4	3
D	4	3	1	0
E	5	4	1	2
F	6	3	3	3

Figure 6.114 Cumulative results of onshore wind energy plans of Germany

Review Area 3 holds significant importance when highlighting the climate change impacts as it relates to measures that aids in tackling the impacts of climate change directly. This review area aims at focusing on actions related to climate change adaptation and mitigation measures in the planning of onshore wind energy developments. The analysis of this review area highlights a major significant difference between Germany and Scotland in mitigating and adapting climate change impacts. The results show that Germany performed slightly better than Scotland when mitigating and adapting the climate change issues into its planning process. Despite the fact that the climate change issues are more prevalent in Scotland as compared to Germany, yet did not justify the results obtained from Scotland onshore wind energy plans. Compared to Scotland, Germany does not have that many issues of peat land and even if it has, the peat lands are scooped off while selecting suitable areas for wind farms. One other discrete reason that might explain this result is that after the 2002 flood episode in Germany, the German government has produced a very strong flood risk management plan, which ultimately supports or aids planners while planning for onshore wind farms. However, few of Germany´s onshore wind energy plans, still fail to consider the issues related to flood while planning for onshore wind farms. One of the major weaknesses found in Germany´s onshore wind energy plans is its poor performance with regard to mitigation of climate change impacts. On contrary to that Scotland documents adequately performed this task by using guidance documents that aids in mitigating the impacts related to climate change for example flood issues, peat lands and carbon-rich soils. The quality of

the Germany and Scotland SEA documents were very inconsistent when using the mitigation hierarchy in their SEA process. Mitigation hierarchy is a tool, which helps planners to prioritise and limit the negative impacts as far as possible. This approach is found in only one of Scotland´s onshore wind energy plans, unlike Germany´s onshore wind energy plans where this practice is very common.
When mitigating the climate change impacts in its plan, in Germany the use of mitigation hierarchy, which is the methodology of preventing, reducing, and offsetting the adverse effects, is very prevalent. Similarly, while considering adaptive measures the onshore wind energy plans from both the countries showed less robustness and more limitations in many places. Both countries did not perform adequately when adapting climate change impacts in the SEA process. One of the major weaknesses encountered while attempting this task is the absence of consideration of technical adaptation measures. However, in Scotland´s onshore wind energy plans, the adaptation measures are mentioned, but not much detail is provided in the documents. Scotland´s onshore wind energy plans did not disclose any information regarding the height and type of the turbine. Whereas in Germany´s onshore wind energy plans, this information is highlighted in order to reflect how efficient the wind turbines are producing clean energy and how modern technology and modern equipments are used to better capture the wind in extreme weather conditions. This discrepancy could be attributed to having a different methodological approach when planning measures for adapting climate change issues.

Review area 4, is slightly underrated than the rest of the review areas. This review area belongs to stakeholder involvement and follow-up. The Germany and Scotland onshore wind energy plans presented results, which showed that most of the tasks in this review area were poorly attempted with omissions and inadequacies. One of the main weaknesses encountered in this review area is that none of the onshore wind energy plans acknowledged nor referenced any climate change expert during the entire planning process. The results thus show poor incorporation of climate change aspects in the stakeholder involvement. However, Germany´s and Scotland´s onshore wind energy plans both include information related to the general public being involved in the process but since the general public is not interested in issues related to climate change rather other issues such as visual and noise, their involvement would not influence the decision made in terms of climate change. Unlike Germany, Scotland´s onshore wind energy plans performed very poorly regarding the inclusion of comments from the stakeholders whereas Germany´s onshore wind energy plans integrate the information regarding the comments of the stakeholders. This rather contradictory result may be due to the reason that most often Scotland´s onshore wind energy plans do not consider adding all these supplementary information in the SEA reports. The stakeholder consultation documents are mostly prepared separately at the very early stage where the developer encourages the public to contact the council as early as possible to talk about the development plan, to identify key issues, procedures, and other related information. These documents are made available to the public on every council's website. The follow-up procedure of Scotland´s onshore wind energy plans is comparatively well performed than Germany´s onshore wind energy plans. The analysis showed very disappointing results of Germany´s onshore wind energy plans, which revealed that the documents lacked provisions for monitoring climate-related impacts. The documents did not refer to any monitoring plan and no climate forecast models are used to anticipate changes encountered in future weather and climate. In contrast to that, Scotland´s onshore wind energy plans are relatively competent in monitoring climate change issues. The documents mention about indicators along with the framework used for monitoring the climate change impacts. In addition to that, for some onshore wind energy plans the council prepared a separate monitoring report, which includes detailed monitoring of every aspect that is relevant to the plan.

These findings seem to indicate that in terms of the quality of impact assessment reports, SEA practice in Germany has closely paralleled that with Scotland. Alternatively, we can say Germany´s system in terms of integrating its climate change impacts in its onshore wind energy plans is slightly more efficient than Scotland´s. It is said because the degree of satisfactoriness facilitated an unbiased comparison between the onshore wind energy plans of Germany and Scotland in terms of climate change integration. Table 6.18 present a cumulative result of the degree of satisfactoriness of the onshore wind energy plans of Germany. The table illustrates how the onshore wind energy plans of Germany performed in each review area. The table also displays to what extent the onshore wind energy plans of Germany integrated the climatic aspects in its SEA reports by showing a cumulative score of all the review areas, which is based on the tasks performed by the onshore wind energy plans in each review area.

Onshore Wind Energy Plans of Germany	Assessment Scores						Degree of Satisfactoriness		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of key issues	9	10	1	1	2	1	79%	8%	13%
Review area 2- Identification and evaluation of alternatives & impact analysis	3	8	7	2	2	2	46%	38%	17%
Review Area 3 – Assessment of mitigation & adaption measures	3	7	4	3	3	4	42%	29%	29%
Review Area 4 – Stakeholder involvement & follow up	3	4	2	2	5	8	29%	17%	54%
Cumulative Score of all Review Areas	18	29	14	8	12	15	49%	23%	28%

Table 6.18 Cumulative result of degree of satisfactoriness of onshore wind energy plans of Germany

The review category grades in each review area allowed for strengths and weaknesses to be determined by regarding categories and sub categories containing only A and B as strengths and those with only E and F grades as weaknesses. The C-D% in degree of satisfactoriness represents the tasks that are not so unsatisfactory (C), neither satisfactory (D) but just averagely carried out. This phenomenon of assessing the strengths and weaknesses in onshore wind energy plans is referred to as degree of satisfactoriness of a document. A cumulative result of the degree of satisfactoriness of the onshore wind energy plans of Scotland is presented in table 6.19. Based on the tasks performed in each review area, the table describes to what degree the onshore wind energy plans of Scotland are considered as satisfactory or unsatisfactory in terms of integrating climate change impacts in SEA of onshore wind energy plans of Scotland.

Onshore Wind Energy Plans of Scotland	**Assessment Scores**						**Degree of Satisfactoriness**		
Review area topics	**Total no. of A**	**Total no. of B**	**Total no. of C**	**Total no. of D**	**Total no. of E**	**Total no. of F**	**A-B%**	**C-D%**	**E-F%**
Review area 1- Description of the plan, baseline & identification of key issues	10	6	2	1	3	2	67%	13%	21%
Review area 2- Identification & evaluation of alternatives & impact analysis	7	5	3	4	3	2	50%	29%	21%
Review Area 3 – Assessment of mitigation & adaption measures	4	3	5	6	3	3	29%	46%	25%
Review Area 4 – Stakeholder involvement & follow up	4	4	0	5	6	4	33%	21%	42%
Cumulative Score of all Review Areas	25	18	10	16	15	11	45%	27%	27%

Table 6.19 Cumulative result of degree of satisfactoriness of onshore wind energy plans of Scotland

The strengths and weaknesses of all the individual documents of Germany and Scotland are explained separately in the previous sections. However cumulative analysis of the degree of satisfactoriness and the extent of climate change impact integration in all the documents in Germany is shown in figure 6.115 and for Scotland, it is shown in figure 6.116.

The below figures are clear representations of the degree of satisfactoriness, which are based on how well the tasks are performed in order to integrate climate change impacts in onshore wind energy plans of Germany and Scotland. According to the analysis of onshore wind energy plans in Germany, it is evident that Germany to some extend highlighted the integration of climate change impacts in its onshore wind energy plans more effectively then Scotland since in Germany almost 49% (A-B%) of the overall tasks performed in all the review areas are considered as satisfactory in terms of climate change integration, whereas

28% (E-F%) of the tasks in the document could be described as unsatisfactory, with omissions and inadequacies.

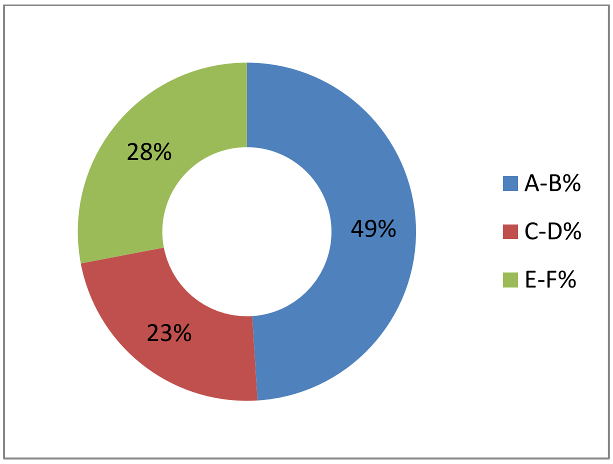


Figure 6.115: Degree of satisfactoriness of tasks in onshore wind energy plans of Germany

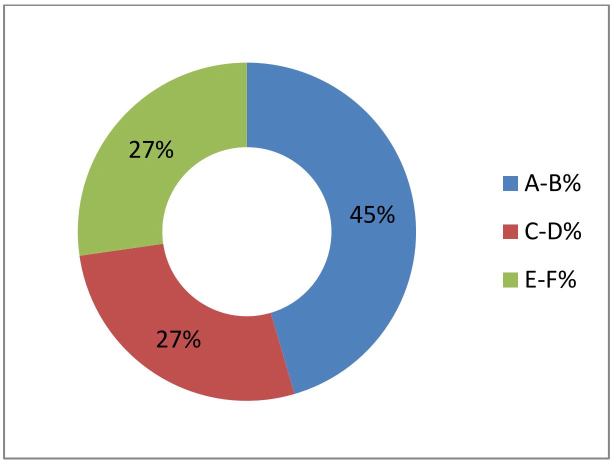


Figure 6.116: Degree of satisfactoriness of tasks in onshore wind energy plans of Scotland

The analysis also reveals that 23% (C-D%) of the tasks attempted in order to incorporate climate change impacts are just averagely conducted. Similarly in Scotland, 45% (A-B%) of the tasks carried out in the documents are described as satisfactory, which is to a lesser degree than Germany. The above figure also shows that 27% (E-F%) of the tasks in the onshore wind energy plans of Scotland are graded as unsatisfactory and 27% (C-D%) of the tasks attempted are just average. This shows that Germany performed slightly better than Scotland in terms of its strengths and also incorporating climate change impacts in its onshore wind energy plans.

The above-mentioned results show some varying degrees of differences and similarities in both the German and Scottish SEAs for onshore wind energy development. The results obtained from the analysis of SEA documents of onshore wind energy plans of Germany and Scotland are further elaborated and validated when conducting qualitative interviews (see Chapter seven) with SEA experts of Germany and Scotland.

7 Analysis of Climate Change Integration in SEA – From Expert's Outlook

In the previous section, case study methodology is used to identify the potential gaps and key areas for climate change integration into SEAs of onshore wind energy plans in Germany and Scotland. Using case study analysis is a part of the notion to understand the integration of complex issues like climate change into SEA. Therefore, this chapter provides a deeper analysis for addressing the inclusion of climate change issues in the SEA of onshore wind energy development, by carrying out an expert interview analysis. The purpose of this chapter is to present a broader picture and understand the complicated issues related to climate change integration and strategic environmental assessment of onshore wind energy development.

7.1 Analysis of SEA Procedural Compliance

Procedural SEA reinforces the description of impact assessment as ´a strategy of influencing decision and action by a priori analysis of predictable impacts´ (Bartlett and Baber, 1989, pp. 143). Empirical studies of SEA substantive effectiveness and the procedural compliance of the SEA process are largely based on two distinct approaches, such as reviews of SEA reports (see chapter six), and interviews with actors (Acharibasam and Noble, 2014; Therivel et al., 2009; Fischer, 2010; Rega and Bonifazi, 2014). Both methods, and particularly their combination, provide important insights on how good and effective a given SEA system can be and support the formulation of recommendations and suggestions for improvement (Bragagnolo and Geneletti, 2012). With the help of expert interviews, this chapter aids in unravelling those factors that are potential gaps and opportunities in SEAs of onshore wind energy plans, within the context of integrating climate change impacts. Furthermore, it shows how these factors influence the process of SEA in countries that are considered as forerunners, in terms of renewable energy strategies such as Germany and Scotland. The analysis of SEA procedural compliance further seeks to explore the substantive effectiveness of strategic environmental assessment in order to understand the nexus between the concerns related to integrating climatic factors and wind energy planning in Germany and Scotland. Substantive effectiveness in environmental assessment is described as the effects that the SEA produces in the decision-maker's understanding or awareness of environmental and sustainability issues, and in the extent to which such issues are considered throughout the planning and decision-making (Runhaar and Driessen, 2007). There are several criteria that are used to evaluate SEA substantive effectiveness (as well as other dimensions of effectiveness) that have been developed over the years by scholars, and by international organizations, as well as by associations of experts/practitioners (see e.g. IAIA, 2002; Therivel, 2004; OECD, 2007; Partidario, 2007). For instance, the OECD (2007) defines two distinct sets of criteria that can be used to evaluate the SEA's effectiveness. The first set is used in order to evaluate the delivery of envisaged outcomes; the second one is a quality control check of the SEA as a process. Thus, this research aids in evaluating the substantial effectiveness of SEA in terms of climate change by evaluating procedural and incremental effectiveness. With regard to core structural elements of SEA, there are eight elements identified as constituting 'good practice' within SEA processes: screening, scoping, consideration of alternatives, impact prediction, mitigation and adaptation, SEA report review, consultation, and public participation, and monitoring (Sadler and Verheem, 1996; Sheate et al., 2001; Therivel, 2004; Fischer, 2010). The research provides the opportunity through which procedural provisions for SEA are evaluated, in order to determine the extent to which the SEA has steered the onshore wind energy plan towards the necessary CO_2 reduction targets. Therefore, this chapter stresses on the procedural compliance of SEA by highlighting whether the SEA is influential in wind energy planning in Germany and Scotland and whether it is providing long term, as well as a high level of environmental protection in the context of considering climate change impacts in planning for onshore wind energy.

7.2 Evaluation of Interviews with the Experts

This section provides information about, the analysis of the outcomes of the semi-structured interviews; interpretation of the interviews, and identifies interviewees' critical opinions towards SEA structural core elements, in order to find an appropriate way to integrate climate change impacts into onshore wind energy planning in Germany and Scotland.

7.2.1 Interpreting the Results of Expert Interviews

This section provides information about qualitative interviews conducted with SEA practitioners and experts from Germany and Scotland, and aids in highlighting the influence of SEA on wind energy planning in the context of climatic factors and how SEA dealt with the climate change impacts in the wind energy planning. Moreover, this section also focuses on the in-depth analysis of those factors that are considered as uncertainties and opportunities in SEAs of onshore wind energy planning in Germany and Scotland. Interviews with SEA experts and planning officials are carried out to complement the results of applying the quality review package tool to SEA reports and to obtain feedback on the perceived strengths and weaknesses of the SEA processes and reports, major factors influencing the quality of SEA, and the potential usefulness of the proposed review package. The interview process, SEA experts selection criteria, and a detailed list of all the experts chosen for this research are already presented in chapter two of this dissertation. The interviewees' perception of the typical strengths and weaknesses of SEA reports generally corresponded to the findings of the quality review package, indicating particular problems in the areas of applying a systematic methodology to integrate the complex issues of climate change in strategic environmental assessment (Bonde and Cherp 2000). The following section describes the extent of climatic factors integrated into the SEA process of onshore wind energy planning from the SEA practitioners' perspectives.

7.2.1.1 Screening

Screening is the process where a decision is taken on whether or not SEA is required for a particular plan. The remarks of all the interviewees from Germany and Scotland on integrating climate change in the screening of SEA are almost parallel. However, the SEA experts highlighted the possibilities of integrating climate change into the screening process to obtain substantive effectiveness in achieving climate change reduction goals. Majority of the SEA experts from both the countries agreed that there is no screening done for onshore wind energy plans, more specifically, the climate change aspects are never considered in the screening stage of SEA for onshore wind energy plans because if the plan, programme or the strategy (PPS) is likely to lead to significant impacts on the environment, SEA becomes mandatory for that PPS and as wind energy proposal are linked with enormous infrastructure with significant impacts on the environment, therefore, they are subject to an SEA. In the below extracts experts from Germany and Scotland both highlight the significance of screening in planning for onshore wind energy proposals.

> *"In Germany, SEA is mandatory for practically all regional plans. Thus, no screening is necessary"*
>
> (GER6, Appendix D: 1019-1020)

Generally, I think that all wind energy projects would have to be subject to an SEA. So, the screening is sort of unnecessary.

(SCO9, Appendix D: 1294-1295)

According to the SEA experts, screening is a process that identifies if a plan requires SEA or not. Therefore, at this stage, it is relatively difficult to consider climate change impacts. In Scotland, screening as such does not really happen because supplementary planning guidance for wind energy plans in Scotland is already an understanding that they require SEA, consequently screening would not really have relevance in the context of Scotland. Similarly, in Germany as well, no screening is carried out for RegFNP (regional Flächennutzungsplan) and TFNP (Teilflächennutzungsplan) because SEA is obligatory in both the cases (GER3).
The analysis reveals that although screening is completely bypassed in conducting SEA for onshore wind energy plans, there still could be a possibility to consider climatic features at the screening stage of the onshore wind energy plans for more robust actions towards the impacts of climate change. It is also crucial that the onshore wind energy companies are fully informed of the significance and magnitude of climate change at the very early stage for two reasons, first in order to improve the knowledge and acceptance for onshore wind energy development and secondly, since climate change is one of the many concerns to be considered at every step of the plan, therefore it does make sense to take the concerns of climate change already in the screening phase (GER7). According to a recent study, it is proven that in the future UK is more vulnerable to the impacts of climate change (Sayers et al., 2018). Therefore, the evidence for possible integration of climate change concerns early at the screening stage was only found in Scotland, where experts mentioned the climate change concerns related to onshore wind energy planning such as floods (SCO10) and peat lands (SCO 9). It is essential to keep peat areas into consideration in Scotland since peat is carbon fix and building wind farms on the peat areas can disturb and easily leak carbon dioxide into the atmosphere because the wind turbines footings are apparently very deep and they can stop the flow of underground water to peat areas. Peat lands are usually sensitive and water is important to them, therefore any type of disturbance can lead to lower the water levels causing the peat to dry, oxidize and release its carbon in the air, the process is slow but frequently unstoppable. Mostly, in onshore wind energy planning the climate change concern, which is of a primary focus, is mitigation. Therefore, the best way to integrate climate change aspects at this level is to take the climate change adaptation into consideration rather than mitigation, since in case of mitigation the wind farms are always performing positively.

Therefore, taking adaptation measures into account is more interesting at this level, and in that case, it is essential to take into account the geography and the area where wind farms are located.

7.2.1.2 Scoping

Within the context of climate change, the process of scoping in SEA makes sure that whether or not strategic actions and adaptation measures of the plan are likely to have a significant effect on climatic factors through an appropriately set out methodology (Booth et al., 2012). The scoping stage is carried out, in order to identify the key environmental issues but when it comes to wind energy parks and the consideration of relevant climate change aspects, the analysis revealed a variety of factors that were neglected while carrying out scoping stage in the context of climate change issues in Germany as well as in Scotland. It is argued, that due to the structure of the environmental assessment in Germany, the information regarding the climate change impacts are often ignored at this stage of SEA. This is due to weak environmental objectives, poor political will along with very little funding resources (GER2). According to an interviewee from Germany,

> *"Politicians say it's just not doable to reach these climate change goals and since there is no act that requires, that you are not allowed to build wind parks in a specific region that might be affected from climate change, even if you find out there might be a risk, there is no law that says its forbidden here so this is why all these aspects of climate change is a big discussion in the research area"*
>
> (GER2, Appendix D: 229-233)

Similarly, in Scotland too, there are several shortcomings in identifying the key issues in the context of climate change. The data proved that there is general neglect on how the climatic factors are taken into account at scoping stage at the planning level and also how climate change might affect these infrastructures in the built environment. Another theme that emerged from the analysis was that at the scoping stage of wind energy planning the positives impacts are more appreciated than the negative ones. The results showed that the positive climate change effects of the wind energy proposal are given more weightage at this stage, as the Scottish Government tends to increase the amount of renewable energy from the cheapest form of source that is wind energy so the action of switching from fossil fuel to renewable

energy with an intention to reduce the GHG emissions is highly appreciated and acknowledge at this stage (SCO10).
On the contrary, in Germany, it is argued that this practice of appreciating the positives than the negative is questionable and there is a need in SEA where the positives are acknowledged as the negatives are. On the other hand, from Germany´s perspective, it is not relevant to stress the positive impacts of wind energy, since scoping relates to the identification of key issues, which will be further evaluated and dealt with during the planning process.

> *"The overall positive effect of wind energy – no carbon dioxide emissions – is, in my opinion, not relevant at the scoping stage as the objective of this stage is to identify the issues which should be looked at in detail when preparing the environmental report"*
>
> (GER6, Appendix D: 1049-1051)

According to an interviewee (GER1), although wind energy is contributing to positive impacts on climate by producing clean energy, but to what extent its positives are documented in the SEA is unknown. Therefore, there is a need for improvement in the procedural aspect of SEA to understand and incorporate the negative as well as positive climate change impacts of the SEA of onshore wind energy parks. One other major theme that emerged from the data analysis is the benefit of identifying climate change impacts very early in the scoping process. From the perspective of Germany´s onshore wind energy SEAs, there is a general consensus that due to Klimaschutz, its crucially important to consider or identify the key issues from a climate change perspective for wind energy parks early in the SEA process, so that the relevant information is collected and accessed to evaluate all the possible impacts and this can only happen if these issues are considered at the very early stage. It was also argued that adverse weather conditions could have dramatic impacts on the wind energy farms, as extreme weather events may influence the wind energy infrastructure along with the generation of clean electricity. Therefore, the key issues that are related to direct regional impacts should be taken in to account.

> *"I think it is important to identify the key issues from a climate change perspective for wind energy parks, as far as it concerns direct regional impacts of wind energy parks"*
>
> (GER3, Appendix D: 431-432)

From Germany´s experts' perspective, the data revealed that the SEA in the context of climate change and controlling its GHG emissions has some serious deficiencies in terms of onshore wind energy planning. It is argued, that Germany follows a very old and rigid nature conservation law and has fixed climate change discussions, unlike Netherlands who implemented their environmental rules from the USA, Canada in the late 80s, whereas Germany's environmental rules are dominated by nature conservation law (GER4). This weakens the potential of Germany´s SEA system to incorporate the impacts of climate change and controls its emissions level because the main concerns in the nature conservation law always revolve around birds, bats, other animals, landscape, and protected areas.

7.2.1.3 Environmental Report

It is revealed in the qualitative analysis of expert interviews that the role of SEA as a tool to document the climate change impacts in the process is highly criticized in Germany, while its role is quite appreciated in Scotland. A detailed overview of how climatic factors are taken into SEA reports of Scotland and Germany is already presented in this dissertation (see chapter six). It is mostly argued that the German plan makers do not consider the positive impacts of the onshore wind energy in the environmental reports. According to an SEA expert (GER1), ideally, in an onshore wind energy plan, the plan makers are also supposed to highlight the positive contribution of the wind energy development along with the information that what consequences or negative impacts would occur if no new sites were identified for wind farms.

However, the recent structure of the environmental reports in Germany does not focus on the positives ones, which are sometimes barely mentioned, and other times completely neglected. Secondly, it is also noticed that the reports are often based on qualitative data with little or almost no quantitative information (GER1 & GER3). Moreover, In terms of integrating climate change issues in the onshore wind plans, almost all the interviewees from Germany highlight that though Germany follows the approach of very extensive environmental reports, yet the climatic factors are least considered in the SEAs of onshore wind energy plans. The below extract from a SEA consultant in Germany highlights the overlapping of tasks in the spatial plans and the environmental reports leading to very extensive environmental statements,

> *"now a days it is quite difficult to see the difference what is the task of the environmental report and what is the task of the plan and the other documents that you prepare for with the plan so I don't think that it must always be a very huge environmental report"*

(GER2, Appendix D: 260-263)

On the other hand, Scottish planners revealed that the quality of the environmental reports and their methodology has changed from more detailed to summarized ones. Furthermore, this change in the methodology was considered as positive since earlier the SEA reports contained detailed analysis, which was very time consuming and did not had much of an impact or any significant influence on the quality of the report. Moreover, Scotland has a very strong climate change policy, the environmental report addresses the climate change issues through legislation which is called the Climate Change (Scotland) Act 2009. This legislation helps in creating a statutory framework for GHG emissions reduction in Scotland and pervades through various legislations of planning, sustainability, and environmental protection.

> *"I think planning legislation has climate change built into it in many ways, there's the Climate Change Scotland Act 2009 and also we have a national planning framework, and both of those elements recognise the significance of climate change, and as such, that is almost built-in automatically into the planning process"*

(SCO9, Appendix D: 1329-1332)

However, one SEA expert from Scotland pointed out that, although climate change is a core element of policy which fosters the development of renewable energy projects yet this rationale starts to get attenuated at a local level, where more local concerns such as impacts on people property get more significance in the decision-making process (SCO8). Nevertheless, it is still evident in the document analysis of Scottish onshore wind energy plans that the Scottish planner considers a lot of guidance documents prepared by the Scottish Government for integrating different issues of climate change aspect in the SEA process such as issues related to flood, carbon-rich soils, wetlands, and peat lands. In terms of climate change, the Scottish consultation authority has produced a guidance document that outlines the consideration of climate change issues in the SEA (Scottish Government, 2010). The analysis proved that there are a number of guidelines present for SEA in Germany and at the EU level, however in most of those guidelines climate change is not dealt within them in detail, rather issues such as prevention of conflicts between the expansion of wind energy and biodiversity policies are more stressed. Therefore, it is suggested by the SEA experts in the interviews that in Germany there is a need for some guidance documents and guidelines, which helps to effectively integrate the impacts of climate change in SEA. On the contrary, it is argued that Scotland has sufficient guidelines for the incorporation of climate change into SEA. Secondly, an SEA expert from Germany also criticized that often times the environmental reports are written in administrative German with very complicated language, which is difficult to understand by the general public, therefore, it is suggested to use less competitive language in the environmental report so that it is easy for the general public to understand the climate change goals (GER1).

7.2.1.3.1 Consideration of Alternatives

It is argued, that the consideration of climate change implications while framing alternatives in the onshore wind energy planning is entirely irrelevant and insignificant. This practice was similar in Scotland and Germany as well. The analysis revealed that the concerns taken into account when considering alternatives are related to siting and priority zones for onshore wind energy developments only. This was also evident while doing a case study analysis between onshore wind energy plans of Germany and Scotland. The below extracts obtained from analysing the interview data further reinforces the validity of this practice as interviewees from Germany and Scotland explained;

> *Germany: "Consideration of alternative is all about siting, I don't think considering climate change hold any significant place here"*
>
> (GER1, Appendix D: 35-36)

> *Scotland: "While considering alternatives, it's all about finding a suitable place for wind energy development"*
>
> (SCO10, Appendix D: 1657-1658)

These statements show that the alternatives are not necessarily specific to climate change factors rather spatial options and spatial framework. However, the consideration of climate change impacts while choosing alternative was slightly reflected in Scotland. One of the

Scottish interviewees highlighted that the alternative options are selected through Scotland's well-developed spatial framework, which limits the wind energy proposal to areas which are inappropriate in terms of national priorities, national parks, national scenic areas, and areas of national environmental significance such as carbon-rich soils, peat land habitat and deep peat areas (SCO9). This shows that Scotland's spatial framework restricted the planning of onshore wind energy farms in areas, which are vulnerable to flood and to areas with carbon-rich soil and peat.
The analysis also revealed that in Germany it is enough to consider Natura 2000 and species of birds of bats while choosing alternatives (GER2). However, the analysis also revealed that flood areas are also taken into consideration in Germany while choosing priority areas for onshore wind energy development. Moreover, there is a lot of political influence when considering alternatives for wind energy development. An interviewee from Germany highlighted, that the consideration of alternatives for wind energy plan is entirely based on political grounds, it is more or less a discussion between stakeholders of wind energy park and politicians of federal and common states which in the end comes out as a part of climate change mitigation (GER4).
The finding shows that the political situation of Germany has complicated the process of considering alternatives for onshore wind energy development. It is also reflected in the new renewable energy law, i.e. EEG (Erneuerbare-Energien-Gesetz) which was renewed in 2017. Formerly, it was federal states that use to decide about how much wind energy should be deployed, but now according to this new law Bundesetagentuer, the federal agency for the energy change decides, which states and which regions needs how much wind energy, so considering climate change aspects in alternatives is not a question here because it is beyond that and it is totally a political decision now (GER4).
On the contrary, Scottish planners are quite satisfied with their practice of considering alternatives for onshore wind energy development. Analysis of data showed that the planners believe the current style of considering the alternatives is sufficient and satisfactory as it justifies the decisions that are made at the strategic level, nevertheless, a deeper assessment about the alternatives are supposed to be at the project level but at the strategic level, the purpose of the alternatives is to justify suitable areas for the onshore wind energy development (SCO10).

7.2.1.3.2 Impact Prediction

Within the context of climate change, impact assessment is conducted to predict the effects of climate change to determine whether the strategic actions have positive, negative, neutral or uncertain effects on environmental receptors (Booth et al., 2012). After a range of potential impacts are recognised in scoping, the next step is to unravel the relative significance of the impact, which is done at the impact prediction stage.

Through analysis, it is mostly argued that to some extent the climate change impacts related to onshore wind energy development are sufficiently evaluated in terms of mitigation and adaptation. It is further observed that interviewees from Germany and Scotland acknowledge the role of wind farms in mitigating the impacts of climate change by reducing GHG emissions and agree that it is very relevant to identify these impacts early at the SEA level.

However, it is also argued that the analyses of the climatic factors in terms of onshore wind parks still need improvement since climate change develops over time. The analysis revealed that the current SEA practices in Germany and Scotland do not involve any methodology to identify the future changes in the wind pattern, as it is one of the very important factors to understand the rate of future CO_2 reduction by onshore wind farms. A SEA consultant from Germany shares that one of the reasons that this factor is insufficiently addressed in the practice is the lack of political will, funding, and less information in data (GER2). Therefore, there is a need for the use of climate models in the impact prediction stage to adequately reflect on the complex issues of climate change impacts.

When exploring the competency of Germany on considering the climate change impacts, it was argued that Germany is more proficient when it comes to impact prediction of onshore wind energy development. Since in Germany, the impacts are analysed according to different interest groups of nature conservation and the general public. The public perception towards onshore wind energy farms is necessary for its development. This clearly shows why the public is so convinced of wind energy development in the country.

> *"it's not just a question of climate change and environmental impact statements or kind of strategic environmental report, no, it's more about ranging different interest groups and what is the result overall for the society."*
>
> (GER4, Appendix D: 628-630)

When exploring information regarding the vulnerability of the plan to the effects of climate change and to what extent they are considered at the impact prediction stage in SEA, it is argued that the effects of climate change on the plan are not assessed at the policy level, as these effects are directly related to the developer. Therefore, the developer is the one responsible for its infrastructure, thus these impacts are evaluated later at the assessment stage, such as Environmental Impact Assessment (EIA).
On the other hand, Scotland follows a robust approach than Germany in terms of taking climate change impacts into account. It has produced strategies (Scottish Government, 2018) and (Scottish Government, 2017) and policies (Scottish Government, 2010) that help Scotland to cut down its emission over the period to 2032. The extracts below from the Scottish planner clearly indicates the vigorousness of Scotland towards achieving climate reduction goals by onshore wind energy development.

> *"The Scottish Government sets out climate change plan which outlines the framework to move towards a low carbon economy that will help to deliver sustainable economic growth and create a greener, fairer and healthier Scotland by 2032"*
>
> (SCO11, Appendix D: 1900-1902)

> *"Scotland's Energy Strategy and Onshore wind position statement outlines how energy generation in Scotland will proceed over the coming years"*
>
> (SCO11, Appendix D: 1903-1904)

It was argued that since a vast area of Scotland is covered by peat, therefore, issues related to deep peat and carbon-rich soils are highly taken into account as they are linked with sequestrated carbon which could lead to loss of carbon due to drying of the peat, in addition to that if a development is granted permission in a forest than compensation measures are taken into consideration to counterbalance the loss of wood in the forest due to development activities (SCO9).

7.2.1.3.3 Mitigation Measures

Within the context of climate change, mitigation measures primarily focus on the reduction of GHG emissions aiming at preventing further climate change effects (Biesbroek et al., 2009;

Larsen et al., 2012). However, onshore wind energy parks are themselves acting as mitigating measures and aiding in GHG emission reduction, yet several interesting opinions from Germany and Scotland emerged on the subject of proposing mitigation measures for onshore wind energy development.

It is argued that proposing mitigation measures at the planning level is only done in terms of the spatial framework with respect to the most suitable location for the onshore wind energy development. This argument is apparent in Scotland and Germany both. The below extracts give a clear indication that this practice is common in both the areas selected for this study;

> Germany*: "mitigation measure are selected in terms of finding the most suitable site for the wind energy development"*
>
> (GER2, Appendix D: 319-320)

> Scotland*: "The mitigation at strategic level has only to do with where wind energy developments are allowed or in the spatial framework outlined by the Scottish Government."*
>
> (SCO10, Appendix D: 1712-1713)

Generally, the spatial framework in the onshore wind energy plan is designed in such a way that mitigation measures are not necessarily needed. For instance, the Scottish Government has outlined the spatial framework for wind energy development in such a way that avoids the development of onshore wind farms in specific areas such as national parks, national scenic areas, and Natura 2000 sites including areas of peat land and carbon-rich soils (SCO9). Therefore, onshore wind energy developments are forbidden on these selected specific sites outlined by the Scottish Government already. The same mitigation strategy is used in Germany as well. However, the onshore wind energy plans yet consider outlining mitigation measures in their analysis for onshore wind energy developmental plans, where a mitigation hierarchy is used to avoid, minimise, restore and offset the negative impacts in order to completely avoid impacts. The evidence for this argument is presented in the previous chapter (see chapter six) where the potential of SEA in identifying mitigation measures is presented for Germany and Scotland.

It is also argued that further impacts are mitigated at the project level. Therefore, at the policy level, the mitigation measures are sufficiently proposed, which relates to finding the most suitable site for onshore wind energy farm (GER1). A more detailed assessment of the mitigation measures such as the shape of the blades, shutting off turbines when in contact with birds and bats, and other types of technical mitigations are dealt later at the project stage otherwise known as EIA, which helps to justify the strategic development of wind energy. Considering Germany's consistency towards renewable energy development and commitment towards GHG emission reduction targets, the analysis also revealed that there is a lot of political influence while identifying suitable developments zones for the onshore wind energy developments to achieve GHG emission reduction goals because the political objectives in terms of onshore wind energy parks in Germany are very dynamic and change all the time, and if a suitable development site is chosen, the political objective changes by demanding that they need a certain amount of total wind energy development in a specific area. Therefore, the planner then has to change the criteria again and search for a new suitable site all over again. This argument is supported in the below extract of a SEA consultant from Germany which succinctly describes the political situation of Germany in the narrative of onshore wind energy planning. It was suggested that this uncertainty could be avoided if Germany has more stable, reliable decisions in the onshore wind energy sector.

> *"there has been so many changes from the political point of view and the decision-makers in the recent years that it's really difficult to come up with good long lasting planning site since the regional plan is not prepared every year but only in 10 or 15 years so to decide on these aspects Germany needs to have a consistency in its political decisions"*
>
> (GER2, Appendix D: 338-341)

7.2.1.3.4 Adaptation Measures

Adaptation strategies aids in reducing the vulnerability of impacts on the environment. For climate change adaptation SEA provide an opportunity to help adjust human activities and also helps the proposed plan or programme to enhance the adaptive capacity of the system and support human responses to efficiently deal with extreme weather events (EC, 2013). There is considerable variation between Scotland and Germany in terms of the key role SEA play in determining, assessing, and opting for adaptation measures for onshore wind energy development in the context of climate change. SEA is cast with a relatively passive role in documenting the adaptation measures in terms of climate change in the onshore wind energy plans. This argument is evident when analyzing the onshore wind energy plans of Germany and Scotland. The results displayed in the previous chapter while analyzing SEA documents for onshore wind energy plans (see chapter six) also supports this argument.

However, the analysis revealed that the climate change issues, which are the main concerns when planning for onshore wind energy farms, are flood and carbon-rich soils, therefore, adaptive measures are necessary for these issues (GER3). Nevertheless, it should be noted, that while selecting suitable development zones for onshore wind energy these impacts are already taken into consideration and thus areas with these impacts are excluded for planning purposes. It is argued, that adaptation measures refer to the coarse-scale of planning, since it might be effective at one planning level and would be completely irrelevant to the other. The extract below clearly supports the notion of how opting for adaptive measures are completely reliant on the level of the plan;

> *"There is quite a bit of research about adaptation in planning, but the focus is more on the other planning level such as the land use plan, however, there are few concerns in regional plan but not so much on the onshore wind energy subject, which I believe should be given much consideration"*
>
> (GER1, Appendix D: 79-82)

The analysis revealed that when choosing suitable concentration zones for onshore wind energy development, the wind speed and the future wind patterns are poorly identified rather economic considerations are always a point of focus because adaptation for these enormous infrastructures requires significant investment. Onshore wind energy infrastructures are part of the built environment, which are vulnerable to extreme weather conditions and natural disasters. Climate change models are significant to use in order to predict future wind patterns while selecting suitable areas for wind farms. Therefore, any adaptation measure considered at the time may become impractical in the next 10 or 15 years considering that these infrastructures are subject to long term planning. To cope up with the uncertainties of the climate change impacts it is not prudent to completely rely on electricity produced from onshore wind energy farms due to variations in weather conditions, therefore, it's important to consider climate change models to keep up the changing wind patterns.

7.2.1.4 Stakeholder Involvement

Within the context of climate change, according to Wende et al., (2012), effective public participation ensures better transparent planning, and make sure that the stakeholders are allowed to assess the contents of the plan or programme regarding existing climate protection targets and substantial environmental goals in SEA. Public participation plays a major role in terms of exerting influence in favour of a climate friendlier planning process because if a plan or programme tends to diverge substantially from the regional or local climate targets the stakeholders can indicate this specifically and take actions against decisions related to climate change (Wende et al., 2012). For decisions on renewable energy infrastructure, the public response is an especially important factor (Cowell, 2010).

The analysis revealed that in terms of climate change impacts the level of engagement of the general public is quite poor and limited in all the case studies selected for this research. It is because the general public would not comment on climate change as they think these impacts are not relevant to them. The general public is mostly concerned by the impacts that tend to be about local issues such as visual, noise, shadow flickering, or socio-economic impacts generated from the wind turbines. It is argued that the general public in Germany is more positive about renewable energy developments. Contributions by the general public through citizen’s wind energy cooperatives now make up 50% of the total installed wind energy capacity (Nestle, 2014). In the past, Governments have attempted to increase the acceptance of wind energy projects by introducing different concepts for participation (Langer et al., 2017). In Germany, for instance, the state government of Mecklenburg-West Pomerania is currently planning to give municipalities and citizens the right to participate in wind energy projects (BWE and WindEnergy Network, 2015). Moreover, the analysis revealed that the federal environmental agency in Germany carries out research every one or two years to evaluate the involvement of the public and it was observed that the people are very much interested in renewable energy development. However, the public does not wish to see wind turbines near their dwelling therefore; the government takes every measure to resolve the NIMBY (Not In My Back Yard) issues (GER1).

It is argued that the involvement of the general public in the SEA process is very moderate in Scotland. Although due to the SEA requirements, the public does have an opportunity to participate but their engagement in the SEA is quite restricted, because the public tends to be more involved at the project level where they are mostly concerned about local impacts only. The below extract outlines the range of public involvement in the SEA process in Scotland;

"I don't think the general public are aware of the duty by authorities to undertake SEA of their plans and policy since they don't typically engage"

(SCO8, Appendix D: 1266-1268)

It is reflected from the analysis that, climate change experts help assess the climate risks and mainstream adaptation into the development plan. They also make sure that future development interventions are resilient in the face of changing climate. Germany and Scotland both acknowledge the role of climate expertise in their planning system. The qualitative exploration revealed that in Scotland the other stakeholders who are directly involved in the SEA and also in matters of climate change aspects, such as Scottish National Heritage (SNH), Scottish Environmental Protection Agency (SEPA), and Historic Scotland are actively engaged through the whole SEA process. These key agencies are highly competent and would critically consider the aspects from scientific scrutiny. In addition to that, they contribute to providing valuable input in terms of climate change. Moreover, their advice would reflect their guidelines and guidance on the issue or national guidance on climate change matters (SCO9). Similarly, in Germany as well there exist some regional planning bodies that have scientific expertise and would actively comment and participate in the SEA process. However, having climate change experts in their team differ from region to region, some regions do not have many resources so the climate change experts are not involved there (GER1).

7.2.1.5 Decision Making

When considering the climate change scenario in the context of decision making, it is crucial that the decision-makers should take into account methods that are more vigorous and robust because robust approaches to decision making do not consider only single climate change projection but integrate a wide and extensive range of climate scenarios through a variety of mechanisms to illustrate as much as possible the uncertainty on future climate (Dittrich et al., 2016). In addition, it is also crucial to make the decision-making processes as transparent and as fair as possible since the level of fairness in the decision making process influences how the general public reacts to a certain plan or project. The qualitative exploration of the decision making of the onshore wind energy industry in Scotland and Germany is found to be highly influenced by the political conditions. SEA is very important for documenting, supporting, and fine-tuning the decision to make it more robust but the SEA would not change the decision because the decision would be made on a variety of factors such as politics. It is argued that the influence of the SEA on the decision-making process for onshore wind energy is fairly poor and limited because these crucial decisions are purely based on political grounds.

In Germany, it is argued that in the context of climate change, the influence of SEA on decision making for onshore wind energy is relatively low and limited. Multiple reasons are identified for this limited influence. One of them is that Germany´s environmental regulations are dominated by the Nature Conservation Act which mostly emphasis on protecting birds and bats. Due to this, the SEA or the part of the SEA which is dealing with the birds and bats becomes the most important thing than any other factor when planning for onshore wind farms. This resulted in a limited contribution of SEA to strengthen wind energy development because the task of the SEA is restricted to issues other than climate change concerns (GER2).

It was also argued that one of the main reasons for poor integration of climate change issues into the decision making stage in SEA is the non-existence of climate change aspects at the regional and local planning level. At this level, the SEA only deals with the priority zones of the wind farms. There is a strong need in Germany to reconsider its policies in the EIA act regarding the environmental impact assessment of 20 or more wind turbines with a tower height of 50 m tall. It was argued that, if the limit of the EIA act regarding the size of the wind farm is changed from 20 or more turbine which is 200m tall, then there is a chance to consider the climate change aspects at the regional level and local level both, therefore there is a need to adapt the limit of the turbines in the EIA act because it cannot be done in the regional and local level (GER1). This strategy will eventually help to better deal with climate change impacts overall. However, with the help of strong political will, more concrete objectives, and a policy-push measure in terms of climate change aspect, the influence of SEA on decision making can be increased.

On the other hand, in Scotland, the influence of SEA in the decision-making process of the onshore wind developments was found moderate. It was argued that in the SEA reports more weightage is given to the landscape and visual impacts. This is because the local technical reports often create situations where the focus of the issues is more towards landscape and visual impacts (SCO8). This issue could be avoided if those technical reports are incorporated into the SEA system to increase the influence of SEA in the decision-making process.

Moreover, the analysis revealed that the influence of the SEA process in decision making is relatively lower than the EIA, or direct policies, or perhaps legislation. This happens due to a lack of awareness of the potentials of the SEAs to contribute to the formulation of discussion on renewable energy. However, this conflict can overcome by having better coordination between the authorities that are writing the policies and those that conduct the SEA process.

7.2.1.6 Monitoring

Monitoring is considered particularly crucial in SEA due to a high level of doubts or uncertainties in predicting impacts at the plan level (Seht, 1999). It will be helpful if suitable indicators and objectives are used to describe the baseline and impact prediction (Therivel, (2004). In the context of climate change, Shaw et al., (2007), DCLG (2007), and Neil Adger et al., (2005) state that appropriate indicators should be selected for monitoring to access the effects of climate change. Posas (2011a), has highlighted various indicators for monitoring climate-related objectives, for instance, CO_2 emissions, energy usage, thermal and energy efficiency rates, proportion of energy produced from renewable resources, depletion of ozone, and fossil fuels, flood management issues, and road traffic growth rates.

In the interviews, it is acknowledged that the inclusion of climate change-related monitoring data in strategic environmental assessment is relatively limited in Scotland and Germany. It is argued that since monitoring the impacts of climate change tends to take a long term approach, it is quite impossible to monitor the effects of climate. The below extract supports this argument regarding the non-consideration of climatic factors in the monitoring stage.

> *"Because the effects of climate change cannot be assessed in the short term, it is not possible in my opinion to take climate change into account in monitoring"*
>
> (GER7, Appendix D: 1217-1218)

There are significant political and legal obstacles to the pursuit of effective monitoring policy by environmental agencies. The analysis of qualitative data showed that in Germany, the government does not contribute with the consultancies to conduct monitoring for the policies since there are no laws and no legal considerations given to monitor the policies related to onshore wind energy development (GER2). Secondly, due to political constraints, there is a lack of provisions in the energy sector in terms of GHG emission reduction and availability of climate data at the regional scale (GER3). Since there is no monitoring at the regional and

local level, therefore, there is no information about how much energy will be produced and how much CO_2 will be reduced. Climate change is a type of aspect that should be addressed at the earliest and highest possible level but due to the non-seriousness of government towards monitoring the climate change issues at the policy level, the monitoring of the climate change aspects are pushed back at the project level which is very late to consider. However, in Germany, there has been little improvement after there have been some changes in the EIA act. According to the new EIA law, monitoring is required for EIA on the project level since there is no monitoring present at the regional and local level. However, there is quite monitoring done at the approval level because the developers are forced to do monitoring on their wind parks themselves. Therefore, that monitoring information can be utilized at the regional and local level too (GER2), where a variety of cumulative and synergistic climate change impacts could be monitored to integrate the climate change aspects at the policy level (GER1). Improvements can be made on better consideration of climate change issues by monitoring how much energy is produced since that would be an indicator of how much CO_2 emission can be reduced.
The analysis revealed that the climate change legislation of Scotland which is Climate Change (Scotland) Act 2009, sets out emission reduction targets for Scotland and requires annual monitoring to be undertaken in terms of climate change impacts of the planning process (SCO11). The below extract highlights the importance of this act in achieving its GHG emission reduction targets;

> *"this Act, (Climate Change (Scotland) Act 2009), helps to set the GHG emission reduction targets and ensures if the emission reduction are achieved or there is still a need to increase the number of renewables in the country, so this act inform the SEA process if the emissions are still released or present into the atmosphere after a wind farm is constructed"*
>
> (SCO10, Appendix D: 1832-1835)

It was argued that the resources, which are used to monitor the climate change issues in Scotland, are rather limited; however, indicators like peat and woodland areas are appropriate indicators to monitor the climate change impacts on the wind energy development areas. (SCO9).

7.3 Summary and Discussion

This chapter provides an analysis of the process and practice of the Strategic Environmental Assessment of onshore wind energy planning in Scotland and Germany. Moreover, the substantive effectiveness in terms of procedural compliance of SEA to efficiently address climate change impacts in the planning process of onshore wind energy development, are also highlighted in this chapter. SEA is a key planning tool that aids in optimizing the best suitable zones for the onshore wind energy development. This chapter presents a holistic picture of SEA application in the onshore wind energy industry in Scotland and Germany, highlighting some strengths and weaknesses of how climate change issues are reflected while opting for suitable concentration zones during the planning process of onshore wind energy development. The results of this chapter are mainly based on qualitative information obtained from highly competent individuals from Scotland and Germany from the field of SEA.

It was found that mostly there is no screening conducted for the onshore wind energy plans because these plans are already subjected to SEA, yet possibilities are highlighted to identify the climate change aspects in the screening process such as consideration of flood plains and peat lands while planning for onshore wind farms. However, these issues are a topic of concern only in Scotland as in Germany due to its efficient flood management plan and exclusions of areas not suitable for wind energy development; these impacts are not much considered. The results showed that a variety of factors are neglected while carrying out the scoping stage in relation to climate change in Germany and Scotland as well. One of the main factors is the weak political will and poorly considering the environmental objectives. Considering the political agenda on onshore wind energy development and the environmental effects of its large-scale usage, the country´s spatial framework regulation of onshore wind power expansion plays a vital role in its realization as well as public acceptance. Considering alternatives in onshore wind energy planning only means optimizing suitable zones for the onshore wind energy plants. The SEA experts believe that climate change does not hold any significance or relevance when considering the alternatives. However, if we holistically observe the situation the impacts are taken into account when the spatial planning frameworks exclude areas that are not considered as suitable for planning onshore wind farms, such as areas with flood vulnerability, areas with peat land, and woodlands. Taking efficiently climate change into account in choosing alternatives only depends on how effective the spatial framework is of a country when identifying priority zones for wind farms.

Impacts related to the planning of onshore wind energy developments are scarcely identified in terms of mitigation and adaptation. Moreover, due to Germany and Scotland well developed spatial framework for onshore wind energy parks, hardly any adaptation or mitigation measures are necessary because their spatial plans already exclude areas that are sensitive in the context of climate change, especially areas with carbon-rich soils and peat lands. However, the current practice fails to incorporate any methodology used to identify future wind patterns. In addition, the level of engagement of the general public in the onshore wind energy planning is quite poor in both countries. They hardly give any feedback on the topic of climate change as the general public is more concerned about the local impacts of wind energy such as visual impact, noise, and shadow flickering of the turbines. The analysis also revealed that the general public of Germany and Scotland are more supportive of onshore wind energy development. However, to consider important decisions related to climate change, Germany and Scotland both do not involve any climate change experts in the planning of onshore wind energy parks.

Moreover, decisions related to the planning of onshore wind development are highly influenced by politics in both countries. If the political will is strong and understands the benefits of producing clean energy by wind farms then the decisions are made in favour of onshore wind farms or vice versa. Monitoring concepts are briefly described in the environmental reports but without clear explanation, since the agencies do not plan to disclose the monitoring results. International SEA research (Bidstrup and Hansen, 2014; Dahmen, 2017; Lobos and Partidário, 2014) and research about German SEA show similar results (Rehhausen et al., 2018; Rehhausen and Stemmer, 2017; Weiland, 2010). The inclusion of climate change aspects in monitoring in this research is also observed to be very limited in Scotland and Germany due to the indecisive nature of climate change. Because monitoring the impacts of climate change takes a long term approach and cannot be accurately evaluated in the short term so it is quite impossible to monitor the effects related to climate change impacts. Germany, at the moment, is assessing its climate change issues through the Nature Conservation Act, which the interviewees from Germany considered it as one of the drawbacks in order to effectively assess the issues of climate change. Scotland follows a strategic approach when dealing with its climate change aspects through The Climate Change (Scotland) Act 2009, which helps Scotland to achieve its GHG emission reductions targets and lead Scotland towards a low carbon economy (Terwel et al., 2011). Furthermore, this act ensures that the general public is aware and most importantly satisfied with the benefits they receive from renewable energy technology.

Overall, this study helped to uncover both negative and positive interactions between climate change issues and the promotion of onshore wind energy expansion. This was possible through the semi-structured questions enquired from the SEA experts of Scotland and Germany, who gave the opportunity to provide an in-depth explanation of possibilities and constraints concerning the integration of climate change impacts in onshore wind energy planning. It is revealed from the analysis that to take climate change impacts better into account in these large-scale developments of onshore wind energy, interrelations between consideration of climate change impacts into SEA and onshore wind energy planning, in particular, is still limited in Germany and Scotland. Therefore, there is a need to develop a planning system that can ensure a dynamic interaction between climate change impacts and the expansion of onshore wind energy in both countries such as Germany as well as Scotland. As a result, reasonable planning procedure with integrated climate change aspects can ensure to achieve the goal of onshore wind energy development, which is to reduce emissions, mitigate climate change impacts and provide a sustainable future, with a clean environment as well as clean energy for future generations to meet their energy needs and combat climate change and its impacts.

8 Conclusion and Recommendations

The main aim of this research is to assess to what extent the climate change issues and climatic factors are incorporated in SEA of onshore wind energy plans in Germany and Scotland. Through literature review (in chapters 3, and 4), case studies (in chapters 5, and 6), and SEA experts perspectives (in chapter 7), which are presented in this dissertation, the objectives proposed in chapter 1 are investigated and assessed. The purpose of this chapter is to revisit the objectives and findings of the literature review and empirical analysis and offer reflections on the integration of climate change factors in onshore wind energy plans within SEA. In addition, with reflections on the outcomes, recommendations are made in light of those findings. Along with that, research limitations and directions for further research are also suggested in subsequent sections of this chapter.

8.1 Summary and Conclusion

In 2014, the Intergovernmental Panel on Climate Change (IPCC) stated that: "Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had a widespread impact on human and natural systems" (IPCC, 2014, p. 2). In December 2015, 197 countries including Germany and the UK signed the Paris Agreement. The purpose of this agreement is to enhance the potential of the countries in order to cope with the impacts of climate change. According to Article 4, Paragraph 2 of the Paris Agreement each country is required to prepare, communicate, and maintain successive Nationally Determined Contributions (NDCs), according to which each country must take measures to reduce its contribution to climate change (UNFCC, 2015). Regardless of these major international political and scientific efforts, there remains a significant gap for reducing GHG emissions and keeping the global temperature rise at a safe level (Bushell et al., 2017).

SEA has been contemplated as the most appropriate tool for taking environmental issues into account and promoting sustainability in decision making at the planning level and also for proper integration of climate change issues into SEA. According to Weiland (2010), the questions of addressing climate change issues in SEAs are not often raised in the German SEAs. Wilson (2010) also examined the UK`s environmental assessment system and concluded that they do address the climate change issues but there is a great need for the development of the approach in their system. This ensures the importance of climate change in SEA as an emerging concern in research and practice as well, but it also illustrates that there are challenges associated with it, among them understanding the necessity to integrate the climate change issues in SEAs is one of them (Larsen et al., 2013).

This study's purpose is to assess to what extent the climate change issues and climatic factors are incorporated in SEA of spatial plans of onshore wind energy developments. Literature reviews and qualitative research methods that include the analysis of documents and semi-structured interviews are used to collect data pertaining to specific research objectives such as:

- To critically review the procedural aspects of SEA of onshore wind energy developments with emphasis on addressing climate change issues;
- To assess and review the SEAs of onshore wind energy plan´s features of Scotland and Germany;
- To undertake a comparative analysis of factors that are considered as constraints and opportunities in the full integration of climate change into SEA;
- To identify appropriate and enhanced measures that can improve the integration of climatic factors into the SEA of spatial plans of the onshore wind energy developments.

The general conclusions in this chapter are based on the findings with regard to the objectives of this research mentioned in the first chapter of this dissertation. The below section reflects on the inclusion of climatic factors in SEA with regard to onshore wind energy plans of Germany and Scotland based on the objectives of this dissertation presented in chapter one.

8.1.1 Procedural Aspects of SEA of Onshore Wind Energy Plans in Addressing Climate Change Issues

In order to understand the practical experience of SEA application regarding onshore wind energy planning and whether or not climate change aspects are addressed procedurally when planning for onshore wind energy developments in Scotland and Germany, it was found out the development of onshore wind energy in Germany is based on the spatial plans which are used to find suitable concentration zones for the development of onshore wind energy plans. The regional and local planning authorities designate priority and suitable areas according to the regulations set in Natura Conservation Act. Germany assesses its climate change issues through the Nature Conservation Act, which according to empirical analysis is one of the drawbacks of the SEA process while incorporating climate change issues in environmental assessment. However, in Scotland, the onshore wind energy developments are planned according to the National Planning Framework 3, which aims at acknowledging renewable energy potential in Scotland. Scotland follows a strategic approach when dealing with its climate change aspects through The Climate Change (Scotland) Act 2009, which helps Scotland to achieve its GHG emission reduction targets and lead Scotland towards a low carbon economy (Terwel et al., 2011), by reducing GHG emissions at least 80% by 2050. Furthermore, this act ensures that the general public is aware and most importantly satisfied with the benefits they receive from renewable energy technology. The Scottish Planning Policy 2014 (SPP 2014), which outlines a spatial framework regarding onshore wind energy, guides the local authorities to consider renewable energy developments in Scotland. The results also reveal that SEAs of both the counties have equal amounts of strengths and weaknesses in their onshore wind energy plans. Additionally, it was noticed from case studies analysis that the SEA procedural methodology of both the countries was reasonable when it comes to integrating climate change impacts but the German SEAs scored relatively higher than the Scottish ones due to their enhanced procedural methodologies in addressing climate change impacts in SEA. The one thing that both the countries lacked while integrating the climatic aspects is that they did not provide any insight into whether (and how) plans will evolve in order to keep up with the current scientific understanding of climate change and its probable effects. In short, the overall analysis shows that the SEA process of both countries still needs improvements in order to facilitate the integration of climatic factors at various stages of the planning process. Moreover, in order to genuinely make SEA applicable and help achieve objectives of integrating climate change impacts into onshore wind energy plans, SEA should be set up in a way that is clearly driven by its added value to decision-making.

8.1.2 State of SEA of Onshore Wind Energy Plans in Germany and Scotland

The current procedural compliance of SEA in Germany reflected positive as well as negative factors such as weak environmental objectives, poor political will, and lack of provisions for local and regional SEAs in terms of methodological guidance and data with the issues of climate change. Moreover, the legal requirements, which are outlined in the SEA Directive and the EIA Act in Germany, require a high level of expectations from the practitioners in terms of how to deal with issues of climate change. The assessment of the onshore wind energy plans of Germany and Scotland was conducted using Lee and Colley's (1992) and Lee et al., (1999) review package in an adapted format. A modified form of Lee and Colley review package is used in order to better address the particular characteristics of climate change integration in onshore wind energy plans. This was mainly achieved through developing review criteria from core research studies reflecting the need for incorporating climate change issues in SEA. Such criteria highlighted in these studies helped to better represent the features of integrating climate change impacts into the SEA procedural steps of Germany and Scotland's onshore wind energy plans. The analysis obtained from Lee and Colley review package revealed that when it comes to practice there are no good methodologies used to integrate the climate change issues effectively into the SEA process. It is also concluded that the SEA Directive does not account for the mitigation and adaptation of climate change, so it is fundamental to include these issues in legal requirement so the impacts of climate change are clearly known and dealt effectively. The analysis from SEA expert interviews reveal that developing strategies and visions and setting long-term goals are major objectives for politics. Therefore, it is crucial to have suitable political conditions for promoting onshore wind energy expansion in Germany.

From Scotland's perspective, it is concluded that Scotland has a strong good policy framework. They have well-developed laws and regulations through which they set policies to adapt to and mitigate the impacts of climate change. In Scotland, the main challenges that come from the local topic are specifically landscape studies which do not really form a part of the mainstream planning process and which influence the way in which developments are considered in the system. This dilutes attention on the broader issues and benefits of onshore wind developments (such as climate change mitigation) and creates a false balance of issues. The case studies analysis showed that Scotland performed slightly lower than Germany when integrating the climate change issues into its planning process. Despite the fact that climate change issues are more prevalent in Scotland as compared to Germany, yet does not substantiate the rationale for reduced integration of climate change issues into the planning process. On the other hand, unlike Scotland, Germany is not so common in having issues of carbon-rich soils and peat land as compared to Scotland and even if it has, the peat lands are scooped off while selecting suitable areas for wind farms. Secondly, after the 2002 flood episode in Germany, the government has produced a very resilient flood risk management plan, which ultimately supports or aids planners while planning for onshore wind energy farms. Moreover, the analysis revealed that in both countries, it is unclear whether the local planning authorities are keeping their plans up to date, incorporating rising societal understanding and appreciation for climate risk, and the urgency of action regarding repowering. In addition to that, it is also not clear, whether local authorities understand how serious climate risk is, and if they are responding appropriately by advancing the onshore wind energy plans through setting more aggressive policies and goals for reducing local greenhouse gas (GHG) emissions.

8.1.3 Constraints and Opportunities in Full Climate Change Integration into SEA

Both Germany and Scotland have a well-developed spatial framework specifically designed to identify different priority areas and schemes for the development of wind energy. Through Scotland's 2009 Act of Climate Change, the country has considered the complex nature issues associated with climate change. This came as a result of a legislative framework that was introduced with a goal to decrease the emission of greenhouse gases (GHG) to a substantially low level. Similarly, Germany has an integrated climate change and energy policies that are aimed at achieving the long-term climate change goals, which further assist the country in decreasing its GHG emissions and expand paths for renewable energy. Moreover, environmental concerns are taken into Germany´s energy policies through Energiewende. Its main objective is to lessen climate change issues through a clean energy policy that aims at leading Germany towards lowering the carbon energy system by promoting renewable energy generation. As with the carbon target, Scotland's renewable energy goal is far more ambitious. The evidence of this study highlights similarities found in both cases, and the outcome of this investigation shows that none of the countries adopted any methodology to anticipate future wind patterns under climate change. Since these infrastructures are planned and build for a remote future, it is crucial to have a projection of future emission levels along with climate change models while planning for the development of onshore wind energy. On the country's domestic level, it should be perceived that the different renewable energy's environmental benefits are often less clear, leading to a low readiness to acknowledge the trade-offs among communities (Kaza and Curtis 2014, p. 355-356). While for the wind power, the communities' less willingness to acknowledge the social, local, and environmental disturbances of wind turbines has resulted in greenhouse gas emissions at the national level that eventually got embraced for the sake of barely shared and long-term benefits. This includes landscape fragmentation and visual intrusion (Firestone et al., 2012, p. 1371-1373). It has also been found that in both countries the local planning authorities did not create any local GHG emission inventory, which is supposed to contain information about the sources and quantities of local emissions. Emission inventory would further help local planning authorities in making strategic and informed decisions regarding space and re-powering of the onshore wind energy farms.

8.1.4 Appropriate and Strengthened Measures to Enhance Climate Change Integration in SEA

The effective spatial regulation of wind energy expansion plays a critical role in public acceptance, hence resulting in the propensity to alleviate and adapt to the different climate change impacts. To further boost the issues of climate change into the development of onshore wind power, it is important to have a sense of political support in relation to the use of various strategic assessment and evaluation tools as a means to reduce and combat the immensely complex nature associated with climate change. Finally, in order to effectively take into account the climate change impacts in SEAs and to efficiently plan for the onshore wind energy development, due consideration should be given to several models of climate change in order to define future wind patterns. Furthermore, less is known with regards to the future estimations of wind speed at the height of the wind axis turbines, which is projected to be above 50 meters, since the speed of wind greatly varies with altitude. Usually, these estimates are not available at the related altitude due to proportional relationship between energy in the wind and wind speed cube (Schaeffer et al., 2012) – that is, the subsequent adjustments and modifications on the later can have a significantly high impact on the former (IRENA, 2019). The below-average wind speed usually produces much lower energy in comparison to the above-average speed that can exceed the pressure on the turbine components (Chilkoti et al., 2017), leading to the activation of the cut-off speed control. This, in return, indicates that analyzing the impact of climate change can only be possible through using advanced methodological approaches (Solaun and Cerdá, 2019). Accordingly, to avoid the effects of wind power generation potential in the future, models of climate change can be utilized to extrapolate wind speeds at various altitudes. In spite of its widespread, onshore wind energy makes good use of many new technologies. The development of the reliability and efficiency of wind turbine maintenance would assist sectors of wind energy to increase their shares in the market of energy generation (Papaelias and Márquez, 2020), and therefore helps to address the impact of climate change more vigorously. Along with that, the authorities of local planning must consider strategic adaptation planning, since it implements an enhanced monitoring framework, and maintain a GHG emission inventory to effectively integrate climate change aspects into the plans of onshore wind energy development.

8.2 Recommendations

As per the obtained results of this research and the implications highlighted above, the following recommendations are derived for Germany and Scotland to further integrate the issues of climate change into SEA's for onshore wind energy plans.

8.2.1 Need for Broad Methodological Approach

SEA is an extremely suitable and useful tool for the implementation of climate protection at the regional and local levels (Islam and Zhang, 2019). However, SEA still needs to adapt some features that could potentially lead to a more methodical, systematic, and comprehensive approach to include the impacts of climate change on the SEA for the development of onshore wind energy. Therefore, diverse methodological approaches should be fully adopted in the SEA of Germany and Scotland to holistically determine the climate change impacts while planning for the development of onshore wind power.

8.2.2 Enhanced Monitoring Programme

The non-linearity and uncertainty of climate change patterns, as well as the long-term horizons, are some examples of the climate change characteristics that present a challenge in the evaluation and monitoring process of the development of onshore wind energy. To face those challenges and ensure effectiveness in the monitoring process, the proposed assessment and evaluation approaches need to be transparent in being flexible, open, and adaptable to the existing contexts. As a result, it is extremely important for Germany and Scotland both, to develop and implement a nationwide framework or scale specifically designed to monitor and evaluate the changes in the vulnerabilities of the sectors of onshore wind energy in relation to climate change. Since monitoring the issues of climate change in the SEA's onshore wind energy plans are observed as the weakest factor in both the countries, there is a strong need to adopt an enhanced monitoring framework with policy output and policy implementation indicators in Germany and Scotland. Such policy indicators will significantly assist in determining whether the SEA's plans are on track to achieve the targeted policy outcomes for the generation of onshore wind power or not and therefore identifying whether measures are in place to implement different policy outcomes (Scottish Government, 2019).

8.2.3 Strong Political Support

Climate policy has been politicized on many levels by on-going debates about whether climate projections and climate science are valid or not, which has made it risky for climate change leaders to make necessary decisions (Bassett and Shandas, 2010). In order to translate the SEA into better goals and policies for addressing climate risks and vulnerability, a high level of political support is needed in Germany and in Scotland too, as a means to consider and resist the climate change impacts. Consequently, an increase in awareness is needed among politicians of both countries, since there is a considerable degree of climate scepticism among politicians. Thus, having the appropriate and stable political conditions that would promote and lead the suitable concepts as well as paving the way to implement the stated reduction objectives of the different climate change issues, is necessary.

8.2.4 Information Regarding Climate Projections

Wind power reliability and availability are based upon climatic and weather conditions. Wind resources rely on atmospheric circulation, and therefore the supply of wind-sourced energy is dependent on climate. Therefore, indicators such as climate change models are well needed in Germany and Scotland, in order to study the present and future trends in climatic conditions. These climate change models have been developed and stimulated at the regional level (Davy et al., 2018; Hueging et al., 2013); however, such an approach has not been adopted by local planning authorities at the local level. Since climate change develops over time, it is useful to consider future changes in wind patterns for wind power parks as these impacts are often abandoned in the current SEA systems in both countries. Moreover, considering the long lifespan of the developments of onshore wind power, information regarding the impacts of climate change should be based on future trends or at least until the life span of the infrastructure, and so it is subsequently necessary to give a particular focus to the overall exploitable wind energy sources that imply the availability of potential wind power generation in addition to identifying the areas that are suitable for expanding the onshore wind power (Schaeffer et al., 2012).

8.2.5 Collaboration and Teamwork

Policies must be communicated more effectively and eventually changed, with the intention to encourage local-scale climate change protection (Picketts et al., 2014). Therefore, to give particular attention to climate protection issues and set climate change goals, there should be a close collaboration between, planners and SEA practitioners of Germany and Scotland, since teamwork will help realize and embrace substantial opportunities to integrate climate change into the planning of onshore wind energy development. Furthermore, teamwork and collaboration between planners and SEA practitioners are indeed necessary to formulate the discussion and policies related to improving the technologies in the sectors of onshore wind energy since they can act as a means to address the complex issues of climate change and its key impacts.

8.2.6 Communication Improvement

The successful integration of climate change issues into SEA of onshore wind energy plans are the results of appropriate scientific research, extensive administration activities as well as a suitable policy framework. Nevertheless, in order to support the climate change goals, a practical communication strategy accompanying them is also of critical importance which should be considered by Germany and Scotland. These communication strategies ought to address scholars, politicians, experts of climate change, and even more the general public, in order to spread and generate support and acceptance. Changing our lifestyles and behaviour patterns can greatly reduce carbon footprints, hence contributing to the reduction of the different climate change impacts that result in many issues.

The extent to which climate change incorporation in the strategic environmental assessment in onshore wind energy planning in Germany and Scotland can be boosted and enhance if such recommendations and suggestions are implemented.

8.3 Research Limitations

Along with other methodologies, interviews were an important piece of this work's research methods. However, interviews are subject to different communication difficulties between the interviewer and the selected interviewees, and therefore can often result in response bias (Ziegler et al., 2018). Accordingly, an interview guide is presented to combat these biases. The filtering of questions, for instance, was utilized to realize the subjectivity levels of experts according to their interests and job positions and roles in the companies. To reduce this limitation, consequently, the triangulation of data sources was used by conducting SEA document analysis of onshore wind energy plans for Germany and Scotland. Another limitation was the time constraint to review the SEA documents. Moreover, this research followed a small sample size, which consequently resulted in difficulty to analyse and compare a broad diversity of factors. Furthermore, the scarcity of quantitative data appeared to be another main important limitation. It should be perceived that the results obtained from quantitative data are conceivably present, as the limited field experience does not efficiently provide data to run statistical analysis. The research is limited to the state of integration at which the development of onshore wind energy in Scotland and Germany is perceived, and therefore the obtained results of this research are closely interlinked with specific country aspects. Accordingly, a particular focus should be given when it comes to the generalization of the obtained results to other countries that have not been investigated in this study.

8.4 Further Research Outlook

In order to ensure emission reduction targets are achieved, different countries pursue different strategic approaches that help them validate and explain government climate change strategies and policies through using an influencing method to present and explain climate change solutions. To explore the potentiality of SEA as a significant tool utilized to better integrate environmental assessment and planning processes, further applied research in the climate change context is critically needed. The effects and impacts of climate change are evident across all the sectors, and therefore cannot be avoided in SEA of proposed development policies, plans, and programs. Particularly, SEA provides a procedural and legal framework to holistically assess the major impacts of climate change based on sustainability and environmental concerns. Moreover, climate change mitigation requires rapid decarbonization of the energy system with the assistance of renewable energy resources including the wind power to attain the Paris Agreement's two-degree goals (UNFCC 2015; Rogelj et al., 2016).

The general climate change idea regarding SEA plans for onshore wind energy that has been extensively covered in this research, explains that it includes a high level of indecisiveness at the local planning level, and therefore it is useful for SEA practitioners to obtain a general overview of the local and regional climate models to better understand the climate bandwidth in terms of changing wind patterns. To truly perceive the bigger picture, SEA is only one of many factors that are critical to achieving the climate change goals, along with many other factors that aid in avoiding the oncoming catastrophic impacts of climate change. Policies and strategies will be crippled if they do not become a reality. To this end, full political support and commitment is the true cornerstone of addressing climate change challenges in the onshore wind energy sector. To date, knowledge of environmental assessments of onshore wind energy in relation to the impacts of climate change at the local level is limited, and more research is needed to fully realize all the risks associated with it.

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Appendixes

Appendix A – Review Topics

This appendix contains a structure of the review quality package that was developed by Lee et al., (1999) originally. The below review checklist contains the review topics which are based upon UK government guidance with reference to environmental appraisals, EU SEA Directive and examples of good SEA practice internationally. The review package is organised in a hierarchical structure consisting of four broad layers. The detailed descriptions of all the major four areas are explained below.

Review Topics of Quality Assessemnt Tool

Review Area 1 - Description of the plan, the affected environment, and the baseline conditions.

Review Category 1.1 - **Description of the Plan.** The purpose of the plan, its place in the planning hierarchy and its main objectives and proposals should be summarised.

Sub Review Category 1.1.1 - Is the type, purpose and lifetime of the plan, its stage in the plan preparation process and any future stages clearly explained?

Sub Review Category 1.1.2 - Are related land use and sectoral plans identified?

Sub Review Category 1.1.3 - Are the plan's main socioeconomic, environmental and/or sustainability objectives clearly stated?

Sub Review Category 1.1.4 - Are the plan's main policies and proposals, together with their aims, described?

Sub Review Category 1.1.5- Is the location and extent of the main areas allocated in the plan for different types of development indicated?

Sub Review Category 1.1.6 - Are international or national environmental protection objectives (including objectives established in related plans) considered?

Review Category 1.2 - **The Affected Environment.** The extent of the environment potentially affected by the plan should be defined.

Sub Review Category 1.2.1 - Is the local environment likely to be affected by the plan and described (by narrative description and/or by a map), including areas extending beyond the plan area, such as catchment areas?

Sub Review Category 1.2.2 - Are components of the wider environment likely to be affected by the plan identified?

Review Category 1.3 - **Baseline Conditions.** A description of the affected environment as it is currently, and as it could be expected to develop if the plan were not to be adopted, should be presented.

Sub Review Category 1.3.1 - Is the local environmental stock described? Particular reference should be given to:

· key assets

· renewable and non-renewable Resources

Sub Review Category 1.3.2 - Is the local environmental quality described? Existing environmental problems and pressures on the environment should be described, including:
· estimates of waste production
· pollution levels
· other development pressures on the environment.
Sub Review Category 1.3.3 - Are the baseline conditions described?

Review Area 2 - Identification and Evaluation of Key Impacts

Review Category 2.1 - **Scoping of the Environmental Appraisal.** Policies and impacts should be scoped in a systematic and explicit manner to ensure that all relevant issues are covered.

Sub Review Category 2.1.1 - Are potentially significant policies, proposals and their impacts, including those of alternatives, identified using a systematic methodology?

Sub Review Category 2.1.2 - Are environmental/sustainability indicators established and justified to assist in impact identification?

Sub Review Category 2.1.3 - Are potentially significant impacts on the following environmental receptors, and interactions between them, identified?
· human beings;
· flora and fauna;
· soil;
· water;
· air;
· climate;
· landscape;
· material assets;
· cultural heritage.

Sub Review Category 2.1.4 - Are alternatives for achieving the plan's objectives or policies identified and is the reason for selecting these for further study given?

Review Category 2.2 - **Describing Key Impacts.** The likely impacts of the plan's policies and proposals, and those of its alternatives, should be described as precisely as possible, taking into consideration the type of plan and the stage in its preparation.

Sub Review Category 2.2.1 - Is a description of the key impacts of the plan's policies and proposals and its alternatives, as identified at the scoping stage, given? A description should be given of any:

· direct and indirect;
· cumulative;
· permanent and temporary;
· positive, negative or uncertain;
· short and long-term

(quantified, where possible); impacts of the plan's policies and proposals on the local and wider environment.

Sub Review Category 2.2.2 - Are the types of future changes to environmental media and receptors (as identified in 1.2) described?

Review Category 2.3 - **Assessment of Impacts.** The expected significance of the projected impacts of the plan's policies and proposals, and its alternatives, should be assessed; based where appropriate on their quantification. The rationale, assumptions and value judgements used in prediction and assessing significance should be described.

Sub Review Category 2.3.1 - Is impact magnitude predicted, either in quantitative or qualitative terms?

Sub Review Category 2.3.2 - Is impact significance assessed, taking into consideration where relevant:

· impact magnitude;
· impact locations;
· impact duration;
· opinions of affected parties/experts;
· environmental/sustainability criteria;
· the precautionary principle;
· international and national environmental protection objectives?

Sub Review Category 2.3.3 - Is the methodology used to predict impact magnitude and significance described and justified? Any value judgements used should be explicitly stated.

Review Category 2.4 - **Appraising the Sustainability of the Plan**. The Report should review how sustainability considerations were taken into account in the plan.

Sub Review Category 2.4.1 - Does the Report assess the sustainability of the plan in the local and wider context?
Sub Review Category 2.4.2 - Does the Report establish and justify specific criteria for evaluating the sustainability of the plan?
Sub Review Category 2.4.3 - Does the Report assess the compliance of the plan to national or Local Authority sustainability strategies, e.g. Local Agenda 21?

<u>Review Area 3 - Alternatives, Mitigation Measures, Monitoring and Recommendations</u>

Review Category 3.1 - **Alternatives.** Alternatives to the plan's policies, proposals and objectives should be considered. These should be outlined and the environmental implications of each presented and the reasons for their rejection briefly discussed.
Sub Review Category 3.1.1 - Are alternatives, considered at previous and present stages of the plan making process, described and evaluated and the reasons for any final choices given? Reasons for not adopting alternatives should also be given. Alternatives may relate to:
· objectives;
· policies and proposals;
· location strategies and land use types.
Sub Review Category 3.1.2 - Is the significance of the predicted environmental impacts used in justifying the choices between alternatives?

Review Category 3.2 - **Mitigation Measures.** Significant adverse impacts likely to result from the implementation of the plan should be considered for mitigation.
Sub Review Category 3.2.1 - Are mitigating measures proposed to prevent, reduce or offset the significant adverse impacts of implementing the plan's policies and proposals on the environment?
Sub Review Category 3.2.2 - Is the anticipated effectiveness of the proposed mitigation measures indicated?
Sub Review Category 3.2.3 - Is the commitment to, and responsibilities for, mitigation measures stated?

Review Category 3.3 - **Monitoring And Review.** Effective arrangements should be made for monitoring and reviewing the plan's implementation.

Sub Review Category 3.3.1 - Are monitoring arrangements proposed to check the environmental impacts resulting from the implementation of the plan, and their conformity with the predictions within the Report?
Sub Review Category 3.3.2 - Are there provisions to review the plan on a regular basis to ensure that any unexpected environmental impacts are identified and taken into account in plan revisions?
Sub Review Category 3.3.3 - Is the commitment to, and responsibilities for, monitoring and review stated?

Review Category 3.4 - **Recommendations.** Based on the results of the environmental appraisal, the Report should present recommendations for consideration in subsequent decision making relating to the plan and its implementation.
Sub Review Category 3.4.1 - Does the Report contain recommendations concerning the contents of the plan, e.g. amending and introducing new policies or proposals and/or on the final selection of alternatives?
Sub Review Category 3.4.2 - Are recommendations made for the further investigation of activities arising from the plan within the project level environmental assessment process?

Review Area 4 - Communication of Results

Review Category 4.1 - **Layout.** The layout of the Report should enable the reader to find and assimilate data easily and quickly. External data sources should be acknowledged.
Sub Review Category 4.1.1 - Is information logically arranged in sections or chapters? The structure of the appraisal should be indicated in a table of contents and summarised in its introduction.
Sub Review Category 4.1.2 - Are the predicted environmental impacts referenced to the policies giving rise to them?
Sub Review Category 4.1.3 - Do chapters and other sections of the Report, unless very short, contain summaries outlining their main findings and conclusions?
Sub Review Category 4.1.4 - Where data or material from external sources are introduced, is the original source acknowledged at that point in the text? Such data and material should be adequately referenced.

Review Category 4.2 - **Presentation.** Care should be taken in the presentation of information to make sure that it is accessible to the non-specialist. The Report should ideally be a self-contained document.

Sub Review Category 4.2.1 - Is information presented so as to be comprehensible to the non-specialist?

Tables, graphs, sketch maps and other devices should be used as appropriate.

Sub Review Category 4.2.2 - Is obscure language avoided? Acronyms and initials should be defined.

Sub Review Category 4.2.3 - To what extent is the Report presented as a self contained document? If and where cross reference is necessary to other planning documentation, the source of the reference should be clearly indicated.

Sub Review Category 4.2.4 - If important data and material are located in appendices, are they also summarised, presented and discussed in the main body of the text?

Review Category 4.3 - **Uncertainties.** Uncertainties and other limitations in information and assessment methods should be acknowledged. The reasons for these and how they have been handled within the environmental appraisal should be explained.

Sub Review Category 4.3.1 - Are uncertainties and other limitations regarding information, data and methodologies acknowledged?

Sub Review Category 4.3.2 - Does the Report explain and justify how these uncertainties and limitations have been handled within the environmental appraisal?

Review Category 4.4 - **Emphasis.** Information should be presented without bias and receive the emphasis appropriate to its importance in the context of the Report.

Sub Review Category 4.4.1 - Are both significant adverse and beneficial environmental impacts given their due emphasis? The significance of adverse impacts should not be disguised by empty or imprecise phrases.

Sub Review Category 4.4.2 - Is the information in the Report presented without bias? The Report should not lobby for a particular point of view toward the plan and its likely environmental consequences.

Review Category 4.5 - **Consultation.** It should be evident how interested parties have been consulted during the environmental appraisal and their opinions have been taken into consideration in the Report.

Sub Review Category 4.5.1 - Is information presented in the Report on any consultation exercises undertaken, during the environmental appraisal, with the environmental authorities, NGOs, the general public and other interested parties in the development plan process?
Sub Review Category 4.5.2 - Are the opinions they expressed summarised and taken into account in the Report?

Review Category 4.6 - **Nontechnical Summary.** There should be a clearly written nontechnical summary of the main findings of the environmental appraisal and how they were reached in the Report.
Sub Review Category 4.6.1 - Is there a nontechnical summary of the environmental appraisal Report? This should include a brief description of the plan, its main objectives and alternatives considered.
Sub Review Category 4.6.2 - Does the summary cover all major Review Topics and issues in the Report and its principal findings and recommendations?

Appendix B – Review Package Collation Sheet

(Adapted)

This appendix present the adapted collation sheet used for the assessment of onshore wind energy plans. This collation sheet is used to record the assessment results obtained from the application of each review criterion. The collation sheet is not only used to record the assessment symbols, but also as a brief summary of the strengths and weaknesses of the SEA reports, that has been assessed.

1. Assessment symbols: Use the following symbols when completing the Collation Sheet below;

Symbol	Explanation
A	Relevant tasks well performed, no important tasks left incomplete.
B	Generally satisfactory and complete, only minor omissions and inadequacies.
C	Can be considered just satisfactory despite omissions and/or inadequacies.
D	Parts are well attempted but must, as a whole, be considered just unsatisfactory because of omissions and/or inadequacies.
E	Not satisfactory, significant omissions or inadequacies.
F	Very unsatisfactory, important task(s) poorly done or not attempted.
N/A	Not applicable. The review topic is not applicable in the context of this statement.

2. Collation Sheet

Overall assessment ……….

1	………..	2	………..	3	………..	4	………..
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1.1.1	………..	2.1.1	………..	3.1.1	………..	4.1.1	………..
1.1.2	………..	2.1.2	………..	3.1.2	………..	4.1.2	………..
1.1.3	………..	2.1.3	………..	3.1.3	………..	4.1.3	………..
1.2	………..	2.2	………..	3.2	………..	4.2	………..
1.2.1	………..	2.2.1	………..	3.2.1	………..	4.2.1	………..
1.2.2	………..	2.2.2	………..	3.2.2	………..	4.2.2	………..
1.2.3	………..	2.2.3	………..	3.2.3	………..	4.2.3	………..

Additional Descriptive Responses

1.0 Description of the plan, baseline and identification of key issues

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2.0 Identification and evaluation of alternatives and impact analysis

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3.0 Assessment of mitigation and adaption measures

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4.0 Stakeholder Involvement and Follow up

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Appendix C – Interview Guide

This appendix illustrates the list of questions and topics that were covered during the interview with the SEA experts in Germany and Scotland. The interviews are designed as semi-structured in nature in order to provide reliable, comparable qualitative data. However, it should be noted that these interview questions are just used as a formal interview guide. Since semi-structure interviews are with a fairly open framework, therefore majority of the questions (other than these questions) were created during the interview.

General Information about Interviewee	
Name:	
Organization:	City:
Current job title:	
Tasks Related to SEA:	
Total years of working in SEA:	
Interview time:	Date:
Contact Details (Email/Tel):	

Purpose of the Interview:

The Purpose of this interview is to make a contribution to scientific research on analyzing and conducting a cross country comparison of the SEA procedural and methodological aspects in order to assess to what extent the climate change issues and climatic factors are incorporated in SEA of onshore wind energy plans in Germany and Scotland.

Scope of the Interview:

This tool will provide a simple framework for evaluating the extent to which climate change is and can be further incorporated into the SEA process of spatial plans of wind energy Industry (onshore).

Screening

1. What are the key concerns which are considered during the screening stage when integrating climate change into SEA of wind energy plans?
2. According to your experience in SEA what is the best way for climate change issues to be addressed during the screening stage of SEAs for wind energy parks?

Scoping

3. Do you think it is important to identify the key issues from a climate change perspective for wind energy parks so early in the SEA process?
4. Can you explain which key points are considered when carrying out the scoping stage of SEA considering wind energy parks in terms of relevant climate change analyses?

Environmental Report

5. What is the quality of environmental report of the SEA of wind energy plans when taking climate change into account?
6. Do you recommend any changes or improvement in current environmental reports related to SEA of wind energy parks?
7. Do you think sufficient guidelines are present for incorporation of climate change into SEA?
8. To what extent these guidelines are used in environmental reports for integration of climate change in SEA Process? What improvements are needed regarding these guidelines?

a) Consideration of Alternatives

9. When considering and recommending alternatives do you think the climate change related implications are taken into account in SEA of wind energy parks?
10. According to your opinion what seems to be the key complexities in consideration of alternatives in SEA of wind energy plans and how they can be improved?

b) Impact Analysis

11. Do you feel the climate change concerns are sufficiently addressed in the impact prediction stage?
12. To what extend you think they are adequately taken into account in terms of integrating climate change into SEA for wind energy parks?

c) Mitigation Measures

13. What are the key factors that are kept in mind when proposing mitigation measures in the SEA for wind energy plans?

14. What are the challenges in proposing mitigation measures in terms of climate change integration in the SEA of wind energy plans and how they can be overcome?

d) Adaptation Measures

15. What are the key challenges and barriers faced when adapting to the impacts of climate change in the SEA for wind energy plans**?**
16. What measures are usually taken for an effective adaptation to climate change impacts in the SEA for wind energy plans?

Public Consultation

17. Are stakeholders provided with sufficient information they needed to participate meaningfully in SEA for wind energy plans?
18. How do you evaluate the involvement of public consultation in SEA in terms of climate change integration for wind energy plans?
19. Is public feedback effectively incorporated during consultation phase to make key decisions?

Decision Making

20. Considering climate change, what is the influence of SEA in decision making process?
21. What improvements can be made in order to increase the influence of SEA (related to wind energy plans) in final decision making stage?
22. Can you describe the barriers to effective climate related decision making? How can they be avoided?

Monitoring

23. Do you think there is enough attention being paid on monitoring climate change issues in SEA of wind energy plans?
24. What improvement can be made on better consideration of climate change issues in the monitoring process of SEA for wind energy plans?

Appendix D – Expert Interview Transcripts

This part of appendix contains all the transcripts of the interviewees that were conducted in order to obtain qualitative data. A total of 11 interviews are conducted for this research. List of the interviewees' information is presented in chapter two of this dissertation. All the interview transcripts are available in the CD attached below;