UNIVERSITY OF TWENTE

The Role of Regions in the Multilevel Governance of Climate Protection in the EU

a Study of Four German Regions

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Abstract

In the scope of its climate and energy package the EU set up binding targets for its member states, including targets for an increase in the share of renewable energies. This Bachelor Thesis analyzes the multilevel governance system of renewable energy in the EU and particularly focuses upon the expectations the EU has on the role of regions and compares these to the actual activities of regions. For this purpose, EU policy documents are studied with regard to actions regions are advised to engage in and the German national action plan is taken into consideration, as well, in order to analyze expectations that are expressed at this level of the multilevel governance system. After this four German regions are analyzed and their actions are summarized and compared to the expectations mentioned in the previous chapters. Finally, the central question is answered by stating that the regions of the study mainly not only meet the expectations but exceed them. This is explained by the fact that regions behave like full actors within the multilevel governance system. They are not only motivated by the EU Directive, but many look back at a long history of climate protection involvement.

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1. Introduction

This study analyzes the role of regions in the multilevel governance of climate protection within the European Union (EU) and compares the actual activities of regions with EU expectations on the role of regions. The EU has set up its 20-20-20 ambitions for reducing CO_2, increasing energy efficiency, and increasing the share of energy from renewable sources until 2020 by 20% each (European Commission, 2012a). However, implementation of concrete policies that aim at making the goals set up by the EU achievable happens at a lower level within the governance structure. This governance structure and the activities at the regional level are the subject of this study.

Multilevel governance with regard to climate governance is a topic in research since several years now. Other scholars already wrote about the topic of multilevel governance with relation to climate protection and stressed the importance of regions within the system of governance (Bulkeley & Kern, 2006; Collier, 1997; Monni & Raes, 2008). Especially the roles of cities and of transnational municipal networks have been subject of research quite often. Harriet Bulkeley states in one article that the "multilevel governance approach captures more fully the social, political, and economic processes that shape global environmental governance" (Betsill & Bulkeley, 2006, p. 142). In cooperation with several other researchers she also published an article on the role of transnational municipal networks (TNMs), defining them as "'Type II' multilevel governance forms" themselves and stresses the current necessity of their existence for the achievement of the European environmental policy (Bulkeley et al., 2003, p. 251).

Ute Collier studies whether local authorities are the most appropriate level for policy making due to the guiding principle of subsidiarity of the EU (Collier, 1997). Her results state that action at all levels of government is required and generally bringing action as close to the citizen as possible by involving local authorities means compliance with the principle of subsidiarity. However, she also remarks that local authorities face in some countries limited scope and an "unfavorable policy context" (Collier, 1997, p. 55).

Studies on multilevel governance are, furthermore, not only limited to Europe. There are also several studies on America, Canada and other parts of the world where the governments are reluctant to the agreement of specific binding targets but where local authorities regard the issue as important and develop initiatives themselves (Schreurs, 2008).

In general, there are many studies on the topic of city involvement on a global scale but not so many in the EU specifically. Additionally, there is a gap with regard to the perception of the EU of the roles of the region. What does the EU expect from regional and local authorities in the governance of climate protection? And what are regions actually doing? Are the actions in compliance with what the EU expects from the regions? These questions will form the basis of the thesis. Due to the complexity and extensiveness of climate protection governance in total only the aspect of renewable energies will be analyzed in this study. Renewable energy is highly important for the EU because it has the potential to help decreasing CO_2 emissions on the one hand and to decrease the dependency on foreign energy supply on the other hand. Therefore, this study focuses on renewable energy rather than CO_2 reduction or energy efficiency. Answers to the above mentioned questions will enable us to get a clear picture of the involvement of the different governance layers in the area of renewable energy. Due to the large number of climate protection initiatives it is easy to get lost and

difficult to understand who is responsible for what and whether supranational targets can be reached. This study will structure the actions and especially focus on the responsibilities of regions. Having a clear idea of who is responsible for what and the scope of action of the different actors is a first step to understanding how climate protection can be organized and this study, thus, forms a first step towards tackling the problem.

1.1 Research goal

As a consequence of what has been outlined above the central question of my thesis will be:

To what extent do climate protection activities of regions in Germany meet the expectations of the European Union within its multilevel EU climate protection policy?

In order to answer this research question several sub questions are necessary:

Q1: What is the multilevel EU climate protection policy?

Q2: What are the expected responsibilities and actions of regions in the multilevel EU climate protection policy?

Q3: What are regions in Germany doing in terms of climate protection?

Q4: To what extent do actual climate protection activities of regions within Germany correspond to the expectations of the EU?

The first sub question requires an analysis of the governance structure of the EU, since that is where the responsibilities of the different layers of government are defined and the multilevel system of environmental governance is laid out. Additionally, an analysis of the EU climate and energy package, including its 20-20-20 targets for CO_2 reduction, energy efficiency, and renewable energy is needed.

Afterwards, the regions of Germany are in the center of analysis. Germany has been chosen for this study as it is the country with the "highest levels of per capita emissions" and because it has set "the most ambitious CO_2 reduction target in the EU" (Collier, 1997, p. 46). Furthermore, it is an interesting case because of its federal governance structure and the sovereignty of the *Bundesländer*. This might influence the role of regional and local authorities as well. Due to the large amount of regions and, therefore, also of regional initiatives the limitation to choose only one country is necessary because otherwise the topic would not be feasible as a bachelor project. However, studying all regions of Germany would still be too much; therefore four regions of Germany are chosen that differ in their location within the country, as well as in their population density since location has influence on the type of renewable energy usable and population density can influence the space available for renewable energy installations. Both criteria are considered to define renewable energy sources available for the region at stake. The regions of the analysis are regions under NUTS3, including districts and district-free cities, and will be Hamburg, Münster, the district of Neumarkt, and Berlin. An exact definition of what is meant by region in this study can be found in Chapter 3. Hamburg is a big city in the North of Germany close to the sea, Münster will serve as a representative for a smaller region in the country side with a lower degree of urbanization, the district of Neumarkt lies in the South in Bavaria, has the lowest population density, and Upper Palatinate is one of the twelve ENNEREG pioneer regions, and Berlin represents a region located in one of the new *Bundesländer* in the East of Germany with the highest population density. The third question will be answered by

focusing on these four regions which will be the units of observation. The competences and initiatives, including the regions' action plans regarding renewable energy, the types of renewable energy they focus on, and already existing projects promoting renewable energy, of these regions need to be examined. In general, the second sub question will be tackled by concentrating primarily on renewable energy when analyzing the regional initiatives. Renewable energy is definable as "energy from a source that is not depleted when used, such as wind or solar power" (Oxford Dictionaries, n.d.). This concentration on renewable energy allows for a more detailed and more focused analysis and limits the scope of the research. Dealing with all three areas of the EU climate and energy package would not be feasible for this thesis since the topic would be too broad then and there would be too many regional initiatives to analyze them in detail. Renewable energy is chosen because it is very important for the EU to increase the share of renewables on the one hand to enable CO_2 reduction and on the other hand also to become less dependent on foreign energy suppliers (European Union, 2013). German municipalities, furthermore, "have traditionally engaged in the provision of electricity, gas, water, public transportation and the disposal of sewage and waste", areas that are influenced by policies striving for renewable energy (Bulkeley & Kern, 2006, p.2240). Thus, an engagement of German NUTS3 regions in the promotion of renewable energy can be expected. The forth question will be answered by comparing between the expectations of the EU concerning the responsibilities and tasks of regions and the observed actions at the regional level.

In general, this study is a qualitative one which analyzes the multilevel governance structure of renewable energy policy in the EU. A theoretical framework for multilevel governance is set up and afterwards the governance structure for renewable energy is analyzed. The supranational level of the EU and the national level of Germany are analyzed at first, followed by the regional level which is described by using the examples of four case studies. The analysis is done by a secondary review of qualitative and quantitative data from legal policy documents and websites.

After having introduced the research goal with the central research question (Chapter 1.1.), the theoretical framework will be explained (Chapter 2), as well as the methodology (Chapter 3) of the study. Afterwards, the governance of renewable energy in the EU (Chapter 4) and Germany (Chapter 5) will be analyzed, followed by the four case studies, Hamburg (Chapter 6.1.), Münster (Chapter 6.2.), Neumarkt (Chapter 6.3.) and Berlin (Chapter 6.4.). Finally, chapter 7 will contain conclusions and recommendations.

2. Theoretical Framework

Within this chapter the theoretical framework of this study will be established, multilevel governance. By discussing and using the most relevant literature a suitable framework of this concept can be established. This framework will then provide a theoretical understanding of the governance structure of renewable energy and, thus, help to structure the analysis.

In order to define what multilevel governance is we first of all need to know what governance is. Governance can be defined as "the sum of ways that individuals and institutions, public and private, manage their affairs" (O'Brien, Goetz, Scholtre, & Williams, 2000, p. 2). Whereas earlier the term of governance was a synonym for government, nowadays the term develops to signifying "a change in the meaning of government, referring to a new process of governing; or a changed condition of ordered rule; or the new method by which society is governed" (Stoker, 1998, p. 17).

Multilevel governance refers to the division of authority among different levels of governance. Within its "White Paper on Multilevel Governance" the Committee of Regions of the EU defines multilevel governance as "coordinated action by the European Union, the Member States and local and regional authorities, based on partnership and aimed at drawing up and implementing EU policies" (EU Committee of the Regions, 2009). Thus, not only the EU itself and the national governments are important in designing policies and the implementation of those, but also regional authorities play a significant role and are included in the process of governance. Important principles related to the concept of multilevel governance are the principles of subsidiarity and of proportionality. According to the Committee of Regions these principles are critical for the "success of those global strategies at the heart of today's European agenda" (EU Committee of the Regions, 2012, p. 3). Decision-making should not only take place in one of the several governance tiers, but policy should be "created and applied at the most appropriate level" which is the basic meaning of the principle of subsidiarity. Multilevel governance got popular several years ago and had an impact on the role of local authorities. By introducing this new form of governance the Committee of Regions aims at creating a more "flexible and participatory form of governance" within the EU (EU Committee of the Regions, 2012, p. 3).

Bulkeley et al. conceptualize environmental governance as "include[ing] complex relationships between different tiers of government – local, regional, national and supranational – and public, private and civic spheres of governance"; thus no level necessarily prevails but constant processes within and between different layers form the basis of this multilevel system (Bulkeley et al., 2003, p. 235). The article refers to two approaches to multilevel governance, both developed by Hooghe & Mark. The first type (Type I) is visualized in Figure 1 and describes a nested approach with a clearly existing hierarchy of the different, "non-overlapping jurisdictions at a limited number of levels" (Hooghe & Marks, 2001, p. 4). This type will only be introduced shortly as a contrast to type II, which rather suits the governance model in the case of environmental governance. Within this first approach the municipal governments are subscribed quite an important role, but action at this level is considered to be derived from "opportunities created through the dynamics of interactions between the EU and nation-states" (Bulkeley et al., 2003, p. 238). Transnational networks are seen as one of two possible loopholes for local governments and domestic interest groups to reach the EU level without direct involvement of the national governments (Fairbrass & Jordan, 2001).

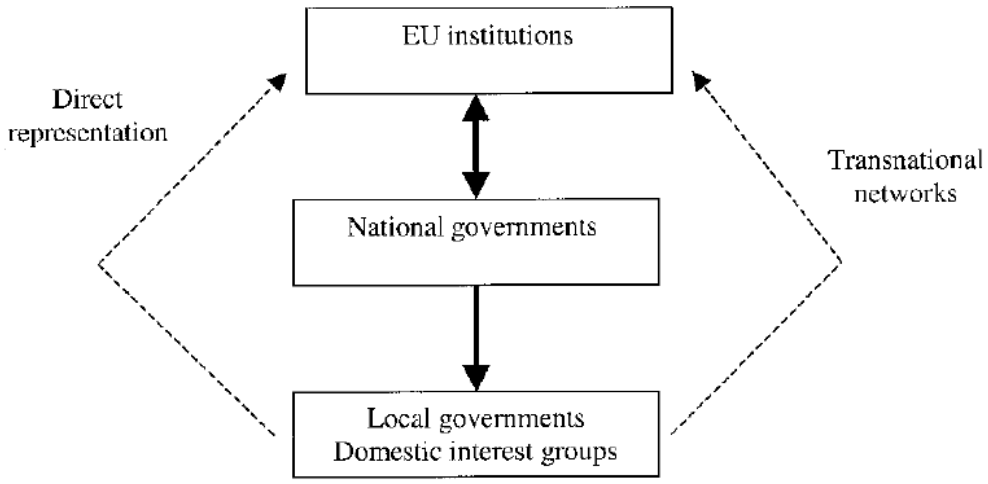

Figure 1: 'Type I' multilevel governance (Bulkeley et al., 2003), originally adapted from: (Fairbrass & Jordan, 2001, p. 501).

The second approach (Figure 2) developed by the same authors but two years later is the polycentric multilevel governance model ('Type II' multilevel governance). This model is characterized by competition and collaboration of "a wide range of public and private actors […] in shifting coalitions" (Hooghe & Marks, 2001, p. 7). By citing Rosenau, Bulkeley et al. state that such a form of governance is "evident at the frontier of domestic and foreign policies" due to the competition and cooperation of 'spheres of authorities', both territorially based and non-territorially based networks, either formally or informally (Bulkeley et al., 2003). In general, overlapping and interconnected spheres of authority form the basis of this approach (Bulkeley et al., 2003).

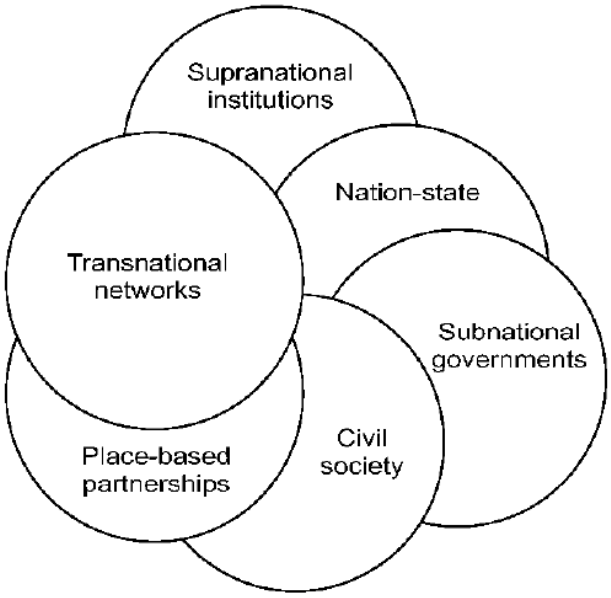

Figure 2: 'Type II' multilevel governance (Bulkeley et al., 2003)

In 2006 Betsill and Bulkeley explain governance in environmental politics as an "argumentative struggle" in which state actors need to redefine the scope and scale of their activity through negotiations with other actors. These negotiations serve the mutual definition of "their respective roles" (Betsill & Bulkeley, 2006, p. 153). The reorganization of scales of activities "may in some cases reinforce the power of the state" according to the authors. In general, Betsill and Bulkeley reinforce the importance of the multilevel governance framework with regard to climate governance due to the "growing recognition that the future of the climate regime may also lie in strong and regional initiatives" (2006, p.153). The authors relate multilevel governance, on the one hand, with the complexity of the state and, on the other, with the "reduced ability of national level state institutions to control the policymaking process" (Betsill & Bulkeley, 2006, p. 154).

In 1997 Ute Collier already mentions the multilevel governance structure of climate governance due to "a lack of competences at EU level, especially in the energy area" because of a reluctance of the member states to provide the EU with the decision-making powers in these areas (Collier, 1997, p. 41). Therefore, the nation states are expected to inhabit an important role in climate change governance. However, Collier states that in reality nation states only have limited authorities and "national emission profiles will also be influenced by decisions taken at the local government level". She stresses the importance of local authorities and connects it to the principle of subsidiarity. In the conclusion Collier states that action at all levels of government is required and, generally, bringing

action as close to the citizen as possible by involving local authorities means compliance with the principle of subsidiarity. The possibility for this is diminished by a limited scope of action within some countries and an "unfavorable policy context" which may endanger the targets for CO_2 emission reduction set for 2000 according to the author (Collier, 1997, p. 55). She does not see compliance with the principle of subsidiarity at the point of time she wrote the article since "subsidiarity must not only mean relocating powers to lower levels but should imply the co-operation and co-ordination of activities between relevant levels of government" (Collier, 1997, p. 55).

Lidskog and Elander state that the present type of multilevel governance is characterized "by the flood of climate action networks, citizen participation in environmental associations and civil society, local government initiatives, national legislations and projects, and in parts of the discussions within the UN, EU, and other international institutions" (Lidskog & Elander, 2009, p. 39). This contradicts the ideal type of consensus building during negotiations between the different types of actors and rather draws the picture of "an ongoing struggle among actors on different levels in society concerning the right to take part in defining and addressing global issues" (Lidskog & Elander, 2009, p. 39). As a final statement the authors request an exploitation of the combined structures of multilevel governance developed by Hooghe and Marks (2001) and see a possibility in transnational networks to provide the basis "for deliberation, common understanding and innovations in climate change mitigation and adaptation" (Lidskog & Elander, 2009, p. 39).

Concluding from this literature study it can thus be said that Collier, Lidskog & Elander, and Bulkeley et al. all describe the governance structure of environmental policy as a multilevel governance system involving many different actors, and define it by struggles and negotiations among these different actors. Thus, the definition of type II multilevel governance seems suitable for this analysis, with its distinction in supranational institutions, nation-state, subnational governments, civil society, place-based partnerships and transnational networks. Defining the governance system of environmental policy as type II suggests that the different layers of governance are intertwined and interaction takes place between all different levels, in contrast to according to a clear hierarchy, as is suggested by type I. In the following study the supranational, the national and the subnational level will be analyzed in this system of multilevel governance and the competences and responsibilities of regions in particular will be clarified. Regions' involvement in transnational networks will only shortly be mentioned but not analyzed in detail due to the limitations of this study.

This framework, therefore, allows a positioning of the different layers of this study within the overall governance system of environmental governance and suggests an interaction also between regional and supra-national EU level. It can be expected that the EU does not only have expectations of nation states, but also of regions, and that regions are also involved in environmental governance that happens at EU level, as well as at national level.

3. Methodology

In the following section the methodology of this study will be provided, starting with the research design of the study. In a next step, multilevel governance will be operationalized, including a definition of the different levels. After that the case selection and sampling will be explained and in the end data collection and data analysis will be specified.

3.1. Research Design

To answer the central question, a qualitative strategy is used in which the cases are compared among each other, as well as with the expectations of the EU. The governance of renewable energy in Germany provides additional background information concerning the role of regions. This qualitative strategy includes analyzing multiple cases, in this case four, in order to conclude with a generalized statement on the role of regions in Germany in the European climate protection governance. The biggest thread is external validity of the study results since only four regions are chosen and policy might vary significantly between the different countries and also between the different *Bundesländer* in Germany. This problem cannot be avoided entirely due to the limitation in choosing only four regions. However, by choosing regions which differ in many aspects (location, population density, and regional initiatives) representativeness is tried to be improved. Nevertheless, the results cannot be generalized for regions in the whole EU since the different member states are likely to have a different setup concerning environmental governance on a national scale. Thus, external validity is not accounted for. Also on a German scale representativeness cannot be assumed without extending the study to a higher number of regions.

3.2. Operationalization of the multilevel governance layers

As mentioned in the theoretical section of this study, type II multilevel governance which is chosen as the definition of multilevel governance for this study consists of the following levels: supranational institutions, nation-state, subnational governments, civil society, place-based partnerships and transnational networks. Since only the first three are in the focus of this research, only they will be defined here.

The supranational government is represented by the European Union in this case. The competences of the EU depend, according to the principle of conferral, on the prior transfer of power to this supranational level by the member states (Europa, 2010). EU action is, furthermore, limited by the principles of proportionality ("the exercise of EU competences may not exceed what is necessary to achieve the objectives of the Treaties") and the principle of subsidiarity ("for shared competences, the EU may intervene only if it is capable of acting more effectively than the Member States") (Europa, 2010).

The nation-state level is in this case represented by the Federal Republic of Germany. In Germany there is not only the national federal governmental level, but, additionally, also the federal states. These federal states can be defined as sovereign and are therefore in several cases responsible for designing laws without any influence of the federal government.

For statistical analysis of regions in Europe Eurostat developed the "Nomenclature of territorial units for statistics" classification (NUTS). This hierarchical system differentiates between NUTS 1 ("major socio-economic regions), NUTS 2 ("basic regions for the application of regional policies") and NUTS 3 ("small regions for specific diagnosis") (European Commission, 2012b). The definition of NUTS 3 is chosen for this study since the communal level has influence in Germany on environmental governance and this level is really close to the citizens. In the case of North Rhine-Westphalia a law has been introduced to communalize tasks of environmental protection in 2008, shifting the responsibility of environmental law to the districts and district free cities, defining them as lower environmental agencies (Städte- und Gemeindebund Nordrhein-Westfalen, 2007). Also in Bavaria the

communal level is of high importance (Bayerisches Landesamt für Umwelt, 2013). In the cases of Berlin and Hamburg it is not relevant which level has how many competences, since both cities are definable as NUTS1, 2, and 3. Münster can be defined as both NUTS2 and NUTS3; however the district-free city of Münster will be concentrated upon here and not the level of the "Regierungsbezirk" Münster. Neumarkt only classifies as NUTS3. Thus this study will focus on regions classified as NUTS3. In the case of Germany NUTS 3 cover the 429 districts ("Kreise").

3.3. Case Selection and Sampling

For this study the multilevel governance system is the unit of analysis, including the EU level, the national level, and regions. Regions within Germany are chosen for this study because of Germany's position, as mentioned before, as the country with the highest CO_2 emission rates in the EU as well as its progress in terms of climate protection. Additionally, Germany can be described as a decentralized state with its *Bundesländer* and regional governments holding a significant amount of authority. Therefore, the chances are high that regions with activities in the sector of climate mitigation can be found. Also personal reasons play a role. My nationality is German which enables me to understand documents of initiatives also in German if they are not available in English. Since Germany has 429 districts under NUTS 3 (*Kreise, kreisfreie Städte*) only a few of them are selected in order to proceed with the qualitative descriptive analysis. After having read about the case of Finland, where Helsinki proved to be unable to contribute to the aim of increasing renewables due to several reasons and the city occupying the position of a 'free-rider' concerning the contribution to the national increase of renewable energy target, the decision for the selection of German regions was done on the basis of accounting for diversity. The regions chosen as units of analysis have been selected after considering the website of the movement "Covenant of mayors", as well as the website of the European project ENNEREG. Covenant of mayors is a movement with regions as signatories. It must be taken into consideration that this selection method prevents the possibility of analyzing a region that might be not at all involved in renewable energies, but due to a lack of an alternative selection method this limitation on regions that are at least to some extend involved in actions regarding renewable energies must be accepted. On the website of Covenant of Mayors different regions can be compared concerning their aims for CO_2 emission reduction and Hamburg, Münster, the district of Neumarkt, and Berlin were chosen. One reason for choosing Hamburg was its nomination as "European Green Capital 2011" (European Commission, 2013a) as well as its overall CO_2 emission reduction target of 40% according to the Covenant of Mayors. Hamburg is, furthermore, participant in a range of alliances and transnational networks, thus we can be sure that there is regional activity concerning climate change mitigation in the region of Hamburg. Due to its location in the North of Germany close to the seaside it is considered to have different renewable energy sources at disposal than other regions. The second case, Münster, has been chosen for its geographical location more or less in the middle of the country and its agrarian characteristics. The population density is much lower than in the metropolitan region of Hamburg and the agrarian background is considered to provide specific renewable energy sources that are not so common in Hamburg. Münster is, as well as Hamburg, a signatory of the Covenant of Mayors movement and also strives for an overall CO_2 emission reduction of 40% according to the website. Additionally, Münster has also applied for the nomination as European Green Capital but lost against Stockholm and Hamburg (Stadt Münster, 2013b). The district of Neumarkt was chosen on the one hand for its location in the South of Germany and on the other because it is part of Upper Palatinate which is one of the twelve ENNEREG pioneer regions, a project with the aim of paving the way for sustainable energy in Europe. This is an

initiative the other two are not involved in. The city of Neumarkt is additionally also a signatory of the Covenant of Mayors initiative and even has an overall CO_2 emission reduction target of 50%, however the district of Neumarkt cannot be a signatory of this initiative, since only cities can participate. Reasons for choosing Berlin involved again its status as a signatory of the Covenant of Mayors (CO_2 reduction aim 40%), as well as its location in the East of Germany. It is part of the new *Bundesländer* and it is interesting to see whether there are differences between the new and the old *Bundesländer* what concerns the role of regions in the climate governance. Additionally, Berlin is the capital of Germany with the highest population density. It is an interesting case to see how such a large city deals with the topic of increasing the share of renewable energy.

The selection of these cases has, therefore, emerged on purpose, paying attention to location, degree of urbanization / population density, and existing regional activity. Considering the representativeness of these regions, it cannot be clearly said that these regions are representative for all German regions that are active in the field of renewable energies. Even though they all lie in different *Bundesländer* which have their own distributions of authority among the government actors and population density and rural characteristics are considered for the choice, the number of only four regions decreases the possibility of representativeness. Nevertheless, these factors that are taken into account are considered to influence access to renewables, as well as dependency of energy from other regions and guarantee, therefore, different possibilities for renewable energies for the four case studies. By checking for involvement in the initiative of Covenant of Mayors it is guaranteed that there are actually activities available to analyze.

The type of sampling method is, thus, definable as a combination of maximum variation and the criterion method.

3.4. Data Collection

In order to answer the research question qualitative factual data needs to be gathered. Two types of data are needed, on the one hand EU policy and on the other hand the climate protection activities in regions. For this purpose government documents by the EU, the German government, and the regional governments of Germany are consulted. Additionally, websites of regional initiatives, of transnational municipal networks, and Sustainable Energy Action Plans (SEAPs) are subjects of observation. Eurostat is helpful as a source for rather current data regarding the achieved share of renewable energy on an EU and nation state level. The national action plan of Germany is important as a source of renewable energy management of the country. The websites of the regions chosen are also directly consulted to find information about their role in enhancing the share of renewables. The websites of transnational renewable networks, like e.g. the Covenant of Mayors or Regions, provide additional information about the involvement of the regions in transnational mitigation settings. From these sources the information necessary to answer the research question is drawn.

3.5. Data Analysis

The data from the articles and the government documents are collected and a secondary review of the data is provided. The data include both qualitative, as well as quantitative data and are derived from policy documents, evaluation reports, websites, and statistical data. The findings on the role of regions are compared to the perception the EU has of the role of regions in the end and an overview of the multilevel governance of climate change in the EU can be provided. Thus, the two types of

data (EU policy and the climate protection activities of regions) are analyzed by means of a descriptive, comparative analysis. No computer programs are necessary for this since no statistics are involved.

4. Governance of Climate Protection in the EU

In the following chapter the governance of climate protection in the EU will be elaborated, including a short historical overview of the involvement of the EU in climate protection, a description of relevant directives, and the expectations the EU has concerning the role of regions.

In March 2007 EU leaders established the "20-20-20" targets of the EU climate and energy package, a set of binding legislation aiming at the achievement of the EU's highly set climate and energy targets for 2020 (European Commission, 2013b). As mentioned before, these targets include a 20% reduction in greenhouse gas emissions compared to the 1990 levels, an increase in renewable energy consumption to a 20% share of general energy consumption, and the improvement of energy efficiency by 20%. For the purpose of this study the goal for renewable energy will be concentrated upon.

In 1997 the starting point was made by targeting a share of 12% of renewable energy in gross inland consumption by 2010 (Commission of the European Communities, 2007). However, due to issues such as "complexity, novelty and [the] decentralized nature of most renewable energy applications" the administration became problematic and the EU was only able to achieve a share of 8.7% (European Commission Eurostat, 2012, p. 4). Another reason for the failure to meet the target was the "generally patchy and highly uneven progress across the EU", indicating that the national policies have not been appropriate for a realization of the overall goal and the achieved share has only been the result of the commitment of a few member states (Commission of the European Communities, 2007, p. 5). As a result of these observations the climate and energy package introduced in 2007 now includes legally binding targets, so that all member states are forced to contribute to the achievement of an increase in the share of renewable energy.

In order to manage the achievement of the target of the 2020 package for renewable energy a "common framework for the production and promotion of energy from renewable sources" (European Union, 2010) is established by the Directive 2009/28/EC "on the promotion of the use of energy from renewable sources […]"(European Parliament & Council, 2009, p. 16). The mandatory national targets which this Directive requires the member states to establish in the form of national renewable energy action plans are an instrument "to provide certainty for investors and to encourage continuous development of technologies which generate energy from all types of renewable sources" (European Parliament & Council, 2009, p. 17). A lack of certainty due to non-binding legislation has shown to be problematic in the past and contributed, as well, to the failure to achieve the target for 2010 (Commission of the European Communities, 2007). Within these national action plans the individual target of each member state differs because it is derived from the "starting point[…] and potential[…], including the existing level of energy from renewable sources and the energy mix" (European Parliament & Council, 2009, p. 18). Thus, each share is dependent on the GDP of a member state, its starting point, its gross final consumption of energy, and its "past efforts with regard to the use of energy from renewable sources". Furthermore, each member state is obliged to reach a "10% target for renewable sources in transport" (European Parliament &

Council, 2009, p. 18). Within the national action plans member states shall specify the targeted "share of energy from renewable sources consumed in transport, electricity and heating and cooling in 2020", while considering "the effects of other policy measures relating to energy efficiency on final consumption of energy" (European Parliament & Council, 2009, p. 28). In general, national targets range from a 10% share for Malta (share in 2005: 0.0%) to 49% in Sweden (share in 2005: 39.8%). The target for Germany is rather low at 18% (share in 2005: 5.8%).

The Directive stresses the importance of member states being able to control "the effects and costs of their national support schemes according to their different potentials", since functional support schemes are vital for maintaining investors' confidence and for designing "effective national measures for target compliance" (European Parliament & Council, 2009, p. 19).

The Directive, furthermore, encourages member states to cooperate strategically, "involving, as appropriate, regions and local authorities". This cooperation can take place in form of, for example, "statistical transfers between Member States, joint projects […,] joint support schemes, […], exchanges of information and best practices, […] and other voluntary coordination between all types of support schemes" (European Parliament & Council, 2009, p. 20). These measures are also called flexibility measures and establish opportunities for cost reduction. They enable facilitating "the consumption in Member States of energy produced from renewable sources in other Member States, and to enable Member States to count energy from renewable sources consumed in other Member States towards their own national targets (European Parliament & Council, 2009, p. 20). Also renewable energy produced in third countries but consumed in a member state shall be able to "count towards Member States' targets".

Concerning the role of regions, this Directive mentions that "Member States may encourage local and regional authorities to set targets in excess of national targets and to involve local and regional authorities in drawing up national renewable energy action plans and in raising awareness of the benefits of energy from renewable sources" (European Parliament & Council, 2009, p. 19). It is stressed that investing in "regional and local production of energy from renewable sources" results in growth and employment possibilities, and that therefore production in these areas should be supported, as well as "the exchange of best practices […] between local and regional development initiatives and […] structural funding in this area" (European Parliament & Council, 2009, p. 16). Biomass installations are highlighted as a renewable energy source with a special "regional investment structure" (European Parliament & Council, 2009, p. 17). Article 4, dealing with the national renewable energy action plans, specifies that national targets are to be reached through "adequate measures […], including cooperation between local, regional, and national authorities" (European Parliament & Council, 2009, p. 28). Member states shall furthermore recommend "local and regional administrative bodies to ensure equipment and systems are installed for the use of electricity, heating, and cooling from renewable energy sources and for district heating and cooling when planning, designing, building, and renovating industrial or residential areas" (European Parliament & Council, 2009, p. 33). Local and regional authorities shall, additionally, together with member states "develop suitable information, awareness raising, guidance or training programmes in order to inform citizens of the benefits and practicalities of developing and using energy from renewable sources" (European Parliament & Council, 2009, p. 34)

The Committee of Regions (CoR) is regarded as "the regions' and local authorities' voice" and "brings the EU closer to its citizens" (Committee of the Regions, n.d.-c). Its mission is the involvement of

"regional and local authorities in the European decision-making process" in order to ensure improved participation of the citizens of the EU according to the principles of subsidiarity and proportionality (Committee of the Regions, 2009, p. 1). The Committee aims at promoting multilevel governance and, therefore, cooperates closely with the various EU institutions, as well as with member states' authorities. Concerning the Europe 2020 strategy, the Committee of the Regions established the Environment, Climate Change and Energy (ENVE) Commission, where "representatives from local and regional authorities [can] discuss the formulation of these policies and […] promote best practices in these fields" (Committee of the Regions, n.d.-a). Additionally, there is the Europe 2020 Monitoring Platform (EUROPE2020MP), which functions as a facilitation instrument for local and regional policy makers to exchange information and good practices (Committee of the Regions, n.d.-b). This platform also facilitates the EU, as well as the member states to deal with "challenges and obstacles, mainly by means of monitoring exercises at the territorial levels feeding into the CoR consultative activity".

The European Council stressed in June 2010 that regional policy needs to support Europe 2020, since the achievement of the goals of this strategy "will be determined largely by decisions made at local and regional level" (Directorate-General for Regional Policy, 2011, p. 3). In a brochure from the Directorate-General for Regional Policy the contributions to sustainable growth in Europe by Regional Policy are laid out. Here, it is stated that local and regional authorities are usually responsible for "land-use planning, public transport, environmental infrastructure, education, health, training and social services" and, therefore, at the center to support sustainable development (Directorate-General for Regional Policy, 2011, p. 3). Within the brochure it is mentioned that regions have different potentials concerning renewable energy sources, which makes it necessary for regions to design own policies that "reflect the particular needs and opportunities of each region", rather than copy existing policies from other regions (2011, p.5). Thus, the central role of regions defined in this document is to establish policies and projects reflecting the needs of the region, while being supported by the EU, as well as by national governments. Financed are these regional initiatives by the help of European Structural Funds. Furthermore, the opportunity for local and regional development through investment in renewable energy is stressed. Next to boosting renewables and energy efficiency through regional policy it is also important to invest in "local Information and Communication Technology (ICT) grids, smart electricity grids, as well as smart electricity distribution as part of the Trans-European Energy Network (TEN-E)" (Directorate-General for Regional Policy, 2011, p. 10). Regional policy is defined as "place-based", the starting point of sustainable growth and the implementation of regional policies as a "partnership of local, regional, national and European stakeholders"(Directorate-General for Regional Policy, 2011, p. 21). Finally, regions are encouraged to cross-border cooperation and reminded of the need of a synergy between regional policy actions and other EU policies.

In summary, the EU, thus, expects regions primarily to support the action plan set up by the EU and the member states and to help achieving the goals according to their potential. The Union stresses that the achievement of its energy goals is highly dependent on support from regional level and defines the regional level as highly influential, due to its closeness to the citizens. Therefore, it advises regions to engage in awareness raising, information sharing, guidance, and training programs. Many areas relevant for the climate protection ambitions of the EU are part of regional authorities' responsibilities. The Union especially advises regions to look at which types of renewable energy sources have potential in that area, and to design own programs accounting for these

potential sources. Another point of recommendation to regions by the EU is to engage in national and international cooperation between regions, in order to exchange practices and to get advice.

These expectations on the role of regions are no clearly defined, binding regulations like in the case of regulations for member states. However, such binding legislation would also not be feasible in this situation. In total, it gets clear that the EU regards the support by regions as highly important. By providing these points of advice the Union tries to influence the actions of regions with regard to climate change and acknowledges the existence of a multilevel governance system in terms of climate governance. With regard to the type II multilevel governance, it gets clear that the EU has both expectations regarding the role of nation-states, as well as regarding the role of regions. However, it only has the power to set up binding targets for the nation-states, while the expectations regarding the contribution of regions are formulated rather vaguely. On the other hand, the Committee of the Regions also represents regional involvement in the EU level. This is an example of the interrelations between all layers of the type II multilevel governance. The governance system is not just a top-down one, but actors of all hierarchical levels interact with one another and build a complex system of governance.

5. Governance of Renewable Energy in Germany

In order to comply with Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Germany established its national renewable energy action plan on August 4th 2010, containing the German goal of reaching an 18% share of renewable energies in gross final energy consumption by 2020 (Bundesrepublik Deutschland, 2010). Within this action plan it is estimated that even a share of 19.6% can be reached by 2020 and a specification of the share for each sector is provided. In the case of renewable energies in the electricity sector a share of 38.6% is targeted, in the heating and cooling sector this share will amount to 15.5%, and in the transport sector it will be 13.2% (Bundesrepublik Deutschland, 2010).

Within the national action plan current measures and legal acts are summarized that influence the different sectors. With regard to electricity, the Renewable Energy Act ("Erneuerbare-Energien-Gesetz", or EEG) is central. Together with the Combined Heat and Power Act ("Kraft-Wärme-Kopplung-Gesetz", or KWKG), the EEG is also relevant for the "production of combined power and heating/cooling based on renewable energies" (Federal Republic of Germany, 2010, p. 5). Concerning the heating and cooling sector, the most important measures are a Market Incentive Program ("Marktanreizprogramm", or MAP), the Renewable Energies Heat Act ("Erneuerbare-Energien-Wärmegesetz", or EEWärmeG), and "support programs of the KfW and the Energy Saving Ordinance" ("Energieeinsparverordnung", or EnEV) (Federal Republic of Germany, 2010, p. 5). There is furthermore a National Development Plan for Electrical Mobility in place, aiming at the promotion of electric mobility as a crucial part in the electricity sector. In the transport sector tax incentives and quotas are relevant means to increase the share of renewable energies. A more detailed overview of policies and measures can be found in Appendix 1.

The national renewable energy action plan of Germany had to be implemented until December 5th 2010, whereas most of the requirements set up by the European Union have already been met by Germany before they have been formulated by the EU (Federal Republic of Germany, 2010). The sustainability criteria, however, have been new. The national action plan of Germany, aiming at

enhancing the “transformation towards an energy system based on renewable energy” (Federal Republic of Germany, 2010), includes a detailed list of current measures and instruments in order to achieve the sectoral targets.

Within the national renewable action plan of Germany the importance of regions and local authorities promoting renewable energies is stressed as well. Regional and local measures are defined as “numerous”, which hinders the establishment of a comprehensive and complete overview in the national action plan concerning regional actions (Federal Republic of Germany, 2010, p. 6). Regarding the expectation of the EU towards member states to involve regions in the establishment of their national renewable energy action plans (see Chapter 4), Germany has fulfilled this expectation by inviting “representatives of the states as well as from the German Federation of Municipal Authorities (*Deutscher Städte- und Gemeindebund*) and the German Association of Cities and Towns (*Deutscher Städtetag*) to participate in preparing the national action plan (Federal Republic of Germany, 2010, p. 118).

The national action plan continues with listing the sources of renewable energies for each sector. They include “wind, biomass, geothermal energy and photovoltaic systems [in the electricity sector]”, “modern pellet heating, efficient biomass heating plants, biomass (block) heating power stations, geothermal heating plants and solar thermal systems” in the heating sector, and biofuels as a mean to decrease CO_2 emissions in the transport sector (Federal Republic of Germany, 2010, pp. 6-7). In total, Germany was the biggest producer of renewable energy in the EU with a share of 19.6% of the total energy production in 2010 (Eurostat, 2012). However, in terms of gross inland energy consumption, only 8.2% of the total amount of energy consumed in Germany have been from renewable energies (Eurostat, 2012). In the electricity sector the biggest improvements have been made so far with a quintuplication of electricity from renewable sources from “17 terawatt hours (TWh) in 1990 to over 93 TWh in 2009” (Federal Republic of Germany, 2010, p. 7). This is primarily due to the increasing importance of other sources than hydropower, which amounted to 91% of renewable electricity in 1990 and currently only represents 20% of it. The rest is composed of wind power (> 40%) and biomass (33%). Concerning the heating sector energy from renewable sources in 2009 amounted to about 115 TWh, which is more than three times the amount of 1990 (32 TWh) (Federal Republic of Germany, 2010). Biomass is the predominant source in this sector and accounts for 68% of renewable energy in this sector; “if biogas, bioliquids and the biogenic share of waste” are included as well, it even accounts for 92% (Federal Republic of Germany, 2010, p. 7). In the transport sector an increase from 1.8% in 2004 to 7.2% in 2007 was followed by a decrease again to 5.5% in 2009 (Federal Republic of Germany, 2010, p. 7). Biodiesel, vegetable oil, and bioethanol are the sources of renewable energy in this sector.

In the national renewable energy action plan two types of scenarios are developed for Germany; on the one hand the “reference scenario” (REF), taking only measures that were implemented before 2009 into account, and on the other hand the “scenario with additional energy efficiency measures” (EFF), which includes “additional energy efficiency and energy saving measures […] that go further than the status quo of 2009” (Federal Republic of Germany, 2010, p. 8).

The document also clarifies which layers of government are responsible for what with regard to renewable energy. In general, it is stressed that the sovereign nature of the federal states “together with regional and urban planning” are central in the “implementation of licensing, certification and approval procedures of renewable energy installations” (Federal Republic of Germany, 2010, p. 22).

Regional development plans are, furthermore, supposed to specify legal principles and have to be taken into consideration in spatial plans and measures. Concerning the provision of information about the environment to the public, the action plan states that this "is generally regulated by the environmental information regulations of Federal and federal state governments" (Federal Republic of Germany, 2010, p. 36). One central actor is the Federal Environment Ministry (BMU) in this case but also the other federal levels contribute so that regional ministries are responsible for "appropriate action at federal state level" and local public administration at municipal level (Federal Republic of Germany, 2010, p. 37). At regional level, for example, there are energy agencies and information centers that provide information regarding renewable energy and measures at this level "include campaigns to the individual technologies, status reports with overviews of contact points and funding, pilot projects, demonstration projects, the creation of information centres, exemplary procurement measures in the public sector, the provision of relevant research findings and the development of guides and check-lists" (Federal Republic of Germany, 2010, pp. 37-38). One example for the municipal level is the "Solarbundesliga", a local competition concerning the establishment of solar thermal and photovoltaic systems (Federal Republic of Germany, 2010, p. 41). At regional level there are, furthermore, cross-regional information campaigns, such as "municipalities active for climate protection", "100% Renewable Energy Regions" and "Bioenergy-regions". In general, concerning information, awareness raising and training programs for citizens most measures are centrally organized under an umbrella campaign, but "are nevertheless planned and implemented by local actors" because the past has shown that this level generally "creates acceptance and strengthens regional structures/grids in the area of renewable energy" (Federal Republic of Germany, 2010, p. 43).

The national action plan clarifies that federal states, as well as municipalities are basically responsible for the development of regional and local renewable energies, but that the Federal Government supports "[a]mbitious projects at regional and local level", such as the participation in the project "Development prospects for sustainable 100% renewable-energy regions in Germany" or the project "Model Regions Bioenergy" (Federal Republic of Germany, 2010, pp. 118-119).

According to the national renewable energy action plan most of the time the Federal government of Germany and the federal states' authorities are responsible for the establishment of guidelines and requirements and also for the assessment of abidance by these regulations. The role of regions is not specified precisely apart from their involvement in the provision of information concerning renewable energies and the environment in general.

However, on the advisory website for municipalities it is stressed that municipalities play a major role in the development towards more renewable energies, due to their role as planning and licensing authorities and their possibility to act as a role model by using public buildings, such as schools or administrative buildings, as areas to implement renewable energy plants, like solar plants (Agentur für Erneuerbare Energien, n.d.-b). Here, options such as the attribution of specific building areas as areas that have to be used for renewable energies or the influence on assigning criteria for energy provision by renewable energy within specific land utilization plans are possibilities for municipalities to promote and support the share of renewable energies. This website also informs on cooperation possibilities within municipalities, involving a wide range of different actors.

In general, the national renewable energy action plan of Germany does not specify explicitly what the responsibilities of regions are, but rather states that federal states or the municipalities are

responsible for regional and local renewable energy developments. However, the Federal Government does support ambitious regional or local level projects. The only responsibility that is rather clearly stated is the role regarding the provision of information and awareness raising for environmental issues. Even though the national action plan does not state clear responsibilities, the important role of regions is nevertheless acknowledged at the Federal level. As formulated on the website of the Agency for Renewable Energy regions should act as role models, using public buildings as areas for renewable energy plants, and should engage in cooperation within the municipalities with a wide range of different actors. The national level of Germany acts in the multilevel governance system as a realizer of EU expectations, formulating no specific regional expectations since the authority to do so lies rather at the federal state levels or in the hands of the municipalities themselves.

6. Case studies of German regions

The following chapter contains the studies of the four regions, Hamburg, Münster, the district of Neumarkt, and Berlin. After analyzing each case regarding the region's involvement in the promotion of renewable energies, in the end there will be a short conclusion concerning findings what regions in Germany are doing in terms of climate protection and how these actions in general correspond to the expectations formulated at EU level.

6.1. Hamburg

Hamburg lies in the North of Germany and is a city and a federal state at the same time. It had a total population of 1,790,756 in 2011 and a population density of 2,349 inhabitants per square kilometer (Hamburg, n.d.). It is an example of a city highly engaged in environmental policy and has in 2011 been announced as European Green Capital. In terms of renewable energy the city "has nearly tripled" the share in the last 12 years and energy is provided by the city-owned supplier "Hamburg Energie" since 2009 (European Commission, 2011, p. 31). According to the Agency for Renewable Energy the share of renewable energies amounted to slightly above 5% in 2008 (Agentur für Erneuerbare Energien, n.d.-a). In contrast to other regions, Hamburg does not mention a specific share of renewable energies as a goal in its action plan.

In January 2011 the city's intention to become a leader in developing a greener future lead to the establishment of the "Cluster Erneuerbare Energien Hamburg" (EEHH), which is the "central regional industry network" in the metropolitan region of Hamburg (Renewable Energy Hamburg, n.d.-a) and counted above 170 members in July 2012 (Behörde für Stadtentwicklung und Umwelt, n.d.-b). These members offer services "related to renewable energy, including financing, contract law, quality management and logistics" (European Commission, 2011, p. 32). A study initiated by Renewable Energy Hamburg Cluster Agency in 2012 has shown that there are "1,466 companies who are active in the field of renewable energy" in the metropolitan region of Hamburg and about 24,700 employees, accounting for about 1.4% of the total workforce (Prognos AG, 2012, p. 1). These figures show the importance of renewable energy in this region. The mission of the EEHH is the promotion and strengthening of cooperation in the sector or renewable energy, by "provid[ing] a platform for dialogue among stakeholders, and promot[ing] interfaces to other sectors, such as logistics" (Renewable Energy Hamburg Cluster Agency, 2012, p. 5). The cluster is engaged in cross-regional, as well as international networking and is also a member of the International Cleantech Network (ICN)

(Renewable Energy Hamburg Cluster Agency, 2012). Related to the EU's expectation of regions being involved in cooperation, it is furthermore relevant to mention that the city is since December 9th 2008 a signatory of the "Covenant of Mayors", a European movement launched by the European Commission to support local authorities' efforts with regard to sustainable energy policies and with the general aim to go beyond the climate protection goals of the EU (Covenant of Mayors, n.d.). Next to its participation in Covenant of Mayors, the city is also a signatory of the international projects Climate Alliance, EUROCITIES, ICLEI, METREC and POLIS (Covenant of Mayors, 2012a). Hamburg also sets the cooperation with other northern German Bundesländer as one of its core goals with regard to renewable energy into its Environmental Program and stresses especially the wish to engage in an energy dialogue in 2012 (Klocke, 2012). Until 2015 the goal is to overcome the investment problems in the area of offshore wind power plants through cooperation.

Related to Hamburg's involvement in the Covenant of Mayors, the city established its "Hamburger Klimaschutzkonzept 2007-2012" (Climate Protection Concept of Hamburg) and used it as its Sustainable Energy Action Plan. Its main goal concerning renewable energy in this program has been to improve the use of biomass from waste for energy production, to improve the energetic capacity from wind power plants to at least 100 megawatt, as well as a significant increase in the use of photovoltaic and solar heat (Hamburg, 2011).

Since 2012 this Concept has been replaced by the "Umweltprogramm 2012 bis 2015" (Environmental Program 2012-2015). The support of and investment in renewable energy play a central role in the climate policy of the region of Hamburg, however no specific percentage is mentioned with regard to the share of renewable energies aimed for. The city negotiated with the central energy providers about investments in climate-friendly and efficient energy production and usage (Klocke, 2012). In general, Hamburg invests in technical innovations in order to deal with the challenge of improving the share of renewable energy. Information sharing with the public and the citizens are accounted for through the establishment of an energy advisory committee. Cooperation between the energy industry, suppliers, and disposal industry shall be intensified and synergies strengthened (Klocke, 2012). The increase of the energetic capacity of wind power plants from 50 MW to 100 MW is still a goal in the Environmental Program. Hamburg generally is an ideal location for wind energy, due to its location between the Baltic and the North Sea (Renewable Energy Hamburg Cluster Agency, 2012). The city also wants to establish wind power plants in more areas, but especially they aim at replacing old wind power plants by new ones with a higher energetic capacity (repowering) (Klocke, 2012). A new wind power plant shall be established in Curslack which shall then also be used as Germany's first wind laboratory by the University of Applied Sciences to do research. The usage of wind energy shall, furthermore, be intensified in the port of the city. Next to investments in wind power plants, the city also aims at improving storage capacities for renewable energy. There are currently tests going on with regard to the transformation of wind to hydrogen. By having its own city-owned energy provider, Hamburg Energie, the city aims at being able to offer end users a transfer to competitive renewable energy on short notice and, thus, to increase the amount of users of green energy (Klocke, 2012).

EEHH mentions the importance of the city of Hamburg as a "central planning location for solar farms in Germany and across the world" and reports about solar energy projects on the river Elbe (Renewable Energy Hamburg, n.d.-b). There are also several solar energy plants on public and private buildings. The energy provider Hamburg Energie has realized its ambitious photovoltaic installation program, engaging citizens, business, and institutions who can rent free space on their roof to the

energy provider and also help co-financing the investment in solar energy (Behörde für Stadtentwicklung und Umwelt, n.d.-c). There is even a website, called the "Hamburger Solaratlas", where citizens can analyze how much sun is falling on their roof (Behörde für Stadtentwicklung und Umwelt, n.d.-d).

Concerning biomass and biogas energy, "rapeseed, field grass and maize" are used as traditional biomass and biogas sources within the metropolitan region (Renewable Energy Hamburg Cluster Agency, 2012, p. 8). Furthermore, in the harbor of the city biofuels is produced. Waste water is also being used for the production of biogas. The city-owned company "HAMBURG WASSER" owns Germany's first waste-water-gas-driven car armada, consisting of 120 climate neutral cars (Behörde für Stadtentwicklung und Umwelt, n.d.-a). In general there are about 350 electric cars in Hamburg, making it the city with the most electric cars (Behörde für Stadtentwicklung und Umwelt, n.d.-e). Hamburg is one out of eight model regions for electric mobility.

To sum up this case study, Hamburg can be defined as a highly engaged region with regard to climate protection in general, but also concerning renewable energies specifically. It has many options of renewable energy sources and is recognized not only as one of the most important locations for renewable energy business in Germany, but has also been acknowledged by the EU by having been granted the European Green Capital Award 2011. Through its "Cluster Erneuerbare Energien Hamburg" the city is also engaged on a global scale in networking knowledge concerning renewable energy. The city defines itself to a huge extent with its environmental involvement and draws attention to these matters through environmental campaigns. The city can certainly be defined as supporting the goals for renewable energy of the EU and Germany; it even sets itself more ambitious goals and has been awarded by the EU as an outstanding region. The city has a lot of potential in renewable energy sources due to its ideal geographical location and invests into optimizing the usage of all potential sources. Concerning the expectations on the role of regions formulated by the EU (Chapter 4) Hamburg certainly engages in awareness raising and information sharing. The international award of being announced European Green Capital can be expected as helping a lot in awareness rising. Hamburg, furthermore, also invests in research and is highly engaged in clusters involving Northern German *Bundesländer*, as well as in international and European regional movements and programs. In total, this region, thus, clearly fulfills and even exceeds what the EU expects from regions. Related to the multilevel governance framework the actions in this region can, therefore, be defined as originating from the city itself, rather than from the vaguely defined expectations of the EU.

6.2. Münster

The city of Münster in North Rhine-Westphalia had 296,536 inhabitants at the end of 2012 (Stadt Münster, 2013c) and a population density of 9.788 inhabitants per hectare (978.8 inhabitants per km²) (Stadt Münster, 2013a). Münster is engaged in local climate protection since 1992, when the city established an expert committee for climate and energy (Duscha, Dünnebeil, Gugel, & Kutzner, 2009). Münster can be defined as "one of the most active climate protection cities of Germany", as it has received the "European Energy Award Gold" three times, in 2005, 2009, and 2012; additionally it was announced "Bundeshauptstadt im Klimaschutz" in 1997 and 2006 (Duscha et al., 2009, p. 3) (European Energy Award, 2012). Münster's goals with regard to Europe's 2020 strategy are also quite ambitious, striving for a CO_2 reduction of 40% and an increase of renewable energy to a share of 20%. In 1995, together with the first CO_2 reduction goal of 25% till 2005, the center of coordination

for climate and energy ("Klenko") has been established, with the task of coordinating all energy related activities in Münster. Internationally, Münster engages in projects such as the ICLEI, as well as the European network Climate Alliance and EUROCITIES (Covenant of Mayors, 2012b; Duscha et al., 2009, p. 3). Furthermore, there is the project "Klimaschutzpartnerschaften in Münster" (climate protection partnership in Münster), that supports climate protection projects in developing countries. Münster is also a signatory of the Covenant of Mayors since July 28th 2008 and thus also developed a Sustainable Energy Action Plan.

In the competition for the European Energy Award 2012 Münster was ranked as the best municipality, achieving 90% of all points (European Energy Award, 2012). In the report it is mentioned that only 1% of the total energy consumption in the city of Münster is made from renewable sources in 2010; however, in the energy consumption of municipal buildings renewable energy accounts for 11.9% of total consumption. Having received that many rewards as the city of Münster has for its climate policy brings the city publicity and raises the climate awareness of the city's citizens.

Even though Münster's goal for renewable energy in 2020 is set at 20%, the "Klimaschutzkonzept 2020" advises the city to strive for less, since the share of renewables in 2006 only amounted to 1,5%. The report regards 6% as realistic and states that if a 20% share is driven for, the means to achieve that highly ambitious goal come along with other problems, regarding e.g. air pollution and overload for the energy grids (Duscha et al., 2009, p. 9). The report regards goals above 6% only realistic for after 2020, due to options to further decrease total energy consumption by then and the introduction of "intelligent energy grids" that are currently being developed. The report advises the city to invest instead in participating in renewable energy plants in other regions, such as off shore wind power plants in the coastal region.

Münster started subsidizing photovoltaic installations in 1995 and achieved its goal of an output of 1 MW in 2002 (Duscha et al., 2009, p. 46). With regard to the "Solarbundesliga" (German Solar League), the city occupies the 8th rank on a national scale and even the 1st rank in North Rhine-Westphalia, due to its program "200 solar roofs for Münster" running from 1995-1999 until it got replaced by programs on a national and *Bundesland* scale. During these few years the city already subsidized 468 solar installations, thus achieving more than double the amount of its original goal. After 1999 the city engaged in promotion of the nation- and *Bundesland*-wide programs.

The city of Münster also engages in waste energy, producing energy out of gas from waste disposals, sewage plants and out of biogas in its disposal center Coerde. The increase in the production of biogas in the farming sector is being enhanced. The land utilization plan for the region has also enabled the establishment of wind power plants, which will be able to produce a yearly amount of 20 GWh of energy. Important points that need to be optimized include district heating, decentralized cogeneration, and using the existing biomass potential (Duscha et al., 2009, p. 46).

Current programs of the city include the "Allianz für Klimaschutz" (Alliance for climate protection), a network for businesses, where stakeholders from the economy, institutions organizations meet to establish new ideas and projects for climate protection (Stadt Münster, n.d.-a). Every business can participate and awareness is raised for projects. Citizens are even able to design own projects and to bring own ideas to the table. Topics for the alliance include heating, electricity, energy and mobility.

Another project is called “Münster packt’s!” (Münster grabs it!), a citizens’ pact in which citizens sign a self-commitment agreement to contribute through small and easy actions to protect the climate. Such actions include sustainable ways of heating, as well as energy saving methods such as switching off stand-by devices, but also actions like switching to green electricity (Amt für Grünflächen und Umweltschutz, n.d.). Citizens are also encouraged to inform their fellow citizens as well. The city argues that protecting the climate is only possible if the citizens also change their behavior.

Similar to Hamburg, Münster also provides its citizens with the opportunity to do a “solar check” (Stadt Münster, n.d.-b). But it does not only encourage its citizens to invest in solar energy, it also supports the establishment of solar panels on public city buildings. Since 1997 Münster already set up 42 solar panel plants on public buildings.

All in all, Münster seems to be a model region with regard to climate protection having received many awards for its exemplary and early engagement in climate protection. Nevertheless, compared to Hamburg, it seems as if the city puts less emphasis on renewable energy and more on CO_2 reduction. The region is also not that well suited for renewable energy sources as Hamburg and, therefore, its capacity to increase its share in renewables significantly depends on the city’s ability to decrease energy consumption in general, as pointed out within the “Klimaschutzkonzept 2020”. Even though it cannot yet keep up with national and European goals for increasing renewable energy to 20% by 2020, Münster is still highly engaged and focuses on those types of renewable energy sources that are appropriate for the region. It does also a lot in awareness raising, stimulates citizens to save energy and become renewable energy clients, and uses those sources of renewable energy that offer potential in the region. It, furthermore, also is a member of international cooperations of regions, but in comparison to Hamburg it is significantly less involved in this area. In total, Münster also lives up to the expectations on the role of regions’ set up by the EU. Just as in the case of Hamburg, Münster’s activities in the field of renewable energy are not set up because of the EU Directive. Münster’s history in the multilevel governance structure of environmental policies began much earlier and goes beyond activities expected from EU or national level.

6.3. Neumarkt

The district of Neumarkt (Landkreis Neumarkt) in Southern Bavaria had a total population of 127,472 at June 30th, 2013 and a population density of 94.84 inhabitants per square kilometer (Landkreis Neumarkt, n.d.). The district started regional management in 1997, coordinated by the regional innovation agency REGINA GmbH (Jacoby, Beutler, Heinisch, & Wappelhorst, 2010, p. 26). For the district of Neumarkt no clearly defined goals in terms of a share of renewable energies for the future are provided. Nevertheless, the field of energy represents a central topic in regional management for the district; special points of attention are intensive awareness raising and publicity in order to promote a decrease in energy consumption and an increase in energy from renewable sources. The institutions “Energieplenum” and “Energiebüro” have been established to deal with the topic of energy at the district level (Jacoby et al., 2010, p. 26). The Energieplenum represents a local Agenda 21 working group, a public forum for citizens, making specific “proposals regarding the improvement of the energy situation, giving impulses and working on concrete individual projects” (Jacoby et al., 2010, p. 27). The Energiebüro functions as the coordinator of energy projects and as an advisor on questions regarding “energy saving, energy efficiency, and renewable energy” to citizens and businesses. It furthermore establishes contacts and organizes topic-related events. The topic of energy is central to the “Energiewoche” (energy week), which takes place regularly and focuses on

domestic use of regenerative energy. The district of Neumarkt furthermore established a wind energy concept for the area of the district and proposed it to the regional government of Regensburg. However, this does not belong to the authority of the district; therefore, the proposal is informal and needs to be dealt with in Regensburg.

The district of Neumarkt is not involved in international cooperation as a district entity. However, the city of Neumarkt is for example a signatory of the Covenant of Mayors and the whole region Upper Palatinate is an ENNEREG pioneer region.

In the report "Kurzbericht zum Energiekonzept" from 2011 there is an overview of the current situation in the production of renewable energy in contrast to the still existing potential (see Appendix 2) (Institut für Energietechnik, 2011). Derived from the apparently still enormous possibilities for extension concerning the production of renewable energy, combined with the energy saving potential of the district, the authors conclude that it is possible for the district of Neumarkt to cover the complete demand for energy by energy from renewable sources by 2030 (Institut für Energietechnik, 2011, pp. 38-39). There would even be an excess of 122 GWh which could be fed into the national energy grid. Concerning thermal energy the calculated demand in 2030 could not be completely covered by 2030; 601 GWh will be missing according to the calculations (Institut für Energietechnik, 2011, p. 40). The report considers the natural circumstances in the district of Neumarkt as promising for opportunities in biomass, solar energy, and wind power plants, but also clarifies the choice of location, for example for wind power plants, as a sensitive issue if there is no support from the citizens. The report requests from the district of Neumarkt to establish "ambitious but realistic goals" and to start leading the way in an active manner(Institut für Energietechnik, 2011, p. 50). It furthermore advises the district to develop exemplary actions, in order to function as a model to private households and businesses.

In summary, the district of Neumarkt shows a lot of potential with regard to renewable energy due to its geographic circumstances. Nevertheless, it is primarily active in informing sharing and awareness raising, since the report from the "Institut für Energietechnik" requests from the district to become more active and to set itself clear, realistic goals. The district does not have a clear share of renewable energies as a goal. With regard to wind power plants the district does not seem to be the right level of authority; nevertheless it set up a proposal, which shows the district's initiative to become more active and to increase its influence on the regional shaping. Also the expectation by the EU of regional involvement in (cross-border) cooperation is not accounted for in this region. Since the expectations from the EU are not really specific, it can at least be said that the district of Neumarkt partly lives up to these expectations. Improvements exist in terms of establishing specific goals, showing initiative to lead the way, and with regard to getting involved in clusters with other regions, on a national scale, as well as on international and European scales. In the multilevel governance structure the district does not belong to the highly engaged actors, like Hamburg and Münster. It does not go beyond EU expectations and even still has problems with meeting the expectations that have so far been formulated in the Directive. A reason for this lower degree of involvement is likely to be the definition of the district of Neumarkt as a district and not as a city. This level seems to be less engaged in renewable energy measures. Nevertheless, improvements seem to be taking place and the district seems to get more involved in the future.

6.4. Berlin

Berlin lies in the East of Germany and is one of the new *Bundesländer*. In 2012 it had 3.375 million inhabitants and a population density of 3,785.2 inhabitants per square kilometer (Statistik Berlin Brandenburg, n.d.). Berlin realized its responsibility as a big municipality to invest in climate protection and defines itself as a "pioneer" in climate protection, due to, among other reasons, its position as the biggest investor in climate projects with in total investments of 160 Mio.€ between 2007 and 2013 and its early engagement in climate politics, starting in 1990 with the "Berliner Energiespargesetz" (Berlin energy saving law" (Senatskanzlei, 2008, pp. 2-3). Two years later the "Berliner Energieagentur" (Berlin energy agency) was founded. Among the projects one notices that the city is especially involved in energy saving, since it invested significantly in the restoration of public buildings in order to save energy and, therefore, Berlin can be defined as a pioneer in "energy saving contracting" (Senatskanzlei, 2008, p. 3). Along with its early investments in climate protection, the goal of the city to reduce CO_2 emissions by 25% by 2010 was already achieved in 2005, leading the city to enhance its goal to a reduction of 40% by 2020 (Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 13).

Regarding (cross-border) cooperation, Berlin is first of all also a signatory of the Covenant of Mayors. Next to that, Berlin furthermore takes part in a lot of other international initiatives, such as the Climate Alliance, EUROCITIES, Forum European Energy Award, ICLEI, METREX and POLIS (Covenant of Mayors, 2014).

In terms of renewable energy sources the Berliner Energieagentur regards the potential for Berlin as high, but nevertheless lower than in rural regions due to the limited space available (Berliner Energieagentur GmbH, n.d.). The agency itself runs photovoltaic plants, as well as block heat and power plants that are working with biological natural gas. They also compile feasibility studies, analysis of the potential of studies, and realization advice regarding renewable energy projects. On the official homepage of the city of Berlin solar energy and biomass (primarily from wood) are defined as the main sources for renewable energy in the case of Berlin (Umweltportal, n.d.). Water power plants and wind power plants are used less due to unfavorable circumstances, while geothermal energy is increasingly included.

Berlin is also a signatory of the Covenant of Mayors. Its Sustainable Energy Action Plan is the Energiekonzept (Energy Concept) 2020 (Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011). Within this conceptual plan energy from renewable sources is stressed as an important issue for the future energy provision of the city, but Berlin cannot keep up with the national developments in the change towards renewable energy due to geographic challenges, such as the limited space, geological and climate conditions, the geographic location and the "urbanistic, social, and industrial structure" of the city (Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 47). The conceptual plan, furthermore, points out the disadvantage of not having its own municipal energy provider like Hamburg. In 2008 renewable energy composed 2.1% of the total energy consumption, while in the electric energy consumption renewable energy accounted for 2.58% and in thermal energy 2.02% (see Appendix 3) (Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 50). Biomass is the main source for renewable energy, both for electricity, as well as for heating; the second biggest source are solar power plants, but they are already almost insignificant compared to biomass (see Appendixes 4 & 5). A third source is heat pumps.

Appendix 6 shows the possible share of renewable energy in the different sectors in 2020 if developments in the renewable energy sector continue as they are currently developing. In that scenario renewable energy will account for 9.9% of total energy consumption, if the biomass heating plant in Klingenberg will be realized as planned, 6.51% of it will not be realized. In Appendix 7 the scenario aimed at is defined, accounting for a share of renewable energy of 14.19% of total energy consumption with the biomass heating plant and 11.80% without it. The political goal of an increase to a share of 20% therefore looks too ambitious and not achievable, due to spatial problems in the urban region (Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011). The biggest potential source is biomass until 2020. Graphs showing the distribution of energy production of the single renewable sources, both for electric energy production as well as for heating energy production, are included in Appendixes 8 and 9. Precise percentages concerning the accounting of each type of renewable energy in the total heating energy consumption can be found in Appendix 10, the percentages of renewable energy sources for electric energy in Appendix 11, and the percentages concerning total energy consumption in Appendix 12. The conceptual plan continues by proposing a list of several short-term and long-term measures concerning each type of renewable energy in order to realize the "Zielszenario" (scenario aimed at) of a share of 14.19%.

In its current action plan of 2013 the city states its aim to be a "climate neutral" city by 2050 and appeals to the citizens to take part in the process, because everyone needs to take part in order to design successful climate protection (Senatsverwaltung für Stadtentwicklung und Umwelt, 2013). The public is included in the process of discussing energy saving and Co_2 reduction potential, for example during workshops. In terms of renewable energy, Berlin wants to establish its own energy transition law. This law has not been introduced yet, but it is supposed to come along with a concrete action plan in order to enable the achievement of the cities ambitious goals. With regard to the energy supply, the city wishes to increase the influence of the public on designing the energy infrastructure. Additionally, the city wants to establish its own municipal energy supplier, which would be focusing primarily on renewable energy, and increase its influence on the gas and electricity grip (Senatsverwaltung für Stadtentwicklung und Umwelt, 2013). While establishing its climate protection plans, the Berlin Senate gets advice from a climate protection council, composed of experts in climate, environment and energy. Especially with regard to energy saving there are several initiatives from the city, such as using public institutions as models for energy efficiency or the Berlin ImpulsE-program, that are informing the public on ways to energy efficiency. There is also the event of the Berlin energy days which is also addressing energy efficiency. The climate protection and energy politics forum ClubE brings young people and experts together and also supports transatlantic climate protection dialogues.

There is such a huge amount of projects concerning climate protection in Berlin that they cannot be named here. In the following a few concerning renewable energy will be mentioned. First of all, concerning solar energy Berlin enables private investors to set up solar panels on public buildings, such as on schools or the town hall (Senatsverwaltung für Stadtentwicklung und Umwelt, n.d.-b). This project is called "Solardachbörse". Next, the city also established a data bank about all solar power plants, called "Solaranlagenkataster". Berlin is the city with the highest concentration of solar energy research and development in Europe, due to the cities modern infrastructure and the dense research and education network (Senatsverwaltung für Stadtentwicklung und Umwelt, n.d.-c). At the Technical University of Berlin (TU Berlin) an innovation center energy has been established. In general Berlin offers many educational tracks regarding sustainable energy (Senatsverwaltung für

Stadtentwicklung und Umwelt, n.d.-e). This is certainly an advantage for the future of energy projects of the city.

Wind energy is not one of the renewable sources that is easily found in Berlin (Senatsverwaltung für Stadtentwicklung und Umwelt, n.d.-d). In 2008 one wind power plant with an energy capacity of 2 MW has been established close to the highway, but this has rather been done symbolically. Furthermore, there is a model project going on to test the possibility of using small wind power plants on buildings in the urban areas.

Geothermal energy is, opposite to solar energy and wind energy, always available and Berlin is geologically suited for this type of renewable energy (Senatsverwaltung für Stadtentwicklung und Umwelt, n.d.-a). However, extra energy is needed if this type of energy shall be used for heating, and there are restrictions regarding geological drilling with respect to ground water. Additionally, not everybody can simply engage in this type of renewable; first permission needs to be granted by the water authority.

In general, Berlin can be defined as a city highly engaged in the field of climate protection. Nevertheless, due to geographic obstacles, possibilities for renewable energy are rather limited compared to the other case studies. Instead, the city engages a lot in energy efficiency, which in the end also leads to a bigger share of renewables if enough energy is saved. It needs to be mentioned that regardless of the geographic problems, the city tries to find solutions through creative ideas, such as the model project of building small wind power plants on top of buildings. Due to the innovativeness of the city with universities engaged in research on renewable energies, it is likely that the city will be able to increase its share of renewables significantly in the future. Also the extension of geothermal energy will help increasing the share of renewables. Whether the highly ambitious goal of becoming a climate neutral city by 2050 can be met needs to be seen. Furthermore worth noticing is the fact that Berlin is currently establishing its own energy transition law. It will be interesting to see in how much this additional legal document at the city level can influence the engagement in renewable energy. All in all, Berlin meets the expectations of the EU regarding the regions involvement in terms of renewable energy, since it is involved in (cross-border) cooperation, in information sharing and awareness raising and it focuses in its own possibilities regarding renewable energy sources.

6.5. Conclusions about regional activities

The regions that have been subject to this study have almost all been highly engaged in renewable energy; Münster and Hamburg have even received awards on national and/or European level for their exceptional contributions or action plans. The studied regions are all engaged in information sharing and awareness raising among the population. Except for the district of Neumarkt they have, furthermore, all been active in cooperation, either on a national cross-regional basis, or on an international/European basis, or between the different actors within one region. This is another expectation formulated by the EU in its Directive concerning the promotion of the use of renewable energies. With the exception of, again, the district of Neumarkt, the regions also all strived for being seen as models in order to motivate the population to become active as well. Additionally, the advice of the EU for regions to look at their specific potential regarding renewable energy sources is followed by regional level authorities. Nevertheless, regions have of course very different opportunities concerning achievable goals, and different regions have, until now, used different

amounts of their total potential. There are regions in Germany, like the district of Neumarkt, that have the possibility to strive for becoming 100% renewable energy regions within the nearer future, and others, like Münster, that should rather put investments in regions where a quick extension of renewable energy plants do not cause other environmental problems. All in all, regions in Germany appear to act as own actors, that have to comply with national and supranational laws, of course, but their own regional and local measures and actions with regard to renewable energy go much further than the vaguely defined expectations of the EU or Germany. Both at supranational EU level, as well as at German national level, the importance of actions at regional and local level is very much recognized. The absence of clearly defined expectations and requirements simply results from the missing power of both governance levels to formulate clear requirements for regions, as well as the difficulty to formulate clear requirements for this governance level to the extreme divergence among the numerous different regions.

7. Conclusion and Recommendations

The study has shown that the regions in Germany are quite engaged with regard to climate protection in general, and often also with regard to renewable energy in particular. Even though there are differences, showing that districts are less active than cities, general activities and measures dealing with the promotion of renewable energy are numerous. Regions seem to realize the opportunities in terms of growth and development possibilities that the progress in renewable energy comes along with.

The central research question of this study has been to what extent climate protection activities of regions in Germany meet the expectations of the European Union within its multilevel EU climate protection policy. The analysis has shown that EU expectations are rather vaguely defined and include primarily the expectation that regions should support the action plan set up by the EU and the member states according to their potential. More specifically, engagement in awareness raising, information sharing, guidance, training programs, cross-regional and international cooperation, and establishing a suitable program for potential renewable energy sources depending on each specific region are advised. The expectations can generally be defined as being met by the regions analyzed in this study, since these are engaged in setting up own targets for renewable energy shares in the future and act as models to the population by using public buildings for renewable plants or by promoting biofuels in cars run by the regional government, like it is the case in Hamburg. They stress the importance of citizens' involvement and organize events on a regular basis. If they experience problems due to population density and spatial problems, like it is the case in Berlin, projects are established to test alternative options.

However, these vaguely formulated expectations at EU level are no sufficient explanation for the extensive engagement of regions in the development of renewable energy. Furthermore, it can be concluded that regions are highly important actors within the multilevel governance system of environmental policies themselves. In most of the regions of this study actions concerning the promotion of renewable energy have begun much earlier than the Directive of the EU has been established.

In general, there is a difference observable regarding increased possibilities in the case of bigger regions with higher levels of authorities, such as Berlin and Hamburg. The district of Neumarkt is not

as highly involved in renewable energy and does not meet all expectations of the EU, yet. Nevertheless, also smaller regions constitute important actors within the as type II definable multilevel governance structure of renewable energies in the EU and the district of Neumarkt is getting more active and realizes its responsibility to higher engagement in the future.

In total the dynamics within the multilevel governance system of renewable energy are numerous and complex, due to the interconnected nature of the layers of governance. Through the establishment of expectations, the EU level is involved at the regional level, but the regional level is also involved at the EU level through the Committee of the Regions. Nation states act as intermediary actors, translating EU legislation to national legislation, but the linkage of regional and EU level does not only evolve through the nation states. In Germany the additional layer of the *Bundesländer* further complicates the multilevel governance system, since these authorities are involved, together with the municipalities itself, in the clear establishment of regional expectations.

This thesis tried to answer the central question of what the EU expects from regions with regard to their involvement in the aim to increase the share of renewable energy, as well as in how far regions meet these expectations. A limitation of this study is the difficulty to generalize about regions. The scope of this thesis is not extensive enough to provide a sufficient number of regions to guarantee generalizability. Thus, for the future it is advisable to set up a bigger study with a similar research question, involving not only regions from Germany, but from all member states so that general statements about all regions in the EU can be made. Nevertheless, this study was able to show the complex interactions between the different actors and the importance of regional activity in order to achieve the renewable energy target set up at the EU level. Regions realize the responsibility they bear with regard to environmental policy and also the opportunities that developments in the area of renewable energy come along with. Due to these reasons there is a high degree of regional activity and EU expectations are met or even exceeded.

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Appendix:

Appendix 1:

Table 5: Overview of all policies and measures

Name and reference of the measure	*Type of measure**	*Expected Result ***	*Target group and/or activity****	*exists/is planned*	*Date of beginning and end of the measure*
1.Renewable Energy Act (EEG)	Legislative	Increased share of renewable energies in electricity	Investors, private households	Exists	Start: April 2000 (as a follow-up regulation to the Electricity Feed Act of 1991); amendments 2004 and 2009; next revision in 2011; the law is not limited in time.
2. Renewable Energies Heat Act (EEWärmeG)	Legislative	Increased share of renewable energies in the heating of buildings (focus on new buildings)	Building owners (private and public)	Exists	Start: Jan 2009; first revision 2011
3. Market Incentive Programme (MAP)	Financial	Investments in renewable energy in heating	Private households, investors	Exists	Start: 1999 financed from funds established in EEWärmeG; until 2012
4. KfW-funding-programs (e.g. CO_2renovation-program)	Financial	Energy efficiency measures and investments in renewable energy in buildings	Private households, investors, building owners, municipalities, social services	Exists	e.g. Start: 1996 End of measures 2011
5. Combined Heat and Power Act (KWKG)	Legislative	New construction, modernization and operation of CHP-plants and heating networks	Power plant operators, energy suppliers, investors	Exists	Start: April 2002, amendment in January 2009
6. Energy Saving Ordinance (EnEV)	Legislative	Compliance with minimum standards for energy efficiency in buildings and heating/cooling systems in new construction and renovation of residential and non-residential buildings	Building owners (private and public)	Exists	Start (current version dated 1.10.2009): October 2007 Basis: Energy Saving Ordinance of 28.03.2009; next amendment 2011/2012
7. Biofuels Quota Act (BioKraftQuG)	Legislative	Minimum share of biofuels of total fuel put into circulation, and tax incentive for certain biofuels	Companies that bring fuels on the market	Exists	Start: January 2007 Duration: beyond 2020 / tax incentive for certain biofuels until the end of 2015

(Federal Republic of Germany, 2010, pp. 20-21)

Appendix 2:

Tabelle 4: Die Potentiale im Bereich der erneuerbaren Energien

Potential EE	Ist-Zustand		Ausbaupotential	
	Endenergie elektrisch [MWh_{el}/a]	Endenergie thermisch [MWh_{Hi}/a]	Endenergie elektrisch [MWh_{el}/a]	Endenergie thermisch [MWh_{Hi}/a]
Photovoltaik	69.916	-	52.674	-
Solarthermie	-	14.623	-	31.708
Biomasse (holzartig inkl. Altholz)	-	1.192.117	-	100.000
Biomasse (landwirtschaftlich)	169.099	-	16.800	18.900
Windkraftanlagen	19.312	-	300.000	-
Wasserkraftanlagen	3.484	-	200	-
Geothermie	-	1.900	- *	- *
Summe	**261.811**	**1.208.640**	**369.674**	**150.608**

* siehe Potentialbetrachtung Geothermie 3.4.6

(Institut für Energietechnik, 2011)

Appendix 3:

Tabelle 6: Gesamtschau der Nutzung Erneuerbarer Energien in Berlin 2005-2008[38]

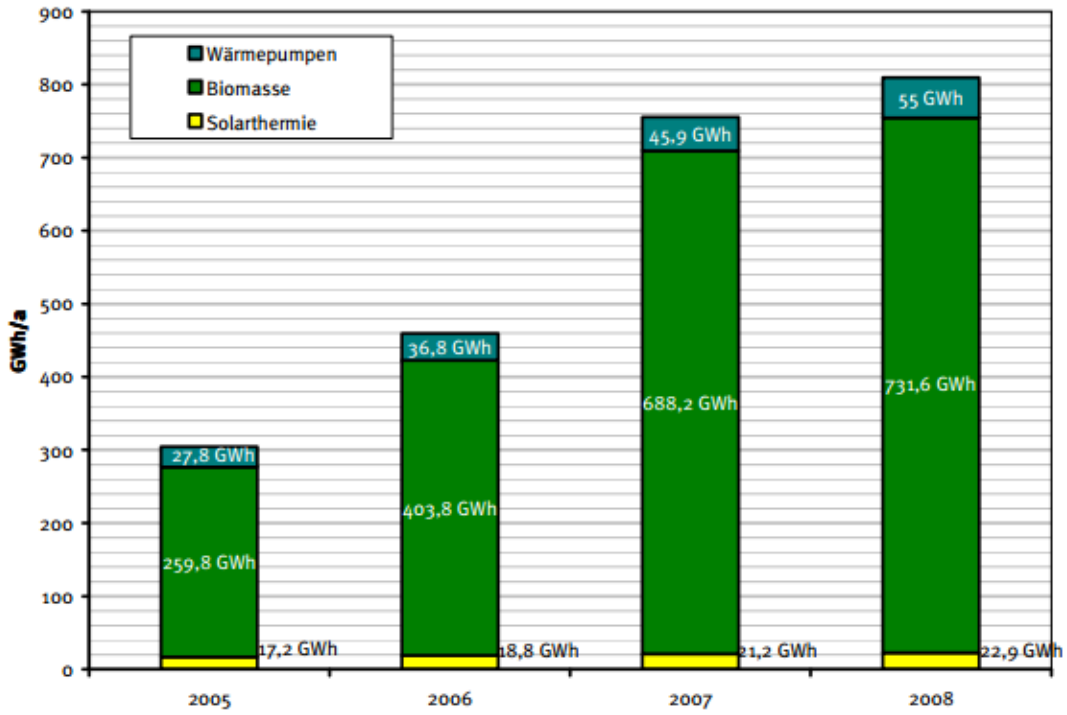
	Einheit	2005	2006	2007	2008
EE-Stromerzeugung gesamt	**GWh_{el}**	**125,3**	**170,7**	**262,8**	**279,1**
EE-Anteil	%	1,16%	1,58%	2,43%	2,58%
Biomasse	GWh_{el}	121	165,5	256,6	268,5
PV	GWh_{el}	4,3	5,2	6,2	8,2
Wind	GWh_{el}	0	0	0	2,4
EE-Stromerzeugung abzüglich Strom für Wärmepumpen	*GWh_{el}*	*112,9*	*154,3*	*242,3*	*254,6*
EE-Wärmeerzeugung gesamt	**GWh_{th}**	**304,8**	**459,4**	**755,3**	**809,5**
EE-Anteil	%	0,76%	1,14%	1,88%	2,02%
Biomasse	GWh_{th}	259,8	403,8	688,2	731,6
Solarthermie	GWh_{th}	17,2	18,8	21,2	22,9
Wärmepumpen	GWh_{th}	27,8	36,8	45,9	55
EE-Energieerzeugung gesamt	**GWh**	**430,1**	**630,1**	**1.018,1**	**1.088,6**
EE-Anteil am Energie-verbrauch	%	0,8%	1,2%	2,0%	2,1%

Quelle: Institut für Ökologische Wirtschaftsforschung 2010 (ausführliche Quellenangaben siehe Langfassung)

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 50)

Appendix 4:

Abbildung 22: Wärmeerzeugung aus Erneuerbaren Energien 2005 bis 2008

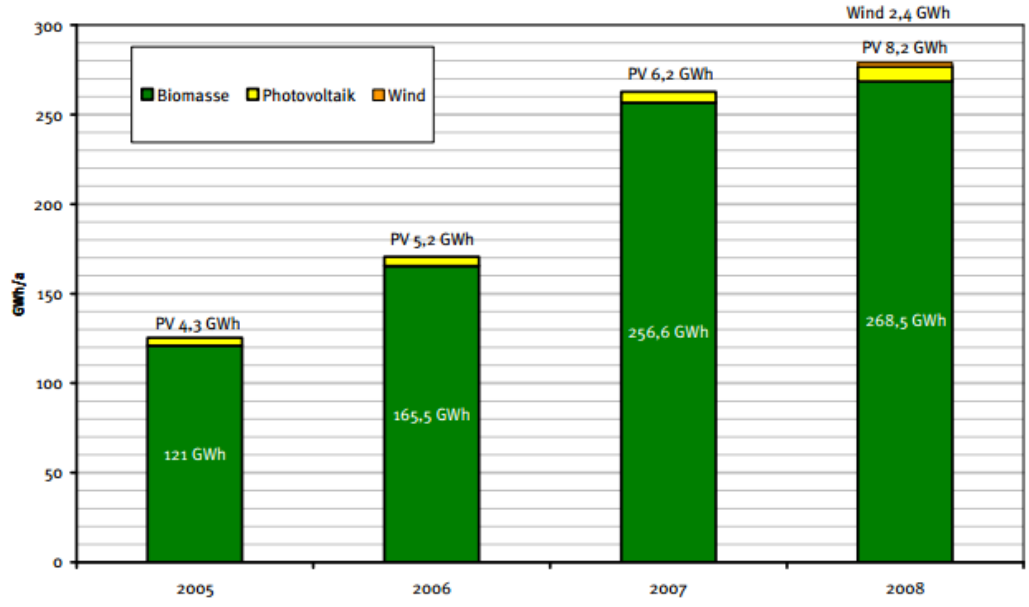


Quelle: Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 51)

Appendix 5:

Abbildung 23: Stromerzeugung aus Erneuerbaren Energien 2005 bis 2008



Quelle: Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 52)

Appendix 6:

Tabelle 11: Energieerzeugung aus Erneuerbaren Energien 2020 in Berlin - Referenzszenario (mit und ohne Biomasse-HKW Klingenberg)[51]

	Einheit	Energieerzeugung 2020 mit Klingenberg	Energieerzeugung 2020 ohne Klingenberg
Summe Stromerzeugung gesamt	**GWh**	**1.324**	**873**
EE-Anteil (inkl. Wärmepumpenstrom) am Stromverbrauch 2020	**%**	**12,07%**	**7,96%**
Summe abzgl. Strom für Wärmepumpen	GWh	*1.195*	*744*
EE-Anteil (ohne Wärmepumpenstrom) am Stromverbrauch 2020	%	*10,89%*	*6,78%*
Photovoltaik	GWh	60	60
Biomasse	GWh	1.184	732
Wind	GWh	80	80
Summe Wärmeerzeugung gesamt	**GWh**	**3.699**	**2.345**
EE-Anteil am Wärmeverbrauch 2020	**%**	**9,62%**	**6,10%**
Solarthermie	GWh	65	65
Biomasse mit Klingenberg	GWh	3.140	1.785
Wärmepumpen[1]	GWh	495	495
Tiefengeothermie	GWh	0	0
Summe Strom und Wärme	**GWh**	**5.023**	**3.217**
EE-Anteil am Energieverbrauch	**%**	**10,16%**	**6,51%**
Summe abzgl. Strom für Wärmepumpen	GWh	*4.894*	*3.088*
Summe abzgl. Strom für Wärmepumpen	%	*9,90%*	*6,25%*

[1] Die dargestellten Werte enthalten den benötigten Wärmepumpenstrom, welche jedoch in der Gesamtbilanz als Strom, nicht als Erneuerbare Energie dargestellt wird.

Quelle: Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 68)

Appendix 7:

Tabelle 12: Energieerzeugung aus Erneuerbaren Energien 2020 in Berlin - Zielszenario (mit und ohne Biomasse-HKW Klingenberg)[1]

	Einheit	Energieerzeugung 2020 mit Klingenberg	Energieerzeugung 2020 ohne Klingenberg
Summe Stromerzeugung gesamt	**GWh**	**1.677**	**1.377**
EE-Anteil (inkl. Wärmepumpenstrom) am Stromverbrauch 2020	**%**	**17,73%**	**14,56%**
Summe abzgl. Strom für Wärmepumpen	*GWh*	*1.486*	*1.185*
EE-Anteil (ohne Wärmepumpenstrom) am Stromverbrauch 2020	*%*	*15,71%*	*12,53%*
Photovoltaik	GWh	173	173
Biomasse	GWh	1.221	920
Wind	GWh	283	283
Summe Wärmeerzeugung gesamt	**GWh**	**4.770**	**3.986**
EE-Anteil (inkl. Wärmepumpenstrom) am Wärmeverbrauch 2020	**%**	**13,26%**	**11,08%**
Solarthermie	GWh	275	275
Biomasse	GWh	3.730	2.946
Wärmepumpen[1]	GWh	730	730
Tiefengeothermie	GWh	35	35
Summe Strom und Wärme	**GWh**	**6.448**	**5.363**
EE-Anteil am Energieverbrauch (inkl. Wärmepumpenstrom)	**%**	**14,19%**	**11,80%**
Summe abzgl. Strom für WP/Tiefengeothermie	*GWh*	*6.256*	*5.171*
EE-Anteil am Energieverbrauch (abzgl. Wärmepumpenstrom)	*%*	*13,77%*	*11,38%*

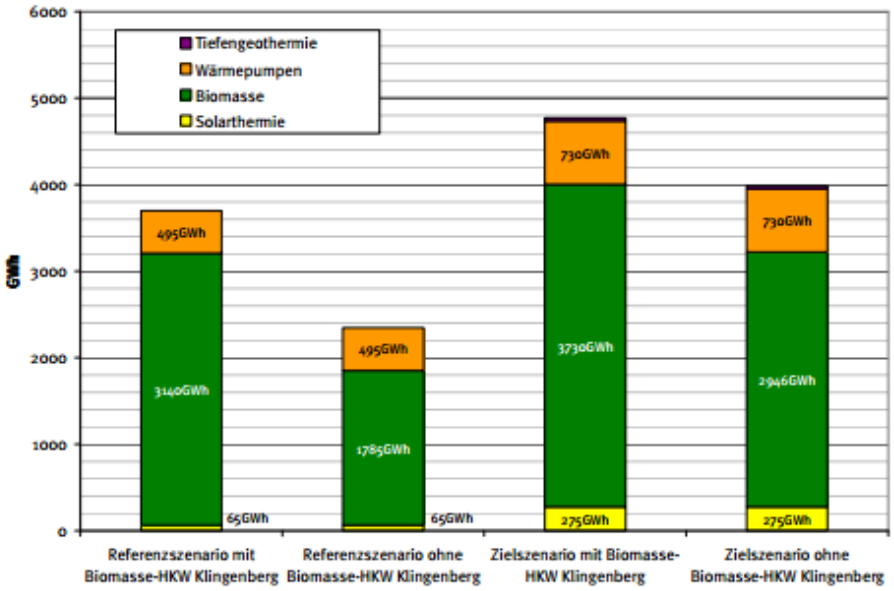
[1] Die Werte enthalten die mit den Wärmepumpen erschließbare Umweltwärme. Der für den Betrieb der Wärmepumpe erforderliche Strom wird nicht berücksichtigt.

Quelle: Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 69)

Appendix 8:

Abbildung 27: Wärmeerzeugung aus Erneuerbaren Energien in Referenz- und Zielszenario (dezentrale und zentrale Nutzung)1



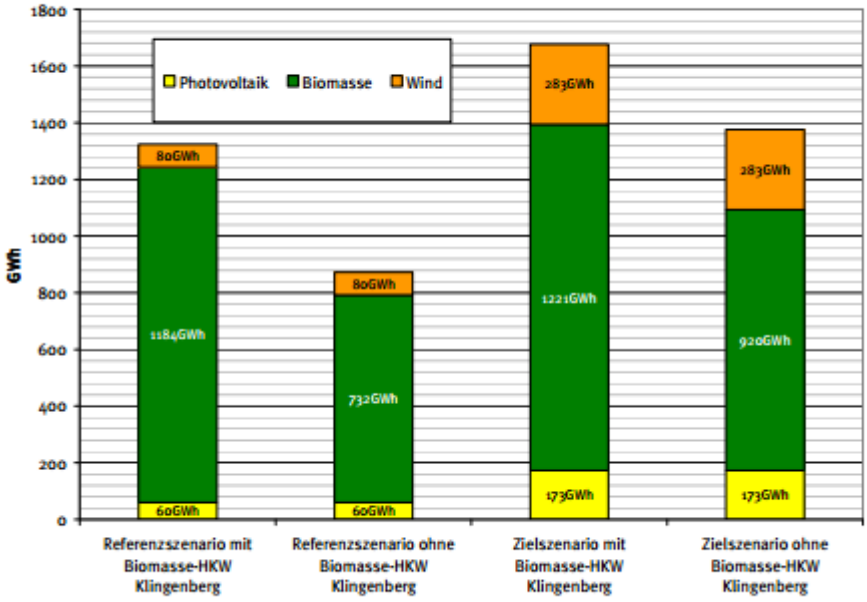
[1]Die dargestellten Werte für die Biomasse enthalten neben den Potentialen für die Fern- und Nahwärme auch die dezentrale, objektbezogene Versorgung (z. B. Pelletkessel)

Quelle: Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 70)

Appendix 9:

Abbildung 28: Stromerzeugung aus Erneuerbaren Energien im Referenz- und Zielszenario (dezentrale und zentrale Nutzung Erneuerbarer Energien)



Quelle: Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 71)

Appendix 10:

Tabelle 13: Wärmebereitstellung durch dezentrale Erneuerbare Energien im Zielszenario 2020 (gebäude- u. nahwärmebezogen)

Technologie	Wärme-bereitstellung 2020 [GWh]	Anteil an der Wärmebereitstel-lung aus Erneuer-baren Energien	Anteil am Wärme-verbrauch des Landes Berlin
Dezentrale Biomasse[54]	715	39,70 %	1,99%
Biomasse über Nah-wärmenetze	236	13,10 %	0,66%
Solarthermie	275	15,27 %	0,76%
Wärmepumpen[55]	540	29,98 %	1,50%
Tiefe Geothermie	35	1,94 %	0,10%
GESAMT	1.801	100 %	5,00%

Quelle: Berliner Energieagentur / Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 73)

Appendix 11:

Tabelle 14: Stromerzeugung durch Erneuerbare Energien im Zielszenario

Technologie	Stromerzeugung 2020 [GWh]	Anteil am Strom aus Erneuerbaren Energien	Anteil am Strom-verbrauch des Lan-des Berlin
Dezentrale Biomasse	1.221 (mit Klingenberg)	72,8 %	12,91 %
Photovoltaik	173	10,3 %	1,83 %
Windkraft	283	16,9 %	2,99 %
GESAMT	1.677	100 %	17,74 %

Quelle: Berliner Energieagentur / Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 74)

Appendix 12:

Tabelle 14: Stromerzeugung durch Erneuerbare Energien im Zielszenario

Technologie	Stromerzeugung 2020 [GWh]	Anteil am Strom aus Erneuerbaren Energien	Anteil am Stromverbrauch des Landes Berlin
Dezentrale Biomasse	1.221 (mit Klingenberg)	72,8 %	12,91 %
Photovoltaik	173	10,3 %	1,83 %
Windkraft	283	16,9 %	2,99 %
GESAMT	1.677	100 %	17,74 %

Quelle: Berliner Energieagentur / Institut für Ökologische Wirtschaftsforschung 2010

(Berliner Energieagentur GmbH & Institut für ökologische Wirtschaftsforschung GmbH, 2011, p. 74)