Transnational recommendations for improving the perspectives for spatial planning for renewable energies in the Baltic Sea region

Ministry of Energy, Infrastructure and Digitalization
Mecklenburg-Vorpommern

Table of contents

List of figures

List of tables

Abbreviations

BEA-APP	-	Baltic Energy Areas – A Planning Perspective,
BEMIP	-	Baltic Energy Market Interconnection Plan,
BSR	-	Baltic Sea Region,
CPH	-	Cogeneration of Power and Heat,
EIA	-	Environmental Impact Assessment,
ESDP	-	European Spatial Development Perspective,
GDP	-	Gross Domestic Product,
MSP	-	Maritime Spatial Planning,
NEEAP	-	National Energy Efficiency Action Plan,
NREAP	-	National Renewable Energies Action Plan,
NTUS	-	Nomenclature of Territorial Units for Statistics,
RE	-	Renewable Energy,
REA	-	Renewable Energy Act,
R&D	-	Research and (technological) Development,
VASAB	-	Visions and Strategies around the Baltic Sea (Committee),
WPP	-	Wind Power Plant

Country codes:

DE	-	Germany,
PL	-	Poland,
SE	-	Sweden,
FI	-	Finland,
DK	-	Denmark,
LT	-	Lithuania,
EE	-	Estonia,
LV	-	Latvia

0. Preliminary remarks

This report deals with the development of renewable energy (RE) in the BEA-APP countries[1] and pilot regions: These are Estonia (Lõuna-Eesti), Latvia (Zemgale), Lithuania (Kauno apskritis), Finland (Keski-Suomi), Denmark (Sjælland), Sweden (Skåne län and Blekinge län), Poland (Zachodniopomorskie) and Germany (Mecklenburg-Vorpommern).

BEA-APP - Baltic Energy Areas - A planning perspective - is an Interreg flagship project within the Horizontal Action "Spatial Planning" of the EU Strategy for the Baltic Sea Region (EUSBSR). In order to facilitate the decarbonisation of the energy systems, additional areas for renewable energies - wind energy, bioenergy, photovoltaics - are needed. Finding the most suitable areas for this requires the improvement of the planning instruments of spatial planning and their harmonisation between the different countries. At the same time, it is necessary to avoid or solve conflicts with other land use demands that arise with the increasing use of renewable energies. The BEA-APP project partners in eight countries of the Baltic Sea Region are therefore developing new spatial planning instruments for managing the expansion of renewable energies and for finding optimal compromises with competing targets and land uses. In addition, they continue to develop concepts for the participation of local actors and residents in renewable energy projects in order to create or strengthen the necessary acceptance among local residents. The developed planning instruments and concepts will be implemented in pilot areas.

The use of renewable energies has a different status in each of these countries and also varies in the speed of expansion. There are several reasons for these differences. Besides the respective technical and political framework conditions and planning methods, also the natural and structural prerequisites for the use of renewable energies vary from country to country: The natural conditions determine the spectrum of renewable energies that can be used and the potential that can be tapped. The countries' structural conditions, in particular the structure of their energy demands, influence the possibilities for using renewable energies. *On the one hand*, a spatially and temporally distributed energy demand accommodates the direct use of many renewable energies, as their energy densities are often lower than those achievable with fossil fuels in combustion processes. Conversely, covering a large, i.e. spatially and temporally concentrated energy demand with renewable energies is often costly and most likely to be achieved through bioenergy (also combustion processes). *On the other hand*, renewable energies can be used to provide energy sources that are comparable to fossil fuels, e.g. biomethane or hydrogen. This means that de facto any energy demand can be covered. However, certain structural, in particular infrastructural prerequisites must be fulfilled.

The following studies, however, only briefly address these natural conditions and structural preconditions of the countries - and only in terms of framework conditions. They then focus on the different political framework conditions as well as the planning methods and criteria that ought to be the main emphasis of this report.

Spatial planning should not be perceived as a barrier against renewable energies, but rather as their supporter and trailblazer. The most effective method of achieving this is to gradually adjust the national planning of the individual countries to the best practice of the country that is implementing particularly successful spatial planning for renewable energies[2].

In order to bring different countries up to the same standard of renewable energy planning, particularly the following prerequisites should be fulfilled:

1 The BEA-APP countries are EU member states and are hereinafter referred to as countries participating in the project.

2 To this end, success would first have to be made "measurable" if it not only manifests itself in a high, diversified level of renewable energy expansion, but if it also includes, for example, low-conflict implementation.

- Comparable political and technical framework conditions:
  - Political = energy/climate policy country objectives, laws on energy/environmental protection, funding and research policy
  - Technical = planning and approval practice,
- Comparable economic and (energy) technological capabilities and similar speed of development,
  - Existence and expandability of technical infrastructures for the generation and use of renewable energies,
  - Performance and other aspects of digitisation,
- Comparable efficiency and equipment of the planning authorities, e.g.
  - Personnel and material resources of the planning authorities,
  - Database - official statistics, specialised data centres,
  - Geodata management/map services,

These conditions are fulfilled just as comparable planning and approval methods and conditions prevail. This is shown by the studies /1/, /2/, /3/ carried out in the BEA-APP project as well as other previous transnational Interreg projects and initiatives such as COMMIN, Baltic InteGrid, Baltic LINes, Baltic InteGrid or BEA-APP[3].

[3] COMMIN – Promoting Spatial Development by Creating COMmon MINdscapes,
Baltic InteGrid - Integrated Baltic Offshore Wind Electricity Grid Development,
Baltic LINes – Coherent Linear Infrastructures in Baltic Maritime Spatial Plans,
Baltic InteGrid – Integrated Baltic offshore wind electricity grid development,
BEA-APP - Baltic Energy Areas - A Planning Perspective.

1. Introduction

There is an almost worldwide consensus on the need to limit the increase in average global temperature to a maximum of 2°C above pre-industrial levels. This requires the development of long-term strategies for decarbonisation and for phasing out the use of fossil fuels. In order to achieve these goals, it is imperative that all countries make a joint shift from fossil fuels to renewable energies. The increased use of renewable energies can make it possible to reduce GHG emissions, which alone can prevent accelerated climate change. A major contribution to this joint increase in the use of renewable energies is the harmonisation and improvement of spatial planning for renewable energies.

For many years, the European Union has pursued a regional policy that is often regarded as an investment policy. However, it is also an instrument for regional development and cohesion. As a cohesion policy (ECP), it has promoted the development of spatial planning instruments at all spatial levels (urban, local, regional, national and transnational). Although European Spatial Planning (ESP) is not a formal competence of the EU, the EU has become an important actor in influencing decisions within spatial planning and thus contributes to shape the EU territory /4/, p. 10. One reason for this are EU documents such as the European Spatial Development Perspective (ESDP)[4]. They express EU goals, set the ESP agenda and are incorporated into national and regional planning systems, if necessary.

However, the accelerated expansion of renewable energies also leads to specific planning conflicts. In order to minimise these, a strategic planning with a watchful eye for unintended side effects and consequences is required.

1.1 Need for joint planning perspectives for renewable energies in the Baltic Sea Region

Harmonisation and improvement of common planning perspectives in the countries of the Baltic Sea Region are necessary for a variety of reasons:

Due to the increasing integration of the EU, countries and regions are moving closer together and influence each other more strongly than before. In order to strengthen its positive effects and to prevent possible negative consequences on spatial structures, an overarching perspective is needed not only for the respective national spatial development policy[5]. This applies all the more so since, for example, climate change and its consequences are not limited to individual countries.

This also applies analogously to renewable energies in the countries of the Baltic Sea Region: they have great RE potential. The sustainable development of these potentials is of great importance because a more sustainable energy supply can achieve a variety of effects, e.g. the simultaneous improvement of energy security, climate protection and regional value creation. However, an increased expansion of renewable energy can also be associated with undesirable effects and risks. Therefore, a methodically planned way is required to tap renewable energy potentials at the same time as increasing energy efficiency. As a result, effects can be greater, achieved more quickly and possibly be

[4] The concept was adopted by the Conference of Spatial Planning Ministers in Potsdam in 1999 and provides the EU's national spatial development and sectoral policies with clear, spatially comprehensive guiding principles and objectives which are to be pursued simultaneously in all EU regions and taken into account in their interactions. It was the first EU document of its kind and is intended to increase the coherence and complementarity of spatial planning in the EU Member States. However, it is not legally binding. The ESDP is supported with concrete measures: In addition to the policy advisory network ESPON, the INTERREG support for European territorial cooperation (Objective 3 of the EU Structural Funds) is an important instrument of sustainable spatial development policy. (https://www.bmvi.de/SharedDocs/DE/Artikel/G/Raumentwicklung/europaeisches-raumentwicklungskonzept-eurek.html).

[5] Source: https://www.bmvi.de/SharedDocs/DE/Artikel/G/Raumentwicklung/europaeisches-raumentwicklungskonzept-eurek.html.

associated with fewer conflicts if the participating countries coordinate their framework conditions as well as planning processes, methods and criteria, if they cooperate in planning and if they exchange and benefit from positive and negative experiences[6].

Joint planning perspectives are therefore an effective, and possibly even the only way, to achieve sustainable RE development. Today, the Baltic Sea Region consists of different national systems in which spatial planning, regional planning and regional development interact in different ways. In the future, these neighbouring national planning systems should be better coordinated and harmonised. This harmonisation concerns, for example, the planning criteria, the political and technical framework conditions and conflict management in the field of renewable energies.

1.1.1 Energy Security

The expansion of RE makes it possible to increase energy security. Almost all countries in the Baltic Sea Region are net importers of energy, in particular fossil fuels[7]. This means that they currently consume more energy than they produce, because they hardly have any own fossil energy resources. However, the possibility of importing energy, essentially in the form of natural gas, depends on several, and above all uncertain influencing factors. These are shaped by geopolitical aspects: A part of the fossil energy is imported from countries outside the EU.

In recent years, the countries have already made efforts to increase their energy security. This was a particularly difficult task for Lithuania. As studies show, Lithuania carried in the years from 1990 to 2009 partial and between 2010 and 2013 full characteristics of an "energy island"[8]. A major reason for this was their natural gas being almost entirely sourced from only one supplier country - the Russian Federation. It was not until 2015 that Lithuania was able to end this unilateral dependence by developing alternative sources of supply through new gas and electricity pipelines and by organising its own energy sector as an energy market /6/, /7/.

Estonia is an example of the self-improvement of its energy security: the country is unique in the EU in that it is one of the world's largest producers of oil shale and 70 % of its energy supply is based on this primary energy source. This allows the country to meet its electricity and heat needs from its own energy resources. It gives Estonia a high degree of energy security, which can be described as autonomy. However, their combustion causes 80 % of Estonia's GHG emissions /8/, p.7.

Denmark, in turn, launched an active energy policy after the first oil crisis in 1973 to secure its energy supply: By the mid-1990s, Denmark had transformed itself from a net importer of oil to a self-sufficient country by using renewable energies in combination with its own oil and gas production in the North Sea. This policy enabled Denmark to overcome its dependence on oil imports. It is therefore one of the first countries to have embarked on a green energy transition that covers all sectors.

VASAB regards the improvement of energy security as a priority task for the countries in the Baltic Sea Region /1/, p.31. This requires in particular an increase in independence from fossil fuels and their imports. In the countries of the Baltic Sea Region, there are several ways of achieving this:

---

6 The EU's cohesion policy aims to strengthen economic and social cohesion. The Lisbon Treaty and the EU Strategy (Europe 2020) already introduced territorial cohesion as a third dimension. Their implementation must answer the question of how the strengths of each individual area can be used to improve the EU as a whole and how cooperation can be further developed (http://ec.europa.eu/regional_policy/de/policy/what/territorial-cohesion/). The EU Strategy for the Baltic Sea Region adopted in 2009 is an example of a new macro-regional approach. (http://ec.europa.eu/regional_policy/cooperation/baltic/index_en.htm).

7 Further information can be found, for example, in the "Energy Union Factsheets", which are part of the European Commission's Third Report on the Situation of the Energy Union (2017) /5/.

8 In 2006, the European Commission stated in its European Strategy for Sustainable, Competitive and Secure Energy (Green Paper) that the Baltic countries form an "energy island". The development of this concept was linked to the initiative of these countries to remove their energy isolation from the rest of the EU and their asymmetric dependence on the Russian Federation /7/.

- Independence from imports can be achieved by developing and using the energy resources available on one's own national territory. This requires an increase in the share of renewable energies in energy consumption while at the same time increasing energy efficiency.
- In addition, the security of energy imports must be increased. This can be achieved by developing integrated energy networks and markets. These allow a free flow of energy within the EU and cross-border regulation of supply and demand.

The more the energy system transformation is supported by integrated markets, pan-European energy networks and supra-regional networks, the less important the concept of energy autonomy becomes and the more it is replaced by the desire to provide affordable and "clean" energy for all EU citizens and for the European economy.

1.1.2 Climate protection

An important way of improving the protection of our climate is to reduce emissions of anthropogenic greenhouse gases. First and foremost, this means reducing CO_2 emissions from the combustion of fossil fuels. This can be achieved in particular by reducing the consumption of fossil fuels combined with an increase in energy efficiency. Their substitution by renewable energies can significantly reduce anthropogenic GHG emissions. The expansion of renewable energies can contribute significantly at regional level to global climate protection. In recent years, the countries of the Baltic Sea Region have achieved considerable expansion rates in the use of renewable energies. Bioenergy as well as wind and solar energy were particularly influential for this growth /1/.

1.1.3 Economic Aspects

In addition to the advantages already mentioned, renewable energies have further economic effects, such as the increase of regional value added, employment and income. In 2014, for example, the renewable energy sector in the EU generated sales of around 144 billion euros and offered work and income to more than one million people in employment[9].

These effects result not only from renewable energy production, but also from energy conversion and distribution as well as from the necessary facilities and infrastructures.

However, the trade balances of the countries in the Baltic Sea Region include economically significant shares resulting from the use of fossil fuels. They will decline with the increased expansion of renewable energies. As a result, national economies will also change, with some industries and companies gaining in importance and others decreasing or even disappearing. In this change, renewable energies in the countries of the Baltic Sea Region will enable additional regional growth and offer socio-economic advantages. A widespread phenomenon of renewable energy technologies is that the resulting employment improves the regional economy, its sectors and the social situation. In this respect, investments in these technologies are a worthwhile alternative to investments in fossil fuels.

Especially the energy sector - the supply as well as the demand side - are changing due to the transition from fossil to renewable energies. On the supply side, the expansion of renewable energies is creating new technologies and renewed infrastructures. The development of these technologies and the installation of these facilities and infrastructures create new employment opportunities and economic growth. On the demand side, the use of renewable energies makes it possible to reduce energy costs because, for example, the prices for energy from wind and sun no longer include fuel costs. Decentralised energy solutions can also be developed.

Renewable energy plants can generate a number of regional economic effects associated with their construction, operation and dismantling at the end of their service life. These effects - their size and their place of origin - can be taken into account during the planning phase or even be influenced by

9 Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports.

it. This is the case, for example, if a planned plant is to be built at several sites located in different (neighbouring) municipalities. The choice of a location for a biomass heating plant can also influence the attainable demand for heat and improve economic efficiency, without that the heat network built for this purpose differs significantly in its dimensions for the individual sites. Cooperation between spatial planning and regional economic development institutions can therefore be significant.

The planning thereby holds an interactive position. On the one hand it should provide the necessary space for the desired expansion of renewable energies, with which the mentioned effects can be realised. On the other hand, a broad social acceptance is necessary. The development and, if necessary, optimisation of the regional economic effects of renewable energy plants is therefore important for the perception of renewable energies in a region. If the population's positive and, if possible, their own experiences are included in the assessment of renewable energies, the necessary broad acceptance can be created and associated potential for conflict can be reduced.

In general, the regional economy benefits from all forms of renewable energy. Nevertheless, their socio-economic effects can differ considerably. Such differences result from the various technologies that are also reflected in the construction and operation of the respective plants /16/. For example, in the case of wind energy, regions with a *wind power* industry have a number of industrial development effects. In the case of *solar energy*, on the other hand, the value added and employment that can be generated by the local economy seem relatively small compared to other technologies. However, building-integrated solar systems can have a significant positive impact on the local or regional construction industry and trade. In the case of *biogas*, the provision of additional organic material from agriculture, industry and households leads to local income. The recycling of nutrients provides high-quality products. The biogas plants can fulfil additional functions as balancing energy producers (network stability). The GHG emissions of a region are not only reduced by the substitution of fossil fuels by renewable energy sources, but also by the removal of methane from deposited organic substances. As with biogas, the effects of *biomass combustion* in conjunction with district heating can vary with the biomass used. In the case of wood residues, for example, resource efficiency increases through the use of an otherwise unused resource from the forestry and furniture industry. At the same time, their economic yields are stabilised. Last but not least, GHG emissions are reduced by avoiding the release of methane during the extraction of unused forest residues (although a certain proportion of dead wood may be necessary for ecological reasons). CHP plants increase the rational and efficient supply of electricity and heat for the benefit of local consumers. At the same time, they reduce local air pollution in comparison with, for example, coal- and coke-fired individual heating systems.

1.2 Database, methodological aspects and objectives of the report

The report aims at the development of transnational recommendations for the improvement of the perspectives for spatial planning for renewable energies in the Baltic Sea Region. From the results of the BEA-APP project and from supporting analyses, technical and political recommendations for the improvement of the perspectives for spatial planning for renewable energies as well as for the adaptation of national political framework conditions are derived. In detail, the following work steps were realised:

- Analysis and reflection of the political and technical framework conditions of spatial planning for renewable energies in the Baltic Sea Region in order to derive recommendations for the improvement/adaptation of these framework conditions,
- Analysis and reflection of the project results on transnational criteria for spatial planning for renewable energies in order to derive recommendations for the technical implementation of transnational planning criteria,
- Analysis and reflection of project results on conflicts and conflict solutions in spatial planning in order to derive recommendations for improved conflict management,

The focus is not on all renewable energies, but on those that are particularly important in the Baltic Sea Region: Wind energy (onshore), solar energy (photovoltaics), biogas and biomass combustion with connected local heating networks.

The report is based on various data and methods: First, the existing project results were evaluated and, if necessary, supplemented with data and information from additional analyses. Furthermore, a questionnaire was developed and completed by the participating countries in the Baltic Sea Region (institutions). In particular, the questionnaire contained questions whose answers provided information on the three main areas of work mentioned above. Finally, contacts with experts in the fields of renewable energies and planning were used for information gathering.

1.3 Interim Conclusion

In order to be able to supply the countries in the Baltic Sea Region with secure and affordable energy, to limit climate change, to conserve non-renewable resources and the environment as well as to generate regional economic growth and employment, a continued and intensified expansion of renewable energies is necessary. This expansion must not only be prepared and accompanied by spatial planning. Rather, with an intensified expansion of renewable energies, the demands on planning, criteria and conflict management will also increase. Harmonisation and the improvement of common planning perspectives in the countries of the Baltic Sea Region are therefore indispensable.

2. Framework conditions for spatial planning for renewable energies in the Baltic Sea Region

The efforts to promote the expansion of renewable energies in the countries of the Baltic Sea Region must take into account their different socio-economic conditions, the current status of their use and the natural conditions - e.g. wind and global radiation conditions, land potential and biomass yields.

The following brief description therefore compares the participating countries[10] and - as far as the necessary data are available - the pilot regions. Particularly important differences in the socio-economic circumstances and in the natural conditions for the use of renewable energies are identified.

2.1 Political framework conditions for the expansion of renewable energies in the Baltic Sea Region

2.1.1 The Baltic Sea Region - Participating Countries and Pilot Areas

The participating countries have different political structures, i.e. different forms of government. This ultimately results in different mechanisms of (energy and environmental) political opinion-forming and decision-making and different approaches to regional development and spatial planning. The spectrum includes parliamentary monarchies (Kingdom of Denmark[11], Sweden[12]) and republics with parliamentary democracy (unicameral and bicameral parliaments in Estonia, Latvia, Finland, Poland and Germany), partially with pronounced presidential elements (as in Lithuania[13]).

There are also differences in administrative structures: While Denmark is a unitary state with five regions and 98 municipalities, Germany consists of 16 federal states, with the cities and municipalities having the right of self-administration according to the constitution. Estonia, the northernmost of the three Baltic countries, consists of 15 counties (including Tartu - Tartu maakond or Tartumaa), 205 municipalities and 42 cities. Latvia is centrally structured and has four administrative districts with limited local self-government. Lithuania, the largest Baltic country in terms of area, consists of ten administrative districts. Poland consists of 16 voivodships, 379 counties and 2,478 municipalities (the centrally oriented administrative system has elements of regional and local self-government). Finland - the northernmost country in the EU - is divided into 18 regional administrations and the autonomous Aland Islands. Sweden is centrally managed and consists of 20 provinces and 290 municipalities. Skåne län is the southernmost province (län) in Sweden with the capital Malmö, while Blekinge län is the smallest province with the capital Karlskrona.

The level and structure of a country's energy consumption influences the possibilities of using renewable energies to meet demand. Energy consumption is determined by socio-economic conditions, e.g. the size of the population, economic activities and settlement structure factors[14]. Table 1 presents selected socio-economic data of the countries for the year 2016. Estonia is the smallest of these countries in terms of population, Germany the largest. The countries' GDP per capita ranges from EUR 10 to 40 thousand per inhabitant. The highest averages are recorded in Denmark and Sweden.

[10] See footnote 1 in section 0.

[11] Denmark consists of three parts: Denmark, the Faroe Islands and Greenland, the latter being self-governing and not part of the EU.

[12] Sweden's head of state is a king (without political power).

[13] While Lithuania regained its independence from the Soviet Union in 1990 (and has been a member of the Eurozone since 2015), Estonia and Latvia regained their independence from the Soviet Union in 1991.

[14] Added to this is the weather, which has a decisive influence on the heat consumption of the existing buildings.

Table 1: Socio-economic data of the participating countries 2016[15]

Acronym	Country	Population in Million		Area in Thousand km²	Inhabitant Density in EW/km²	GDP/Inhabitant in Thousand EUR
1	2	4		5	6	7
DK	Denmark	5.7	↑	42.9	136.4	48.4
DE	Germany	82.2	→	357.4	233.1	38.2
EE	Estonia	1.3	→	43.4	30.3	16.0
LV	Latvia	2.0	↓	64.6	31.0	12.7
LT	Lithuania	2.9	↓	65.3	45.8	13.5
PL	Poland	38.0	↓	312.7	123.6	11.1
FI	Finland	5.5	↑	338.4	18.1	39.3
SE	Sweden	9.9	↑	407.3	24.4	46.8
Total	-	147.4	↑	1,632.1	90.3	28.3
EU28 share in %		28.9		37.1	-	-

There are also differences with regard to settlement structures, which can be recorded in indicators such as population density, Figure 1. The nomogram indicates the location of the participating countries in different density ranges. The population densities in Germany and Poland are significantly higher than in the other countries. It is also evident that Denmark is highly urbanised compared to the other countries: it is the smallest country in terms of area, yet its population density exceeds that of Poland. Over 86 % of the population in Denmark lives in cities. Copenhagen has over 500 thousand inhabitants, its metropolitan area even 1.4 million people. The BEA-APP pilot region Sjælland (Zealand) has the highest population density in Denmark[16].

The structure of the (residential) building stock is empirically related to the population density, which in turn accounts for a considerable part of the energy consumption of a country or region[17]. In Latvia and Estonia more than 60 % of the population live in apartment buildings, in Lithuania and in Germany far more than 50 %. In Poland this is slightly less than 50 %. Even smaller are the shares of the population in Sweden, Finland[18] and especially in Denmark, where the majority lives in single-family houses rather than multi-family houses[19].

15 Data sources: Eurostat and /59/.

16 The 7.223 km² large region consists of a large part of the island Sjælland as well as the islands Lolland, Falster and Møn. There are in total about 832 thousand inhabitants, so that the region has a population density of about 115 inhabitants/km².

17 Related to the type of building, single-family houses are more energy-intensive than two-family houses and small apartment buildings in terms of living space, assuming the same conditions. Large multi-family houses, which can be found in larger cities in particular, have a relatively low heat requirement.

18 95 % of Finland's land area is rural and 31 % of the population lives there.

19 See also /50/, p.34.

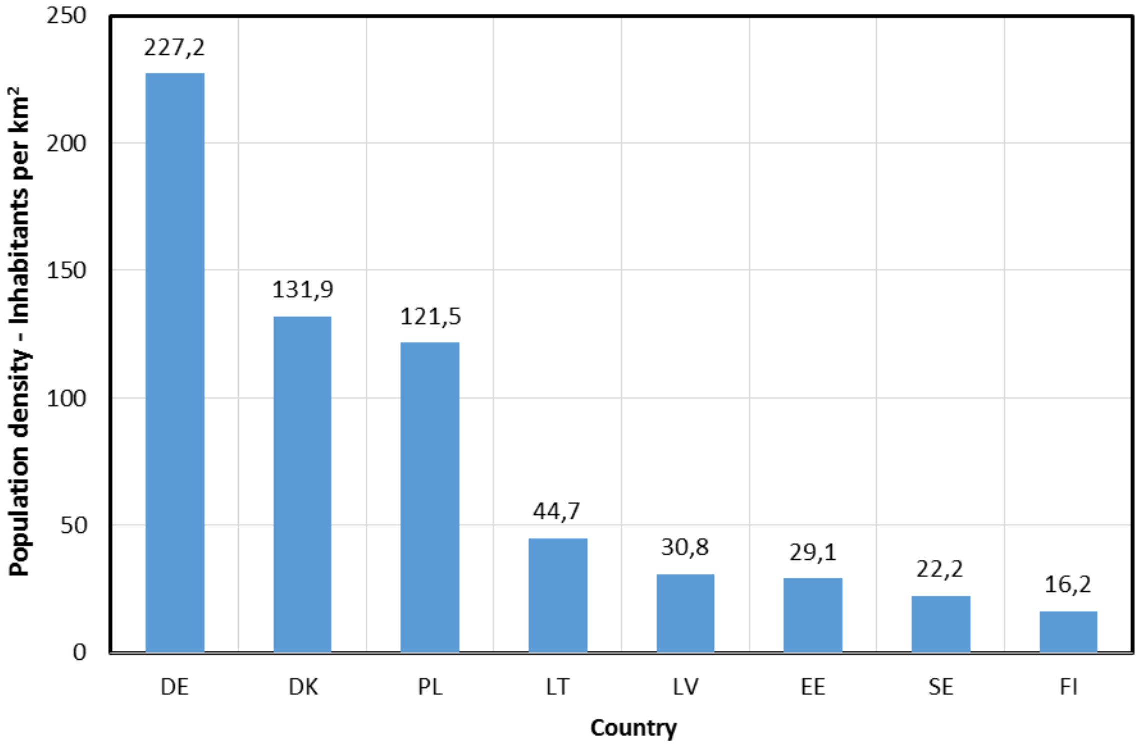


Figure 1: Population density in the participating countries[20]

2.1.2 National targets for the expansion of renewable energies and ways to achieve them

Different national targets for the expansion of renewable energies can be one reason for the different status of their use. In the following, first the EU targets and then the national targets for the expansion of renewable energies as well as ways of achieving them will be analysed.

European Union - Common Framework for National Renewable Energy Sources – Targets

The EU's Renewable Energy Directive 2009/28/EC /9/ sets a binding target of a 20 % share of renewable energies in final energy consumption to be achieved by 2020. As these must continue to play an important role in European energy policy after 2020, the member states have already adopted new energy and climate protection targets. These account for a minimum share of renewables of 27 % in final energy consumption by 2030. The total emissions of the EU are to be reduced by 40 % compared to 1990. To this end, the following targets are further to be achieved by 2030:

- Reduce emissions from major emitters (energy installations, oil and gas) by 43 %,
- Reduce emissions from existing buildings, agriculture and transport by 30 %,
- Increase the share of renewable energies in final energy consumption to at least 27 %[21].
- Improvement of energy efficiency by at least 27 %.

In 2016 the European Commission published a proposal for a further developed Renewable Energy Directive /10/[22]. With its implementation, the EU aims to ensure that the above-mentioned targets

---

[20] Data source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_statistics_at_regional_level#Population_density.

[21] The EU is currently negotiating a stricter target to achieve at least 32 % share of RE in primary energy consumption by 2030. This share is currently around 16.7 % (end 2016, /57/, p. 25).

[22] This proposal was amended again in 2018: European Parliament amendments of 17 January 2018 on the proposal for a directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast) (COM(2016)0767 - C8-0500/2016 - 2016/0382(COD)).

are achieved and assumes global leadership in the use of renewable energies. The European Parliament decided in 2018 on a renewable energy target of 35 % by 2030[23].

National targets for renewable energy expansion in the Baltic Sea Region

The participating countries have each developed their own targets, which should also contribute to achieving the overall EU targets or even go beyond them. Sweden has set itself the most ambitious target with a 49 % share of RE in final energy consumption, including 10 % in transport by 2020.

All participating countries have adopted national programmes or plans to achieve their RE development targets. These plans include sectoral targets for electricity generation, heat supply and transport. They include policy measures to achieve these targets and information on the renewable energy mix to be achieved.

Comparable national targets for RE expansion are defined in particular as renewable energy shares in final energy consumption and in electricity generation.

Table 2 compares the current RE targets of the participating countries. According to this, the target shares of RE in final energy consumption are often higher than the envisaged EU target.

In addition, the participating countries have set themselves a number of individual targets, e.g. for the reduced use of fossil fuels or for climate protection.

Denmark's targets are based both on specific national targets and on the country's commitments to the EU and UN[24]:

- According to the 2015 government platform, the use of fossil fuels should be completed by 2050.
- The Danish Climate Protection Act envisages a "low emission society" by 2050.

Germany adopted a comprehensive strategy with its energy concept /12/ in 2010 that includes both medium-term (2030) as well as long-term (2050) targets. The Renewable Energies Act (REA) stipulates the expansion of offshore wind farm capacity by 700 MW/a between 2023 and 2025 and by 840 MW/a between 2026 and 2030 (North Sea and Baltic Sea).

Estonia's energy sector is mainly based on domestic oil shale, whose intensive use causes high GHG emissions[25]. The country's energy policy therefore focuses on reducing the CO_2 intensity of its energy sector /8/. A new development plan for this sector /11/ plans energy and climate policy goals and measures for the period up to 2030 and gives an outlook up to 2050. It proposes a 45 % share of RE in final energy consumption.

Latvia has a long-term energy strategy since 2010 ("Strategy 2030") /13/, which includes both energy-related targets and planned policy measures. According to this strategy, half of the final energy consumption is to be provided by renewable energies by 2030. In 2016, guidelines for the development of the energy sector 2016-2020[26] were adopted, according to which the Latvian energy production system is to be restructured.

[23] For further information: https://ec.europa.eu/energy/en/topics/renewable-energy.

[24] Source: https://ens.dk/en/our-responsibilities/energy-climate-politics/danish-climate-policies.

[25] See section 1.1.1.

[26] Source: Guidelines for Energy Sector Development 2016-2020 (2016). Available at: http://tap.mk.gov.lv/lv/mk/tap/?pid=40342629&mode=mk&date=2016-02-09.

Table 2: Renewable energy expansion targets of the participating countries 2015[27]

Target → / Country ↓	Share of RE in final energy consumption		Share of RE in electricity generation	
	Share	Target (2015)	Share	Target (2015)
1	2	3	4	5
Denmark	30	35 % by 2020 100 % by 2050	51	50 % by 2020 100 % by 2050
Estonia	25	25 % by 2020	15.1	17.6 % by 2020
Finland	39.3	38 % by 2020 40 % by 2025	33	33 % by 2020
Germany [a)]	14	18 % by 2020 30 % by 2030 45 % by 2040 60 % by 2050	31	40-45 % by 2025 55-60 % by 2035 80 % by 2050
Latvia	38	40 % by 2020	52	60 % by 2020
Lithuania	26	23 % by 2020	16	21 % by 2020
Poland	12	15.5 % by 2020	13.4	19.3 % by 2020
Sweden [a)]	54	50 % by 2020	65.8	62.9 % by 2020

a) The targets for the share of RE in final energy consumption to be achieved by 2020 are set for all EU-28 countries in EU Directive 2009/28/EC. Germany and Sweden have set themselves higher targets as indicated above.

In 2018 ***Lithuania*** updated the National Strategy for Energy Independence from 2012 with initiatives /23/ and extended it by guidelines for the development of the energy sector until 2030/2050. Accordingly, Lithuania wants to be independent of fossil fuels by 2050 and to have completely converted its energy supply to renewable energies. In order to achieve this goal, the share of RE in final energy consumption is to increase to 70 % by 2050. In addition, the share of renewable or local energies in heat generation should also rise to 70 % by 2020 /15/, p.2.

Poland has not yet presented a climate-related strategy for the period after 2020. However, the government is preparing a new energy policy for 2050 with a focus on 2030. By 2030, hard coal and lignite are expected to account for around 60 % of the energy mix. Only afterwards these will be gradually reduced to 50 % by 2050. The new National Programme for a Low-Emission Economy will also provide for the expansion of the use of low-carbon energy sources and the improvement of energy efficiency. Offshore wind farms, gas-fired power plants and other renewable energies are expected to play a major role. Compared to the National Renewable Energy Action Plan for 2020[28], Poland is on track to meet its targets for renewable heat/cooling. However, the current share of RE in electricity and transport is below the NREAP targets.

Finland has set medium-term energy and climate targets in a National Energy and Climate Strategy (2013). According to this strategy, wind power generation is to increase to 6 TWh by 2020 and to 9

27 Compiled from /58/, p. 187.

28 NREAP - National Renewable Action Plan 2020 /4/.

TWh by 2025. The strategic goals of the current government program "Finland - a country of solutions" also include bioenergy and environmental protection. The share of RE should be at least 50 % by 2020 and at least 55 % by 2050 /17/, p.24.

Sweden's integrated energy and climate protection policy aims at a sustainable, secure and competitive energy supply and compliance with the country's commitments to the EU and the UN. The renewable energy targets decided in 2008 provided for at least a
50 % share of RE in energy consumption and 10 % in transport by 2020. According to the now intensified target, 100 % RE-based electricity generation should additionally be achieved by 2040 /55/. The vehicle population should be independent of fossil fuels and climate-neutral by 2030. Energy efficiency is to be increased by 20 % by 2020 compared to 2008. Finally, several steps have already been taken towards a strategy for decarbonisation by 2050. It should lead to a fully renewable energy supply by 2040/2045 and to a zero-emission society by 2050. In Sweden, there are also numerous regional environmental guidelines and action plans to implement decarbonisation.

However, many targets are probably still too low with regard to the Paris Accord[29] adopted by the UN Climate Change Conference in Paris in 2015. As studies show, a complete decarbonisation must be achieved by 2045. Even though scenarios exist for the development of power generation, targets for the contributions of individual energy sources, such as offshore wind energy[30], are lacking.

Ways to achieve the defined targets for renewable energy development in the Baltic Sea Region

There are a number of ways and instruments available to achieve the renewable energy expansion targets. First, transnational economic instruments that do not distort competition, such as carbon dioxide taxes, international emissions trading and the certification of RE electricity, can contribute to achieving the targets.

Guided by the insight that markets alone cannot produce the desired share of renewable energy, the EU has developed funding programmes as a further important means of contributing to the achievement of the national targets for the expansion of renewable energy[31].

Instruments have also been established at the national level of the countries, e.g. in the form of various support programmes and laws. One example is the Renewable Energy Act in Germany. It guarantees priority feed-in and feed-in tariffs for renewable electricity.

At national and regional level, informal instruments can contribute to the achievement of RE development objectives. These can be commissions, initiatives and citizens' alliances. They strengthen the social discourse on renewable energies, participation and possibly set priorities with regard to the preferred renewable energy sources to be used. They can improve the social acceptance of renewable energies and thus pave the way for more projects.

Sweden, for example, intends to appoint a cross-party Energy Commission to ensure a long-term and sustainable agreement on energy policy issues. The starting point for discussion in this commission is set by the government and should be the substitution of nuclear energy by renewable energies and energy efficiency measures. Both are important steps towards the goal of full renewable energy supply. Another example is the solar strategy proposed by the Swedish Energy Agency in 2016.

Although certain renewable energies have greater potential in all participating countries, there are clear differences in the preferred renewable energies and energy technologies. Finland, for example,

---

29 This climate conference was of central importance, as it resulted in the adoption of a new international agreement succeeding the Kyoto Protocol. In the agreement, all countries committed themselves to changing the global economy in a climate-friendly way (under the Kyoto Protocol, only a few industrialised countries were obliged to reduce emissions).

30 Quoted after: Baltic Lines - Interim summary of the EU and country targets for 2030 and 2050 /52/.

31 Source: https://ec.europa.eu/energy/en/topics/renewable-energy/support-schemes.

sees its greatest opportunities for achieving its renewable energy expansion targets in increasing liquid biofuel and biogas production and in improving the technologies used for this purpose /17/, p.24. Biomass is also the most important renewable energy source for Estonia: it supplies 70 % of the district heating generated. The wind energy and solar potentials for hot water generation are also high /8/, p.9. Sweden, on the other hand, currently primarily uses solid biomass and waste as well as onshore wind energy /54/, p.79. In Lithuania, on the other hand, the district heating supply is of great importance: in this case the expansion of RE requires renewable energy sources that are suitable for district heating generation[32].

2.1.3 Political and legal framework for the expansion of renewable energies in the Baltic Sea Region

Energy Policies

Due to the similarities of the participating countries in the Baltic Sea Region, there are also similarities in their basic energy policy lines, especially since these are already "synchronised" at least to some extent by EU directives and UN climate protection policy. Thus, the countries present plans for achieving the EU targets for renewable energies (EU Directive 2009/28/EC) or long-term strategies for achieving their climate protection targets, as required by the Paris Agreement. At the same time, the countries still pursue their own energy policies that follow their respective national framework conditions and preferences. These must be taken into account when deriving recommendations for improving spatial planning for renewable energies:

Denmark: The overriding goal of Danish energy policy is to become independent of fossil fuels by 2050. This goal is to be achieved primarily with renewable energies and increased energy efficiency. To this end, the country has adopted an "Energy Strategy 2050" /47/. This strategy covers all sectors: electricity, heat and transport and defines a number of cross-sector policy objectives. In addition, the government adopted a new "Energy Agreement" in 2012, which is intended to secure broad political support for the energy strategy and for further concrete policy initiatives required to achieve the targets.

Germany: Germany's energy and climate protection policy underwent a significant turnaround in the wake of the nuclear accident in Japan in 2011. The German government adopted an "Energy Concept 2050" /12/ with basic guidelines for a change in energy supply. By 2050, primary energy consumption is to be halved compared with 2008 and renewable energies are to achieve a share of 60 %[33]. To this end, the use of fossil fuels must be phased out and the energy supply must gradually become more sustainable and competitive. The core elements of energy and climate protection policy are therefore a "Climate Protection Action Programme 2020" /19/ and a "National Action Plan for Energy Efficiency" (NAPE) /20/. In 2016, the Federal Government also presented a "Climate Protection Plan 2050" /22/. According to this plan, Germany should also become largely greenhouse gas neutral by 2050. In the medium term, i.e. by 2030, GHG emissions are to fall by at least 55 % compared with 1990 levels. The first steps of transforming the energy supply, known as the Energy Turnaround, have been implemented very successfully. Nevertheless, there are still unsolved problems: Examples include the slow expansion of electricity transmission grids to integrate the growing renewable generation capacity, and the transformation of energy markets to limit the rise in electricity prices. At present, progressive energy and climate change policies and the Energy Turnaround seem to be losing momentum. In particular, recent political and legal developments are slowing down the further expansion of renewable energies. One example of this is the amended Renewable Energy Act (REA) of

32 In Lithuanian cities, approx. 72 % of the living space is centrally heated, the installed thermal capacity is almost 10 GW and the annual heat production 9.4 TWh. Source: https://enmin.lrv.lt/en/sectoral-policy/heat-sector-1.

33 Source: https://www.umweltbundesamt.de/en/topics/climate-energy/climate-protection-energy-policy-in-germany and https://www.bmwi.de/Redaktion/EN/Dossier/energy-transition.html.

2017 /21/. Germany must currently assume that it will fail to meet its national and international targets.

Estonia: In 2009 the Estonian Parliament adopted a "National Development Plan for the Energy Sector until 2020" /11/. This plan was updated up to 2030 in 2013 and extended to include a forecast for the year 2050. The plan coordinates the introduction of sector-specific laws and regulations. The government has also development plans for the electricity sector, oil shale production, bioenergy and energy efficiency /8/.

Latvia: In 2016 the Latvian government adopted guidelines for the development of the energy sector 2016-2020, according to which energy security, competitiveness and sustainable energy supply are central objectives of energy policy. As a contribution to the sustainability of the energy sector, the National Development Plan aims to increase the share of RE in primary energy consumption while concentrating on competitive energy prices. Since these goals are contradictory, the government must find ways to achieve both /14/.

Lithuania: Energy independence is a key objective of Lithuania's energy policy. To this end, the energy sector has already been fundamentally restructured. The diversification of energy sources has opened up new development opportunities for the country. In addition, economic competitiveness, energy efficiency and an efficient energy infrastructure are important strategic goals. Their achievement requires a significant expansion of renewable energies, in particular wind energy from the Baltic Sea and bioenergy /15/, p. 2/4. On 21 June 2018, the Lithuanian parliament approved a revised "National Strategy for Energy Independence" /23/ in which renewable energies have been strengthened once again. The strategy contains the country's most important energy targets for 2030 and defines guidelines for energy development until 2050. Two major projects are planned to strengthen energy security: The synchronisation of the Lithuanian electricity grid with the European interconnected system by 2025 and the construction of a gas link between Lithuania and Poland by 2021. In order to reduce the country's dependence on electricity imports, it is planned to create its own reliable and competitive electricity generation. To this end, but also to achieve the EU's climate targets and to reduce dependence on imported fuels, renewable energies are to be expanded. By 2030, 45 % of electricity consumption and 90 % of heat consumption are to be generated from renewable energy sources, and 100 % by 2050[34]. By 2020, the share of RE in final energy consumption should rise to 23 % of total consumption and at least 10 % of transport consumption. Between 2007 and 2014, the share of RE in final energy consumption increased by 9.16 % to 23.66 %, which means that Lithuania has already reached the target of 23 %[35]. In addition, Lithuania has set sectoral targets in its "Law on Energy from Renewable Sources" /25/: The share of RE in electricity generation should rise to at least 20 %, in district heating to at least 60 % and in private households to at least 80 % of the respective energy consumption.

Poland: The use of coal dominates Poland's energy consumption: Poland is one of the largest coal consumers in the world and the second largest in the EU after Germany. Poland sees the use of its large domestic coal reserves as an opportunity to guarantee its energy security and independence from energy imports. Also the fact that Poland is not yet included in the Nord Stream could play a role in this orientation of energy policy. However, the consumption of various coal products, e.g. for domestic heating, not only leads to considerable air pollution, but also to high GHG emissions[36]. A

---

[34] Source: https://enmin.lrv.lt/en/news/seimas-approves-progressive-and-innovative-lithuanian-energy-strategy.

[35] Source: https://enmin.lrv.lt/en/sectoral-policy/renewable-energy-sources.

[36] Poland ratified the Paris Convention in October 2016 on the assumption that emission reductions may also be achieved by increasing CO_2 sinks. The Polish government therefore sees the increased CO_2 sequestration in so-called "forest carbon farms" as an essential opportunity to achieve the objectives of the Paris Convention and at the same time continue the use of coal. Source: https://www.mos.gov.pl/en/news/details/news/minister-szyszko-our-aim-is-to-present-the-forest-carbon-farms-to-the-world/.

special feature of the use of renewable energies in Poland is that a large proportion of it comes from the co-incineration of coal and biomass. For this reason, the use of renewable energies depends on the use of fossil fuels. Although Poland has been able to significantly increase the share of renewable energies in final energy consumption in recent years, it is still relatively low at 12 %, Figure 5 and Table 4 on pages 30 and 31 respectively[37]. If Poland's future energy policy continues to support the use of coal in the energy sector, it will also influence the further expansion of renewable energies.

Finland: Finland wants to become a CO_2-neutral society. The country's energy and climate protection policies are closely interwoven, as almost 80 % of Finland's GHG emissions are caused by its energy supply. A "Roadmap for Energy and Climate Protection 2050" /48/ was presented in 2014, followed by a report on policy options in 2015. The national energy and climate change strategy, which is currently under revision, identifies measures to achieve targets for the year 2030, which have been specified in a government programme. In addition, the country aims to reduce its GHG emissions by 80 - 95 % by 2050 /17/. The government is currently revising its energy and climate change strategy and its medium and long-term climate change plans in order to safely meet the country's and the EU's 2030 climate change targets[38].

Sweden: With its low carbon intensity and high share of renewable energy in energy consumption, Sweden is one of the leading IEA member countries[39]. This is the result of strict CO_2 and energy taxation, emissions trading and the promotion of renewable energies within the framework of an electricity certificate system /54/, p.9. To continue these political efforts, the Swedish government and important political actors concluded an agreement in 2016 on a long-term energy policy as a common roadmap for the transition to a predominantly renewable electricity supply. It is agreed that Sweden must have a robust electricity supply with high supply security and low environmental impact and must offer electricity at competitive prices. At the same time, the country is committed to achieving global climate goals. Sweden wants to become one of the first countries in the world to manage without fossil fuels. A government initiative called "Fossil Free Sweden" brings together stakeholders from business, municipalities, regions and organisations from all over the country. All stakeholders are given the opportunity to present their specific contributions to climate protection[40].

The participating countries therefore pursue quite their own individual energy and climate protection policies. Improving the planning perspectives for renewable energies in the Baltic Sea Region will therefore only be successful if national peculiarities are included in the development of recommendations for harmonised or transnational planning. Due to these special features, only recommendations and implementation proposals that open up concrete possibilities for countries to expand renewable energies in accordance with their circumstances and thus contribute to common goals for energy and climate protection can be successful.

Spatial planning systems and legislation on the planning and use of renewable energies

In the participating regions and countries, both spatial planning and the use of renewable energies are comprehensively regulated by law[41]. The number and purpose of the laws differ from country to country, as do the spatial planning systems, but there are also commonalities.

---

37 In Germany, the share of RE in final energy consumption is hardly higher. However, Germany is currently setting up a "coal commission" with the aim of phasing out coal use in the next few years.

38 Source: https://tem.fi/en/energy-and-climate-strategy.

39 The International Energy Agency (IEA) was founded in 1974 to improve the energy security of its member countries and to develop energy analyses and statistics for them. The IEA currently unites 29 member countries worldwide, including all BEA-APP countries except Latvia and Lithuania. The European Union is also involved and participates in the activities of the IEA.

40 Source: https://www.government.se/articles/2016/06/agreement-on-swedish-energy-policy/ und https://www.government.se/government-of-sweden/ministry-of-the-environment/.

41 Annex 2 gives an overview of the applicable laws.

In a comparison of national legislations, two planning approaches can be typified which characterize the regulation and planning of renewable energy plants /2/, p.17. One of these planning approaches - the Residual Area Approach - is based on the recording of the remaining areas for renewable energy plants, after all other land use considerations have been set by the state, municipality and other authorities. The other planning approach - the Optimal Resource Approach - is based on the selection of areas where a renewable energy source is available. This planning process aims to include all necessary natural and environmental aspects, but with the valuable renewable energy source as a starting point[42].

National legislation[43] and spatial planning systems reflect *on the one hand* - and in addition to other issues such as technical or natural prerequisites - national particularities. Recommendations for improving the planning perspectives for renewable energies in the Baltic Sea Region could therefore aim to strengthen the respective country-specific renewable energy sources. *On the other hand*, existing national legislation may also contain some inefficiencies. Another way of increasing the use of renewable energies in the Baltic Sea Region is therefore to make recommendations that bring the respective national framework conditions closer to those of the countries that are particularly successful in planning and using renewable energies. In the following, the most important characteristics of selected spatial planning systems in the countries of the Baltic Sea Region are described in more detail - including the spatial planning systems in Denmark and Sweden, which are very successful in the planning of renewable energies.

Denmark: The Danish spatial planning system[44] is often regarded as a very successful planning system. Its structure and the most important features of the individual levels are shown in Figure 2. There are three levels: national - with a national planning report, regional - with strategic (regional economic) development planning and local - with 98 municipalities that are the most important actors in land use planning: They carry out strategic forward planning for their territory and develop detailed municipal and local plans that control land use /31/, p.81.

In Denmark, spatial planning is decentralised and has involved the public in decision-making processes since the 1970s. The Danish Planning Act divides the responsibility for planning in Denmark between the Danish Minister of Industry, Economy and Finance, the five regional councils and the 98 local councils. The Danish government lays down general guidelines for planning. In 2007 a government planning committee for onshore wind energy use published a report with recommendations and principles for future planning /32/. The municipalities then plan how the Danish cities and landscapes should develop within the framework of the state and regional guidelines. The municipalities are responsible for translating these guidelines and visions into concrete spatial planning. Therefore, the municipalities use municipal and local development plans as planning instruments. The municipal plan defines the overall objectives and guidelines for the development of the individual municipalities for a period of 12 years. These local development plans form the basis of the Danish spatial planning system. They enable the citizens of a municipality to relate the political and planning objectives of the municipal plan directly to their living environment and compare them with their own ideas.

Danish strategic heat planning is of particular importance. Denmark adopted its first Heat Supply Act in 1979, which contained a comprehensive public heat plan that made it possible to finance a common district heating infrastructure. At the same time, a connection obligation was introduced to ensure sufficient heat abstraction and a flexible, energy- and cost-efficient supply of heat. Today, district heating covers 80 % of Denmark's heating needs[45].

---

42 In /2/, similarities and differences in national legislation are described exemplarily by comparing the approval processes for a biogas plant in Finland and Denmark.

43 Annex 3 provides an overview of the spatial planning systems mentioned here.

44 Source: https://danishbusinessauthority.dk/danish-spatial-planning-system.

45 Source: https://stateofgreen.com/en/sectors/district-energy/district-energy-planning/.

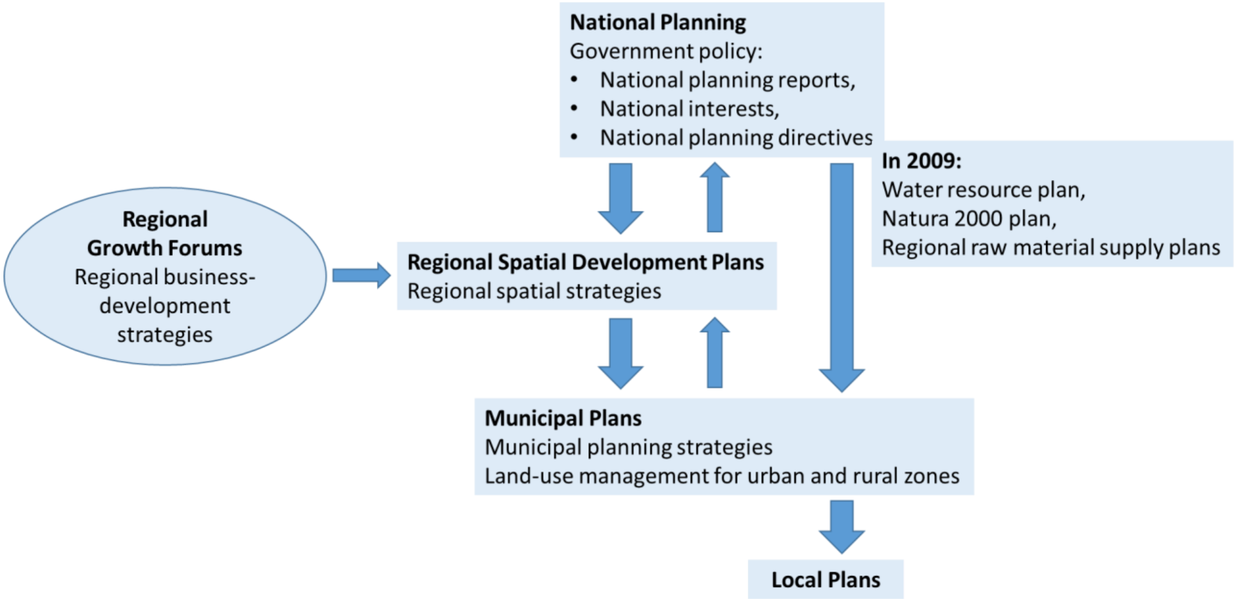


Figure 2: System of spatial planning in Denmark[46]

The Danish municipalities and regions are thus subject to statutory obligations such as municipal heat planning, wind energy planning and biogas planning. In addition, they have decided to develop strategic energy plans together with their respective regions in order to contribute efficiently to the implementation of the government alliance for the climate strategy 2050, which was concluded in 2012 (14 such projects were implemented in 2014/15[47]).

The Renewable Energies Promotion Act of 2009 is important for the expansion of renewable energies. It regulates possibilities for the promotion of onshore wind energy.

In addition, the law required all municipalities to collectively prepare and adopt an amendment to their municipal plans. These were to reserve land for a total capacity of 75 MW of wind turbines to be installed in 2010 and 2011[48].

Germany: Spatial planning in Germany is a system aimed at balancing different user interests. It has a fourth planning level with the federal state (Länder) level, Figure 3.

The legal basis for spatial planning is formed by the Federal Act on Spatial Planning (ROG) /34/ and the Federal Building Code (BauGB) /35/, which, for example, are supported for M-V by the Regional Planning Act M-V (LPlG M-V) /36/ and the Regional Building Code (LBauO M-V) /37/. Also important are the Federal Building Utilisation Ordinance (BauNV) /38/ and the Federal Nature Conservation Act (BNatSchG) /39/. The conditions in the respective federal states (Länder) are similar since they, for example, often base their legislation on the federal level and coordinate among themselves[49].

46 Source: https://www2.skovognatur.dk/udgivelser/2006/87-7279-728-2/html/kap03_eng.htm.

47 The Zealand Region Strategic Energy Plan is the result of a regional partnership between 16 municipalities in the region, 19 utilities, the Energy Cluster Zealand (a non-profit organisation founded in 2009 with funding from the European Regional Development Fund and owned by the municipalities and the Zealand Region) and the University of Roskilde /27/, p.6.

48 Source: http://www.ens.dk/sites/ens.dk/files/supply/renewable-energy/wind-power/onshore-wind-power/Promotion_of_Renewable_Energy_Act_-_extract.pdf.

49 The Ministerial Conference for Spatial Planning (MCSP) is the body for coordination between the Federal Government and the Federal States on spatial planning issues. The MCSP deals with fundamental questions of spatial planning and development. The MCSP 's permanent office is the Federal Ministry of

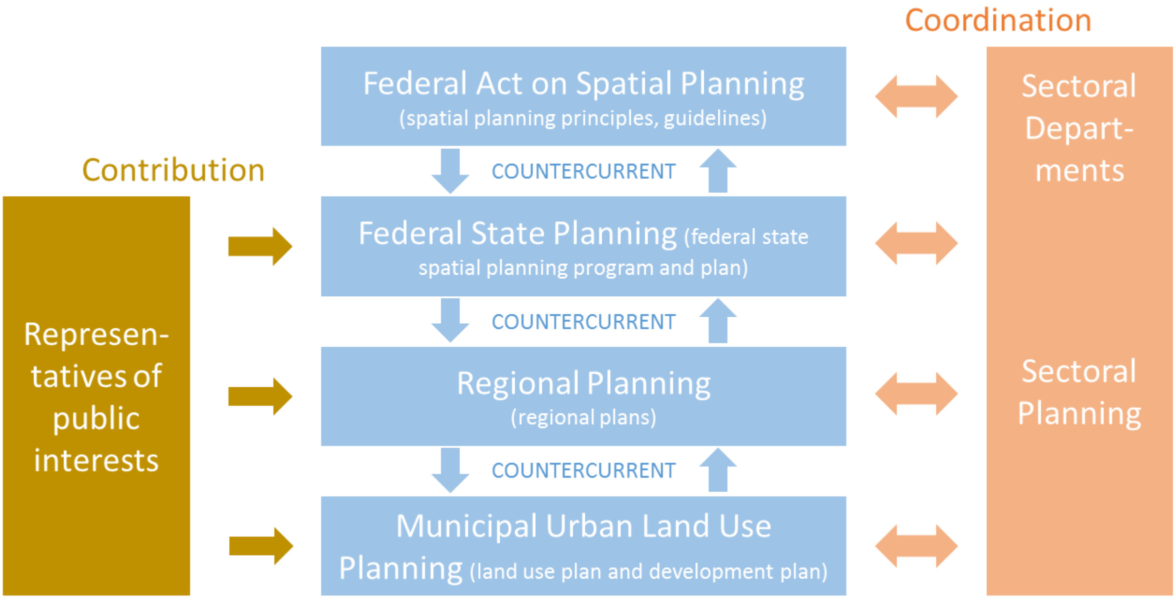


Figure 3: System of regional planning in Germany[50]

There is a whole range of sectoral planning with specific contents (landscape, agricultural structure and forest, transport, water management, waste) in the German system of spatial planning. Additionally, there are supplementary plans (spatial use concepts, plans for protected areas, climatological preliminary plans, etc.). Renewable energies have contextual touching with all these planning aspects, because they require land, change landscape and agricultural structures, generate or use transport and waste, etc.

The strategic "Guiding principles for spatial development in Germany" /33/ adopted by the Ministerial Conference on Spatial Planning in 2016 set accents for the spatial planning of the federal government and the federal states, but also provide orientation for the subordinate planning levels - regional planning bodies, municipalities and associations of municipalities. The guiding principles are: strengthening competitiveness, securing services of general interest, controlling and sustainably developing land uses, as well as shaping climate change and energy system transformation (the latter is intended to strengthen regional planning as an interdisciplinary policy at federal and county level)[51].

In Mecklenburg-Vorpommern, the planning system is formed, among others, by four planning regions, the associated regional planning associations and offices for regional planning and state planning. The available instruments are shown in Figure 4. The regional planning must, on the one hand, respect the requirements of state planning and concretize them for the region and, on the other hand, take into account the concerns of sectoral planning and municipal urban land use planning. It must examine the development concepts of the municipalities[52], weigh them against and among each other, and incorporate the results into its regional plans.

Transport and Digital Infrastructure (BMVI). Source: https://www.bmvi.de/DE/Ministerium/Minister-konferenzen/Ministerkonferenz-Raumordnung/ministerkonferenz-raumordnung.html.

50 Source: https://www.arl-net.de/system/files/planungssystem_de.jpg.

51 A wide variety of interests in use must be weighed up since land area is a scarce resource, decisions taken have a long-term effect and partially anticipate later decisions. For this purpose, the spatial planning system in Germany uses the instruments "spatial planning plan", "spatial planning procedure" and "spatial planning cooperation". Source: https://www.bmvi.de/DE/Home/home.html.

52 Source: https://www.regierung-mv.de/Landesregierung/em/Raumordnung/Regionalplanung/.

There are sectoral plans and instruments such as landscape (framework) or green area plans at all planning levels subordinate to the national level. At the municipal level there is, among others, the preparatory and the binding land-use plan.

The federal government itself can, for example, draw up cross-border spatial planning plans for flood protection and is responsible for spatial planning in the Baltic Sea and thus also for the planning and approval of, for example, offshore wind farms.

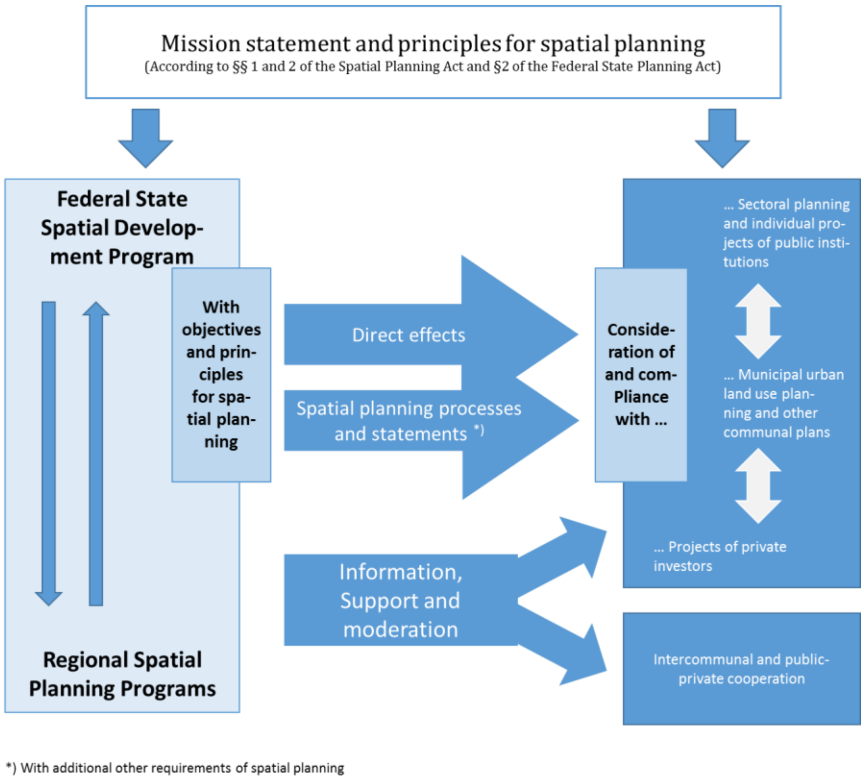


Figure 4: Instruments of regional planning in Mecklenburg-Vorpommern[53]

Estonia: The Estonian spatial planning system is based on a planning law that entered into force on 1 January 2003 and consists of four hierarchical planning levels: national, regional (county), urban/rural plans and detailed planning build on one another. Local administrations are also required to develop urban and rural development plans and a number of sectoral plans (e.g. water supply, sanitation, waste) /60/, p.41.

A wide variety of interactions and planning coordination are possible between the individual planning levels and plans: Planning can react promptly and flexibly to challenges by changing planning at lower levels. In addition, the Planning Act does not draw any sharp lines between levels and planning types. However, plans below the regional plans no longer contain land-use planning, while immobile planning objects are exclusively subject of detailed planning /60/, p.3.

Latvia: The objective of spatial planning in Latvia is to promote a sustainable and balanced development of the country. This includes assessing the territorial development potential of the state, region and municipal areas and defining usage, requirements and constraints. Spatial planning have to be in line with the spatial planning activities of neighbouring countries and those of the European Union. The Spatial Planning Act of 2002, which upheld the spatial planning principles implemented and developed in 1994, stipulates that the following principles must be observed in all types of spatial plans:

53 Source: https://www.regierung-mv.de/Landesregierung/em/Raumordnung/.

sustainability, the harmonization of interests; continuity, succession, diversity, competition and public relations. The legal background of the spatial planning system in Latvia can be characterized as follows: The basic implementation tools of the spatial planning system are laws, and provisions of regional and local self-governments. Spatial development is governed directly by the specific legislation - by the Planning Act and the decree issued by the Cabinet of Ministers, as well as the binding regulations of the regional and local governments on land use and building policy. Spatial planning is defined indirectly - it is governed by sectoral laws with spatial dimensions or includes specific areas, such as: Construction, transport, infrastructure, public service, environmental protection, heritage and other sector-specific laws and regulations.

Lithuania: The Lithuanian planning system, like the Estonian and Latvian systems, was established in its present form after 1991. The Spatial Planning Act adopted in 1995 states that territorial planning is to be carried out at national, regional, local and municipal level. It distinguishes between general, sectoral and detailed planning. Sectoral planning has not been classified according to spatial levels, the Law on Spatial Planning only defines its objects, e.g. forest and water resources, infrastructures, protected areas or natural and immovable cultural assets.

Overall, the system and hierarchy of spatial planning in Lithuania are quite complex compared to other EU countries, and also the planning processes at the local level are described as complicated /61/, pp.8/3: For cities, general plans have to be drawn up for the entire city as well as for districts. On the other hand, detailed plans must cover the entire city. A separate law on regional development was passed in 2002. Since then, planning has been regulated equally by two laws at national and regional level. Accordingly, there are two planning processes and two structures of planning documents. In 2002/2004, the government also adopted "Recognised Methods of Strategic Planning"[54]. The resolution establishes, among other things, a methodological link between spatial and financial planning of the relevant territorial units. The legal regulations are supported by ordinances. There are, for example, regulations for sectoral planning for communications and transport as well as infrastructure (heat, electricity, gas and oil supply networks). According to a law on local self-government in Lithuania, municipalities have three degrees of autonomy. Spatial planning and related issues such as cultural and landscape protection or technical infrastructure planning can be planned "with limited independence" by the municipalities /61/, p.26.

Finland: The main law on land use control, spatial planning and construction in Finland is the "*Land Use and Building Act (LUBA 132/1999)"* /28/, which entered into force in 2000. This Land Use and Building Act aims to organise land use and construction in such a way that it creates the basis for a high quality of life. To this end, ecologically, economically, socially and culturally sustainable developments are to be promoted. In addition, it should be ensured that every inhabitant has the opportunity to participate in open planning processes. This should ensure high quality of published planning decisions and participatory processes and include a broad spectrum of planning expertise.

These general objectives are complemented by more specific objectives related to the control of land use planning and construction. All objectives have been developed to create a healthy, safe, attractive and socially functioning living environment, taking full account of the needs of different groups. Further details can be found in the *"Land Use and Building Decree (895/1999)"* /29/[55].

The Land Use and Building Act is also the basis for the conservation and protection of Finland's architectural heritage and cultural landscape. Further laws to protect the built environment and landscape

---

[54] The Government resolution of the Republic of Lithuania "On Approval of Methodics of Strategic Planning". 2002. 06.06. No. 827. (Lietuvos Respublikos Vyriausybės nutarimas „Dėl Strateginio planavimo metodikos patvirtinimo". 2002. 06.06. No. 827.).

[55] The building regulations were revised and came into force in January 2018, in accordance with the amendment to the Land Use and Building Act that came into force in 2013 (958/2012). One of the main objectives of the reform was to clarify the building regulations and to ensure coherence and predictability in the application of these. The aim was also to reduce the amount of regulations. Source: http://www.ym.fi/en-US/Land_use_and_building/Legislation_and_instructions/The_National_Building_Code_of_Finland.

can be found, for example, in the *"Building Protection Act and the Nature Conservation Act (1096/1996)"* /30/.

The Land Use and Building Act (currently under revision) and the Land Use and Construction Ordinance require that land use plans take account of the built environment and landscape[56]. The evaluation of the effects of a land use plan must also take into account the direct and indirect effects of its implementation on the cityscape, the landscape, the cultural heritage and the built environment.

Sweden: Also the **Swedish regional planning system** is very successful in the planning of renewable energies[57]. At the national level, the national strategy for regional competitiveness, entrepreneurship and employment 2007-2013, formulated by the Ministry of Enterprise, Energy and Communications, is the fundamental and on all important issues EU-compliant strategy paper. This strategy identifies national priorities for regional development: Innovation and renewal, qualification and improvement of labour supply, accessibility and strategic cross-border cooperation. It aims to provide guidelines for regional development work at national/regional/municipal level. The national priorities identified must be taken into account.

At the regional level, the ordinance on regional development work applies. According to this, each district must formulate a regional development programme (RDP). This is prepared by the self-administrated regions through discussions with the district parliament, the municipalities, companies and organisations in the district and related government offices, i.e. the responsibility for the formulation lies in principle with the district administrative council. However, the responsibility can be transferred to the association of municipalities, which has often happened.

Land use planning in Sweden is predominantly the responsibility of municipalities, in which the state can only intervene to a very limited extent *("municipal planning monopoly")*[58]. The state's intentions - e.g. national social aspects, infrastructures such as railways, roads or power plants, environmental protection and coastal protection - were first laid down in the *Natural Resource Act* (1987), which was replaced in 1998 by the *Swedish Environmental Code* (1998:808).

Swedish spatial planning and regional development have undergone a number of changes in recent years, which have been described as follows: "There is obviously no single Swedish model for regional planning or regional development." /42/[59]. These changes in recent decades have affected, among others, legislation and led to an increasing neoliberalization of planning[60], which gives private actors a greater influence on the planning processes /56/. As a result, the balance of power in the Swedish spatial planning system has shifted and with a focus on more collaborative planning approaches, spatial planning has become more complex. It is becoming more entrepreneurial in order to implement more projects. The planners themselves see it as a challenge to discuss all future building projects with the private parties. If cities want to develop certain areas, this must be done in cooperation with the developers. Due to the need to consider more issues such as the environment and

---

[56] Source: http://www.ym.fi/en-US/Land_use_and_building/Legislation_and_instructions/Legislation_on_building_and_landscape_protection.

[57] See also: https://www.boverket.se/en/start/building-in-sweden/swedish-market/laws-and-regulations/planning-process/.

[58] The only reasons the nation could interfere with municipal planning (comprehensive plan, detailed plan and territorial regulations) through the county council are: (1) a national interest is not taken into account; (2) inter-municipal planning issues have not been coordinated; (3) an environmental quality standard is not met; (4) coastal protection is lifted but is contradictory; and (5) the regulations or planned buildings are inappropriate for health, safety, disaster, flood or erosion risks.

[59] Quoted after: An Overview of Spatial Policy in the Sweden: http://www.mlit.go.jp/kokudokeikaku/international/spw/general/sweden/index_e.html.

[60] This means more market-oriented planning. It is possible that the aforementioned development (neo-liberal shift) can be found not only in Sweden, but also in other participating countries.

public participation, planning in Sweden seems to have become more political and articulate in the last 10 to 15 years. It can be said that nowadays, planning in Sweden is linked to the promotion of the local economy and at the same time works towards sustainable development.

2.1.4 Interim Conclusion

The planning in the participating countries in the Baltic Sea Region is not uniform with regard to their political systems. The respective national circumstances influence the possibilities of forming political opinion, the ability to reach a consensus on long-term goals and the political decision-making process, also in the field of renewable energies. There are also certain differences in socio-economic conditions, which in turn influence energy consumption and thus the possibilities of meeting demand with renewable energies. Further differences are reflected, for example, in the energy policy preferences of the countries. Also the political and legal framework conditions for spatial planning show not only similarities but also differences:

- The basic structures of the spatial planning systems in the participating countries are quite similar and comparable. However, there are also differences, e.g. in the spatial hierarchies: municipal planning - regional planning - national planning. Other differences concern instruments (e.g. land use or urban land-use plans in Germany and their equivalents in other countries) and decision-making structures (e.g. planning and approval competences of municipalities in Sweden).
- For renewable energies, at least two different planning approaches are practised in the participating countries, which differ in the evaluation of renewable energies: The residual area approach looks for areas for renewable energies that are not claimed for any other land use. The resource approach, on the other hand, uses renewable energies as a starting point and searches for areas that offer optimal conditions for energy generation.
- The processes involved in planning and, in particular, approving renewable energy plants are sometimes complex and time-consuming. As a result, there is, for example, a demand to shorten the time required for procedures, in particular by streamlining participation processes (hearings).
- There are various planning requirements for certain renewable energy planning objects (e.g. for solar energy in Swedish municipalities), sometimes different intermediate results lead to the same consequences (e.g. in Denmark a biogas plant - regardless of its size, i.e. with or without environmental impact assessments - can in any case only be implemented by a municipal plan or by a supplement to it, i.e. integrated into existing planning).
- In some countries, e.g. Denmark, Germany and Estonia, there is a whole range of sectoral planning (landscape, agricultural structure and forestry, transport, water management, waste). Renewable energies have interfaces to virtually all these sectoral plans. Furthermore, there are supplementary plans (spatial use concepts, plans for protected areas, climatological preliminary plans[61], etc.), for example in Germany.

One important common feature, however, is the similar or even identical national targets that the participating countries have set themselves for the expansion of renewable energies by 2020, 2030 and 2050. Another important common feature is the socio-economic similarities, which are also expressed in comparable energy structures. Last but not least, all participating countries also have large and comparable renewable energy potentials and connectable infrastructures.

---

[61] On the one hand the climate is a natural factor influencing the use of space, on the other hand the use of space also influences the climate. In preliminary planning, proposals for the optimal type of land use are developed, e.g. for residential complexes or recreation areas, in order to take into account the climate potential of an area and to use it correctly /51/, S.167 ff.

2.2 Technical framework conditions for the expansion of renewable energies in the Baltic Sea Region

2.2.1 Energy Data

Differences in size and socio-economic conditions of the participating countries also result in differences in the energy consumption. Figure 5 compares their energy consumption, whereby for each country, in addition to primary energy consumption, the final energy consumption and its composition from fossil and RE shares are also plotted in relation to the number of inhabitants.

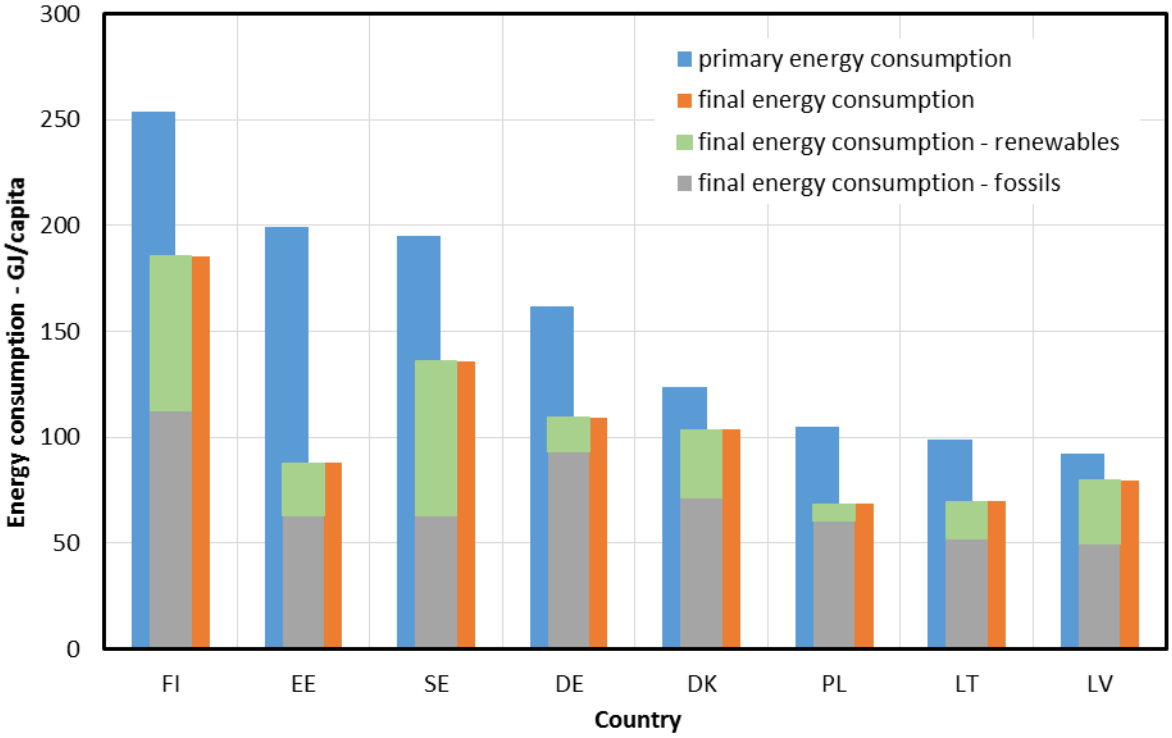


Figure 5: Energy consumption in the participating countries[62]

In addition, the following tables show important energy consumption indicators for the participating countries for 2015, including the final energy consumption further subdivided into electricity, heat and transport sectors and the share of renewable energies contained therein. It can be seen that their share in primary energy consumption and also in final energy consumption in the participating countries does not appear to be particularly high, with the exception of Latvia (in primary energy consumption) and Sweden (in final energy consumption).

Indicators of an economy, such as GDP per capita or energy intensity[63], can be seen as indicators of a country's economic and technological performance (among other influences, such as industry structure within the economy). Since some renewable energies are more knowledge- and technology-intensive than others, such indicators may change visibly with the continued expansion of these renewable energies. In this respect, such indicators can help to explain differences in the use of renewable energies between the countries of the Baltic Sea Region (at least to the extent that they are technology- or know how-intensive).

---

62 Data source: Eurostat.

63 Energy intensity is the amount of energy needed to produce one unit of GDP.

Table 3: Energy consumption indicators for the participating countries 2015[64]

Acronym	**Country**	PEC in PJ	PEC/capita in GJ/in-habitant	FEC/capita in GJ/in-habitant	PEC/FEC in -	Share of RE PEC in %	Energy Intensity in MJ / 1.000 EUR (GDP)
1	2	3	4	5	6	7	9
DK	Denmark	702	123.0	102.3	1.2	21.0	2.6
DE	Germany	13,155	160.1	108.1	1.5	12.4	4.3
EE	Estonia	262	199.0	88.0	2.3	20.6	12.9
LV	Latvia	183	93.1	80.5	1.2	**53.2**	7.5
LT	Lithuania	289	100.2	70.6	1.4	21.2	7.7
PL	Poland	3,996	105.2	68.6	1.5	9.0	9.3
FI	Finland	1,388	253.0	184.5	1.4	31.4	6.6
SE	Sweden	1,904	193.3	135.0	1.4	40.4	4.2
For Information: EU28		68,141	133.5	88.9	1.5	12.6	4.6

Table 4: Final energy consumption of the participating countries 2015[65]

Acronym	**Country**	FEC in PJ	Thereof Electricity	Heat	Traffic	Share of RE in FEC in %
1	2	3	4	5	6	7
DK	Denmark	584	111	266	207	30.8
DE	Germany	8,881	1,853	4,383	2,645	14.6
EE	Estonia	116	25	58	33	28.6
LV	Latvia	159	23	87	48	37.6
LT	Lithuania	204	33	94	77	25.8
PL	Poland	2,606	460	1,424	722	11.8
FI	Finland	1,012	283	529	201	39.3
SE	Sweden	1,330	450	517	363	**53.9**
Sum		14,892	3,238	7,359	4,295	-
For information: EU28		45,386	9,869	20,503	15,014	12.60

64 Data sources: Eurostat, /53/.
65 Data sources: Eurostat, /53/.

As the tables show, GDP and energy intensity vary considerably between countries. Denmark had the highest GDP in 2016 with 48,400 EUR per capita and the lowest energy intensity of 2.6 MJ per 1,000 EUR. The lowest GDP was recorded for Poland with 11,100 EUR per capita, the highest energy intensity with 12.9 MJ per 1,000 EUR for Estonia (i.e. not for the same country). Such conditions and differences have reasons which can determine, i.e. strengthen or weaken, the use of one or the other renewable energy source and thus the country-specific possibilities for it.

2.2.2 Renewable Energy Data

Data on the current status of renewable energy use are available, encompassing the EU as a whole as well as the individual participating countries, e.g. from European statistics, country statistics and national renewable energy progress reports, in which all EU countries report every two years on their progress towards meeting the EU's renewable energy targets for 2020. The European Commission then produces an EU-wide report, the latest edition of which was published in 2017. According to this:

- The share of RE in final energy consumption in the EU as a whole will reach around 16.4% by 2015,
- The majority of countries will meet their RE targets if they continue their efforts,
- Only a 6 % share of RE in the transport sector will be reached by 2015 (target: 10 % by 2020)[66].

Table 5 shows the total final energy consumption for the participating countries as well as broken down into electricity, heat and transport. The share of RE in the respective sectoral consumption is also given. Assuming that these indicators for the countries also approximately reflect the relationships within the pilot regions, it can be stated that the share of renewable energies in final energy consumption in the pilot regions is the same or higher than in the countries as a whole. This applies at least to Mecklenburg-Vorpommern and also Sjælland, South Estonia, Zemgale, District of Kaunas, West Pomerania, Central Finland and Blekinge are supplied with renewable energy in higher proportions than the respective countries as a whole /16/, p. 4. Denmark, Estonia, Finland, Latvia, Lithuania and Sweden are already above their target for 2020 (6 out of 11 in total) /16/, p. 112. For example, Lithuania achieved a share of RE in final energy consumption of 25.86 % in 2015 (+ 2.2 % compared to 2014). Electricity accounted for 15.55 % (+ 1.85 %), heating and cooling for 46.17 % (+ 5.5%) and transport for 4.56 % (+ 0.23 %)[67].

2.2.3 Interim Conclusion

The primary and final energy consumption of the participating countries form the framework for the expansion of renewable energies, just as the status of their current use. The participating countries can be roughly divided into groups on the basis of specific parameters that can be derived from this: Latvia, Lithuania and Poland consume relatively little primary and final energy per inhabitant. Significantly higher values are recorded for Denmark, Germany, Estonia and Sweden. Finland has the highest per capita consumption of energy.

One reason for this are differences in weather conditions: While Germany, Denmark and Poland have comparably low heating degree day figures (approx. 3,000 Kd), these - and thus also the heat energy consumption - are higher in Lithuania, Latvia and Estonia (approx. 4,000 Kd). By far the highest heating degree day figures are recorded for Sweden and Finland (approx. 5,200 and 5,500 Kd respectively).

---

66 Source: 4th progress report from MS (reference year 2015-2016). Available at: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports.

67 Source: https://enmin.lrv.lt/en/sectoral-policy/renewable-energy-sources.

Table 5: Final energy consumption and RE shares of the participating countries 2015[68]

Acronym	**Country**	FEC in PJ	FEC Electricity	Share of RE in %	FEC Heat	Share of RE in %	FEC Traffic	Share of RE in %
1	2	3	4	5	6	7	8	9
DK	Denmark	584	111	51.3	266	39.6	207	6.7
DE	Germany	8,881	1,853	30.7	4,383	12.9	2,645	6.8
EE	Estonia	116	25	15.1	58	49.6	33	0.4
LV	Latvia	159	23	52.2	87	51.8	48	3.9
LT	Lithuania	204	33	15.5	94	46.1	77	4.6
PL	Poland	2,606	460	13.4	1,424	14.3	722	6.4
FI	Finland	1,012	283	32.5	529	52.8	201	22.0
SE	Sweden	1,330	450	**65.8**	517	**68.6**	363	**24.0**
Sum		14,892	3,238	-	7,359	-	4,295	-
EU28		45,386	9,869	28.8	20,503	18.6	15,014	6,7

However, these two countries - Sweden and Finland - have also achieved the highest renewable energy shares in energy consumption to date of over 40 %. For Latvia, Denmark, Estonia and Lithuania, the shares are average between 25 and 40 %. Germany and Poland, on the other hand, have so far achieved renewable energy shares of less than 20 %.

What all countries have in common is that bioenergy is the most important energy source within renewable energies: In Estonia, Lithuania and Latvia, over 90 % of the renewable energies used come from bioenergy. In Poland and Finland these shares are just over 80%. In Germany, Denmark and Sweden, bioenergy accounts for about 60 to 70 % of renewable energy production. Hydropower accounts for a further 35 % in Sweden and about 15 % in Finland. Wind energy has so far been used in particular in Denmark (approx. 35 %), Germany (just under 20 %) and Poland (just under 15 %).

2.3 National criteria for the spatial planning for renewable energies

Due to the large variety of planning procedures for renewable energies in the participating countries, there is so far no comparative overall view of the planning criteria used in planning. In the following, such an overall view is attempted for the planning of wind turbines in the onshore sector[69].

2.3.1 Comparative overview of planning criteria - onshore wind energy

In terms of onshore wind energy, Table 6 gives an overview of the planning criteria for wind turbines in the participating countries. A typical planning criterion describes the minimum distance between wind turbines and other land uses, for example in residential areas: In ***Denmark***, the height of the wind turbines determines the required distance, but in principle it is possible to build in rural areas.

---

68 Data sources: EuroStat, /53/.

69 Most of the information listed there has been extracted from the replies given by the project partners in earlier questionnaire surveys.

In ***Lithuania***, such criteria for residential areas should be examined very carefully. In ***Latvia***, individual wind turbines should not be placed closer than 3 rotor diameters apart, no closer than 500 m to residential buildings in rural areas and no closer than 1 km to compact residential buildings. The distance between wind farms and residential buildings, however, must be at least five times the maximum height of the wind turbines and at least 2 km to compact residential buildings. In Estonia, 2 km zones will be established (due to the noise exposure of other land uses). This planning criterion is currently being under discussion in ***Mecklenburg-Vorpommern***.

Further requirements for the building permit may arise, for example, from the participation of persons living close to the wind turbines: In ***Finland***, models for public participation in spatial planning are compulsory under Finnishland use planning legislation. In ***Sweden***, however, such models are optional in the planning process. However, project developers should consult with local residents about their projects. There is also consultation in strategic planning when it comes to the designation of wind-suitable areas. Before the planning documents are adopted by politicians, they must be published so that everyone can raise his or her voice. In ***Denmark***, a 20 % share of a wind energy project must be offered to citizens of the municipality concerned. Also in ***Poland***, ***Latvia*** and ***Germany*** a public discussion in one form or another is required by the legislation, sometimes depending on the size or capacity of a wind energy project: In Germany, public participation in the approval procedure is only mandatory for larger wind farms with 20 or more individual turbines. In the case of smaller wind energy projects, this may become necessary in individual instances, e.g. if special environmental impacts are to be expected.

2.3.2 Solar energy (photovoltaics)

A large number of planning criteria also exist for photovoltaic (PV) systems in the participating countries, the most important of which are addressed below. Where such criteria exist, a distinction is made between size-dependent criteria and location criteria:

Denmark: Danish urban planning has the possibility to designate areas for solar energy use. Typically, feasibility studies must be carried out for solar systems in connection with heating systems. The other planning procedures also differ between smaller private solar systems on residential buildings and those on larger areas for solar systems. The size of the area is therefore an important planning criterion.

Germany (Mecklenburg-Vorpommern): In land use plans, special areas can be designated for smaller PV systems. However, PV systems with an area of one hectare or more can only be planned by spatial planning. The location or height of a solar system is also a criterion that determines whether it requires approval: No building permit is required for solar systems on roofs. For building-independent systems more than 3 m high and 9 m long, a building supervisory approval is required. PV parks should also be erected near suitable power lines and preferably on sealed conversion sites for economic, traffic, residential or military use as well as on waste landfills and contaminated sites outside protected landscape areas. Special approval requirements for the construction of PV systems arise for areas with special landscape potential, areas with fertile soils and areas for the protection of certain parts of nature and landscape.

Estonia: The planning here depends on the given location qualities, i.e. on the built or near-natural environment. Solar systems can reduce landscape qualities and attractiveness and significantly change aesthetics. In sensitive areas it is therefore necessary, for example, to fit PV systems into the traditional street scene or landscape.

Latvia: For all solar installations, an application must be submitted to the Ministry of Economy. The Ministry decides on the granting of a permit (valid for 3 - 5 years) and informs the regulatory authority, the public electricity trader and the electricity grid operator about the granting of a permit.

Table 6: Planning criteria for wind turbines in the participating countries (overview)

Wind	Specified areas	Capacity or height	Size-dependent planning process	Environmental conditions (e.g. wind conditions)	Technical aspects - network capacity	Other technical aspects
Finland	In case of 10 or more wind turbines, the wind farm is of regional relevance and object of the regional land use planning.	In case of 10 or more wind turbines, the wind farm is of regional relevance and object of the regional land use planning.	No. If land use planning is a decision-making process, the process may vary.	Wind conditions (are investigated in the wake of the regional land use plan based on wind atlas)	Regional land use plan evaluates network connection for wind farms of regional relevance	No specification
Sweden	Strategic planning identifies suitable areas (not legally binding). Generally, a permit can be requested for each site.	Wind turbines are always subject to approval. Altitude criteria are usually taken into consideration, the performance not (anymore).	No, decision-makers are the cities or counties. Larger wind turbines have larger conflict potential and need stronger grid connections.	Wind conditions	Some plans take network capacity into account, but ultimately leave this to the market	1. Noise emissions near resi-dential buildings. 2. Transport possibilities du-ring the construction phase.
Germany	Suitable areas with a minimum area of 35 ha.	Height is a criterion in the approval procedure.	Wind turbines up to 50 m in height require a building permit. Individual wind turbines over 50 m high and wind farms require Federal	Wind conditions (the designation of the suitable area takes these into account, but the project developer has the final decision)	The grid connection must be defined in the technical specifications of the project.	Noise (thresholds depend on area type), shading. Flight safety navigation lights, wind turbine shutdown for species protection (birds, bats).
Latvia	No specification	Wind turbines must have a minimum distance between each other of 3 rotor diameters. The minimum distance to housing development is 500 m	Wind turbines of 20 m or higher require EIA with special investigation for birds/bats. Wind farms from 125 kW upwards require approval	Wind atlas	Secure energy flow in the network	Reference to EIA and permission (specific requirements)
Poland	No specification	No specification	No room planning for wind turbines <40 kW, wind turbine locations must be planned for in the local spatial management plan; if necessary,	Wind conditions	No specification	Gradual increase in the scope of planning with wind farm output
Denmark	No specification	The height of the wind turbines defines the minimum distances (to buildings at least height x4, up to 25 m height the minimum distance is 100m).	Special rules apply to wind turbines on private land with a maximum height of 25 m. Commercial wind turbines require an EIA and a local plan.	Detailed investigation of the wind conditions by the project developer (wind potential is being carried out by the Danish Energy Agency)	Project developers may have to contribute to the costs of network reinforcement measures.	No specification
Lithuania	No specification	Network access (thresholds and restrictions must be set for each project)	The scope of the planning process depends on capacity and height.	Wind velocity in specific locations	No specification	No specification
Estonia	No specification	No specification	Wind turbines < 10 kW are subject to simplified requirements (type approval).	Coasts and open countryside are preferred locations, also earlier open pit mines.	Project developers may have to contribute to the costs of network reinforcement measures.	Wind turbines < 10 kW are subject to simplified requirements (type approval).

1) Wind farms with 20 or more wind turbines require public participation (a simplified procedure applies to smaller wind farms).

Lithuania: Important criteria for the planning of a solar system are the orientation of a building, the shading conditions and the number of sunny days per year at planned sites. Project developers of larger PV systems also require the approval of the national electricity grid operator***.***

Poland: The essential planning aspects are determined by the solar radiation conditions in a planned area. The planning procedure is significantly dependent on the size of a solar installation: Small PV systems with an installed capacity of *less than 40* kW_p and free-standing solar collectors do not require a regional planning process. For PV systems with an installed capacity of *40 - 100* kW_p, it is necessary to take the connection conditions of the local energy supplier into account. In addition, an extract from the local spatial planning plan is required. If such a plan is not available, a decision must be obtained on the conditions for the development and cultivation of the land. After all, such systems require a building permit. Finally, for PV systems with an installed capacity $> 100\ kW_p$, an area designated in the plans must be used. If no areas are designated, a procedure for changing the planning can be pursued in order to designate such an area. If suitable areas have already been identified in the planning, the relevant local council must determine the procedure for developing a local spatial management plan, in which the conditions for spatial management are described. If there is no local plan for the area of a potential PV installation, the investor must turn to the Mayor for a decision on the land development and management conditions for a precise location of the investment. PV systems with more than 0.5 ha area in nature reserves or with more than 1.0 ha area in other areas can have a significant impact on the environment. Regardless of the installed capacity, it is necessary to obtain an environmental impact assessment. These decisions are taken at the municipal level.

Finland: Until now, solar installations in Central Finland have been of minor importance. However, activity has increased in recent years. There are experiences with solar systems on roofs. These are municipal land use plans, which in many cases are linked to detailed land use planning and require building permits.

Sweden: For open space solar energy (solar parks) it is still unclear whether they require a building permit or not. There have been cases in both directions. Whether a building permit is required for a solar system can be decided by the location, since the rules can vary from municipality to municipality. In the municipality of Karlskrona, for example, solar systems can be built on buildings outside detailed planning without a permit. On buildings in the area of detailed planning, the building permit exemption applies to detached and semi-detached houses and associated supplementary buildings.

The solar panels must be placed along the roof (pitch of the roof) in order to be exempt from approval. If the solar panels are installed above the ground, the installation must not be higher than 1.20 m.

2.3.3 Biogas

Denmark: The planning process depends on the region: In the southern part of the country there are regulations for plants with an annual capacity of 36,000 tonnes (so-called farm biogas plants). From this size on there is a set of rules for planning.

Germany (Mecklenburg-Vorpommern): The planning process depends on the planned size of the plant and the type and quantity of feedstock.

Estonia: So far there are no biogas plants in Estonia. The construction requires the adoption of a detailed plan by the relevant local council.

Latvia: First, the building specification is developed and submitted to the relevant municipality. If necessary, the local council decides on the conditions, e.g. environmental impact assessment, public consultation, obtaining the permit, implementation.

Lithuania: Planning should take into account environmental impacts such as unpleasant odours. When feeding electricity into the grid, the grid capacity should be specified in the technical specifications.

Poland: The planning process here depends on the installed capacity: For *biogas plants > 100 kW*, site planning including protection zones for residential and land use is carried out in a local plan. If the local plan does not identify suitable sites, a plan revision procedure is required to determine such sites. If a site plan identifies such sites, but the biogas plant conflicts with the respective local plan, a plan revision procedure is also required for the planned plant. *Biogas plants > 0.5 MW* require an environmental impact assessment.

Finland: The planning process depends on the size, location and feedstock of a planned biogas plant.

Sweden: In Sweden, the planning process is independent of the size or location of a plant. Planning must be carried out in the same way for all biogas plants.

2.3.4 Biomass combustion in connection with district heating supply

Denmark: Within spatial plans, municipalities also draw up heat plans in which areas for biomass plants with district heating are identified.

Germany (Mecklenburg-Vorpommern): Special areas for biomass plants with district heating can be identified in land use plans. The planning process itself depends on the size of the plant: Biomass plants with a rated thermal output of less than 1 MW require a building permit. For larger plants up to 50 MW an additional permit according to the Federal Emission Control Act is required. Biomass plants with an output of more than 50 MW also require public participation.

Estonia: Small biomass plants in less urbanised areas can be developed as part of a building permit procedure.

Latvia: The planning process is regulated. First, a project description must be drawn up and submitted to the municipality. The municipality then decides on the further procedure, e.g. on the necessity of an environmental impact assessment, on public consultation, obtaining permits, implementation.

Lithuania: The planning procedure is independent of the size, but the environmental requirements vary depending on the size of the planned facility.

Poland: The planning of biomass plants corresponds to that of biogas plants.

Finland: If a biomass plant with district heating is classified as regionally or supra-regionally significant due to its size, planning is carried out in a regional land use plan. After land use planning, each project requires an environmental impact assessment and a building permit (and, if applicable, an environmental permit).

Sweden: For biomass plants with district heating, spatial plans designate special commercial areas. They tend to be located near residential areas and the district heating network. However, once it has been decided to build a biomass plant, suitable sites are identified. The planning procedure is independent of the size, but the protected area grows with the size of the plant.

2.3.5 General planning criteria

Planning criteria represent framework conditions for the realisation of plants for the use of renewable energies. The following set of general planning criteria was developed by the participating regions (BEA-APP pilot areas) for use in spatial planning in connection with renewable energies in the Baltic Sea Region. It contains general planning criteria in the areas of planning, natural conditions, technical aspects, society, economy, other aspects and conflict potential - insofar as these are or should be subject to spatial planning. The need for such a set of general criteria arises because there is so far no common transnational consensus on planning criteria between the countries of the Baltic Sea Region.

There are increasingly complex social, economic, technological and ecological factors in the countries of the Baltic Sea Region. This increasing complexity is also reflected in planning, in planning processes and criteria, in the participation and involvement of various actors, in conflict prevention and conflict management. As it turned out, a direct comparison of specific planning criteria and processes between the participating countries is not possible. Therefore, more general spatial planning criteria were developed to determine the most suitable sites and growth areas for renewable energies.

The general planning criteria refer to central aspects of spatial planning for renewable energies in the Baltic Sea Region: these can be divided into the areas of planning, society, economy, other and cross-sectional aspects.

Planning

In the BSR, land-based spatial planning is carried out by all countries at national, regional and local levels. The level and binding nature of spatial planning vary between countries, but all BSR countries have specific regulations. Regulations concern, for example, the minimum distance between wind turbines and residential areas, the size of solar and biogas plants and approval procedures for various RE plants.

The project results and consultations of experts within the BEA-APP partnership have shown that the identification of specific areas in spatial plans and existing standard planning procedures are the core aspects for the spatial development of renewable energy plants in the BSR. In this respect, the general aspects for the area of planning are:

Aspect 1: Designated areas for renewable energies: Areas designated for renewable energy installations. Other space-related uses, if they are incompatible with renewable energy plants, are excluded in this area or competing uses must be weighted (with priority for renewable energies).

Aspect 2: Standard planning processes: Standardised planning processes in the BSR countries apply to certain sizes and types of renewable energy installations and define e.g. the need for public participation, the legal framework and the responsibility of authorities.

Society

It is in the interest of all affected communities in the Baltic Sea Region that spatial planning decisions can be understood and influenced by all stakeholders and their representatives.

Concrete projects in the field of renewable energies are often confronted with scepticism and a "not in my backyard" attitude of the local population and other stakeholders, which often leads to uncertainties, protests and ultimately to delays in spatial planning for renewable energy facilities. Other stakeholders, such as company representatives, can also have a direct or indirect influence on planning decisions. Therefore, the models, processes and rules of existing participation in renewable energy planning are a central aspect of spatial planning and thus a societal aspect.

Aspect 3: Models for participation in spatial planning: the purpose of public participation, or at least stakeholder involvement, is to ensure that stakeholders and the public are heard. In this respect, many participation models are in place and need to be taken into account in spatial planning for renewable energy.

Economy

Despite the various economic effects of the expansion of renewable energies in the BSR, necessary acceptance for the expansion of renewable energies can be achieved through the economic participation of the affected citizens and communities. Economic participation is a strong instrument for avoiding conflicts and paves the way for higher regional added value. Currently implemented in Sweden, Denmark and Germany for e.g. wind power plants, financial participation models can play an important role in the future reduction of the conflict potential of renewable energy plants in the BSR. For this reason, economic participation was chosen as a general aspect in order to improve the framework conditions for spatial planning for renewable energies.

Aspect 4: Economic participation models: Economic participation can be achieved through participation in regional energy cooperatives, municipal wind farms and solar parks and other formats. The aim is to increase the local benefit for those affected from the added value of energy production.

Other and cross-cutting aspects

Aspect 5: Natural renewable energy sources: Natural renewable energy resources can be evaluated by using renewable energy resource data sets that provide information on e.g. raw materials for bioenergy (e.g. plant residues or forest residues), solar energy characteristics (e.g. irradiance, soil measurement) or wind energy characteristics (e.g. wind speed, power density, soil measurement) for a given region. The availability of renewable energy sources varies within the BSR, with available resources (e.g. sun and wind) and with time. For a holistic view of regenerative energy generation in the BSR, the different potentials of natural energy sources must be taken into account and thus represent a general aspect.

Aspect 6: Network capacity considered in spatial planning: Renewable energy generation from wind and solar energy is subject to natural variability. This variability places special demands on the energy systems and grids that receive it. In addition, the technologies for the use of wind and solar energy are technologically and economically so mature that they are suitable for use in large capacities and in a wide range of sites. With the expansion of such large plants, the development of renewable power generation has a considerable influence on the expansion requirements of the power grids. The integration of renewable energies proves to be a complex challenge, because many decision-makers such as energy storage operators, grid operators, energy market operators and planners are involved. In the case of renewable energy plants with a large electrical output, the grid capacity must be taken into account on the basis of national spatial planning regulations in individual countries of the Baltic Sea Region. It thus represents a general aspect of spatial planning for renewable energies.

Aspect 7: Capacity and height of the plants considered in spatial planning: Especially in spatial planning for wind energy, the capacity and height of the plants is a central aspect in most countries of the Baltic Sea Region. The capacity to generate electricity also plays an important role in spatial planning for biogas and biomass plants as well as solar power plants. With regard to the national planning regulations and procedures in many BSR countries, the capacity and height of the plants is a general aspect of spatial planning.

Aspect 8: Conflict potential: Conflicts over renewable energy installations occur in all participating Baltic Sea Regions. Some conflicts relate to different renewable energy sources (e.g. there is a solar energy conflict between large open space PV systems and agriculture). Other conflicts result from the respective type of energy production. For wind energy these are, for example, environmental conflicts (influence of wind turbines on birds or other impairments of species protection), landscape conflicts (e.g. through the influence of wind turbines on the cultural landscape, on natural values and on cultural assets). In addition, there have so far been conflicts caused by noise, night blinks and shadowing. Solar energy, on the other hand, is often associated with conflicts over the architectural design of historical buildings. Biogas plants can impair air quality and cause noise. The combustion of biomass for district heating often faces the problem that the heat requirement of a municipality is too small for an economic plant size. Therefore, a multi-layered and, if necessary, interdisciplinary evaluation of the conflict potential for new renewable energy plants to be planned is necessary in spatial planning. The conflict potential thus represents a general aspect of spatial planning in the countries of the Baltic Sea Region.

The general planning criteria represent central aspects of spatial planning for renewable energies in the Baltic Sea Region. In future studies or projects, the general planning approach could be further developed with the aim of comparing the planning situation for different renewable energies in different countries around the Baltic Sea. The comparability of the planning situation in the countries paves the way to also develop comparable planning perspectives for countries and regions, to evaluate challenges and obstacles and to formulate country-specific recommendations for changes in current planning practice.

2.3.6 Interim Conclusion

In spatial planning for renewable energies, the countries use specific criteria to be applied to individual renewable energies. A comprehensive comparative overview of these planning criteria does not yet exist. Such an overview, compiled here for onshore wind energy, shows that some criteria are applied in many or all participating countries. Other criteria, on the other hand, are country-specific and therefore less widespread.

Overall, a direct comparison of specific planning criteria and planning processes between the participating countries proves to be difficult and time-consuming. Therefore, more general spatial planning criteria were developed to determine the most suitable sites and growth areas for renewable energies. These general planning criteria relate to central aspects of spatial planning for renewable energies in the Baltic Sea Region and can therefore be structured into the areas of planning (designated areas for renewable energies and standard planning processes), society (participation models for spatial planning), economy (economic participation models) and other overarching aspects (natural renewable energy sources, energy grid capacity, RE plant sizes and conflict potentials).

2.4 Starting points for technical recommendations on spatial planning for renewable energies

Spatial planning is a key instrument for creating long-term framework conditions for social, territorial and economic development within and between the countries of the Baltic Sea Region (BSR). As will be shown below, the EU sees an increasing importance of the use of renewable energies in the coming decades. This also leads to increasing demands on spatial planning, which - by accepting and meeting these challenges - can further expand its role as a key instrument.

2.4.1 Countries' spatial planning systems as a framework to be improved

The spatial planning systems in the participating countries show both similarities and differences with regard to their structures (national, regional[70], municipal/local[71]), their instruments (in particular

[70] In Estonia and Lithuania, counties are located at this level. In Estonia, for example, they have a coordinating function, while the municipalities are the main actors in planning /31/, p.87.

[71] In Germany there is an additional federal states (Länder) level.

their plans) and their legal framework conditions[72]. The latter applies in particular to national spatial planning, construction and environmental protection laws and, where applicable, to laws promoting renewable energies.

The Danish and Swedish systems can be regarded as very successful in terms of the renewable energy shares achieved in energy consumption. Both systems - especially the Swedish one - give the municipal planning level a high degree of planning and decision-making authority. Both systems - and again the Swedish system in particular - have a simpler structure than, for example, the Estonian or German planning systems (cf. system structures in Annex 3).

There is no differentiated sectoral planning in the Finnish, Swedish and Polish systems - in contrast to, for example, the Danish, German or Estonian systems. Another special feature of the Danish planning system is heat planning located at municipal level.

A planning document specially conceived for spatial planning and addressing renewable energies is only available in Finland (and - although much more abstract - in Germany)[73]. There are similar documents in the other countries in terms of direction and content. In Germany, for example, the energy concept of the Federal Government (2010) can also be classified in this way, but it does not contain any statements that are spatially concretized. The Finnish guiding vision, on the other hand, has been decidedly developed as a guideline for spatial planning /31/, p.94.

Renewable energies have also been successfully expanded in Mecklenburg-Vorpommern in recent years. However, the spatial planning system in Mecklenburg-Vorpommern also has potential for improvement with regard to the planning of renewable energies:

1. Wind energy reveals the high standards associated with the definition of widely accepted planning criteria for wind suitable areas. In addition, wind energy is meeting growing resistance from various players. Spatial planning is continuously required to fulfil its claim of a balancing planning that avoids conflicts as much as possible.
2. In the case of other renewable energies, further efforts have to be carried out to meet the ambitious renewable energy targets

Literature point out further deficits concerning spatial planning for renewable energies in Germany /41/, p.7 ff., which can be the subject of recommendations based on the assumption of comparable deficits in other participating countries:

- The public is involved too little and too late,
- The contribution possibilities in the procedures are too limited,
- Planning and approval procedures are not sufficiently comprehensible to the public,
- Participation paradox - as long as participation in planning procedures would be effectively possible, these are too abstract; Citizens recognize their concerns only when planning and approval procedures become concrete - but then effective participation is hardly possible any more,
- The NIMBY theory[74] negates that those affected pursue their own interests in rational benefit calculations; in addition, citizens may reject projects on the basis of perceived procedural and distributional injustice.

[72] In the Baltic countries - especially in Lithuania - these laws may not focus primarily on renewable energies, but on ensuring the security of energy supply. However, since renewable energies are of particular importance in this respect, the objective is similar.

[73] Finland: "A Renewable and Enabling Finland" /40/ is located at the national level and serves as a guiding vision for regional land use planning until 2050. In Germany: „ Guiding principles and action strategies for spatial development“ /33/.

[74] The so-called "Not In My Backyard" syndrome means that the rejection of renewable energy systems is predominantly selfish behaviour, in which the citizens concerned place their own interests above those of the common good. They would therefore only advocate such energy systems as long as they are not themselves affected by them.

2.4.2 The new EU cohesion policy after 2020 as a future framework condition

The EU is currently developing its cohesion policy further from 2020. The starting points for EU cohesion policy after 2020 are /44/:

- Resolutions on European territorial cooperation and speeding up the implementation of cohesion policy, on the EU strategy for the Baltic Sea Region and the role of macro-regions in future cohesion policy as well as on new instruments (integrated territorial investment and local development actions by the population),
- Conclusions: "At least one in five euros of the EU budget for climate change: despite ambitious efforts, there is a high risk that the target will not be met" /43/.

As a result, the present cohesion policy was judged to be very efficient and at the same time it was determined that it is still an urgently needed political instrument. In future, all partners at national, regional and local level would have to be involved, as enshrined in the partnership principle of the EU umbrella regulation /45/.

Accordingly, European Territorial Cooperation (ETC) should remain one of the objectives of the Cohesion Policy 2014-2020. The European Parliament intends to continue and to significantly increase funding for ETCs in the next programming period /44/, p.9.

An important policy area for a modernised cohesion policy in the period after 2020 will be climate protection and adaptation to it as well as green industries, renewable energies and a sustainable infrastructure: On the one hand, the EU has entered into commitments in the Paris Climate Change Agreement and has therefore set itself the target of spending at least 20 % of the EU budget on climate protection measures. On the other hand, there is a high risk that the target will not be achieved /43/.

As good relations between urban areas and their rural environment are very important for the mentioned policy areas, the "partnerships" set up by the Amsterdam Pact[75] should be included in the cohesion policy for the period after 2020. Also the digital agenda will be a priority for the cohesion policy in the next programming period. Two investment priorities will therefore be set in the EU's cohesion policy from 2020 onwards[76]:

- A smarter Europe (through innovation, digitisation, economic change and support for small and medium-sized enterprises).
- A greener, CO_2-free Europe, implementing the Paris Convention and investing in energy transformation, renewable energies and the fight against climate change.

Furthermore, the new generation of programmes for interregional and cross-border cooperation ("Interreg") aims to remove cross-border barriers and promote interregional innovation projects. Interregional and cross-border cooperation will be facilitated by the new possibility for regions to use part of their resources to co-finance projects across Europe in collaboration with other regions. This should also help member countries to overcome cross-border barriers and develop common services and offers. For border regions and member countries interested in harmonising their legislation, the Commission proposes a new instrument, the *European cross-border mechanism*.

2.4.3 Starting points for the improvement of the technical planning perspectives

In order to support the expansion of renewable energies more strongly on the planning side, various approaches are possible. The distinction between two typical planning approaches described in Section 2.1.3 can prove fruitful: The residual land approach is based on recording available land and

75 The Urban Agenda for the EU - http://ec.europa.eu/regional_policy/en/policy/themes/urban-development/agenda/ and /46/.

76 Source: http://ec.europa.eu/regional_policy/de/2021_2027/.

making it usable for RE. The resource approach evaluates existing RE potentials and draws on particularly suitable sites for the use of renewable energies for further planning. A distinction can also be made between proactive and reactive planning. Proactive planning develops energy concepts and identifies suitable areas before an actor, e.g. an investor, has proposed a concrete project. Reactive planning, on the other hand, picks up concrete project proposals or applications and integrates them into existing planning, provided that the (compatibility) tests are positive. In proactive planning, it would be particularly important to work out criteria and plans that could lead to consensus, i.e. recommendations would concentrate on early planning phases. In reactive planning, on the other hand, it would be important that the planning department itself proposes suitable sites for project development, while at the same time providing planning support for the proposals made by project owners.

In order to improve the technical perspectives for spatial planning for renewable energies, the following possibilities exist:

1. <u>Strengthening the subject</u> - the significance of renewable energies in planning
   - Through more binding pro-RE statements in trend-setting policy documents,
   - Through binding planning contracts - e.g. by including certain renewable energies as an independent object in formal planning; their effectiveness is greater if they are classified at a higher planning level with binding effect for those below,
2. <u>Strengthening pro-RE decision-makers</u> - e.g. spatial, regional and local planners,
   - Exchange of experience between the planning authorities of the countries in the Baltic Sea Region to harmonise best practice in spatial planning[77],
3. <u>Strengthening their instruments</u>
   - In addition to GDP, further indicators[78] should be developed to obtain a more comprehensive picture of the development of renewable energies in countries and regions[79],
   - Further development/development of programme sets that enshrine regional RE objectives in formal planning (for this purpose, these should also be checked in particular for unintended impacts),
   - Criteria - Further development of the "General criteria": Specification of planning parameters to (geo) data models with definition of attributes, representation, resolution,
   - Criteria - harmonisation of the "specified criteria" - these can be a common basis for planning and decision-making, even for different (or differing) planning processes in the countries[80],
   - Plans - if necessary, equalisation of RE planning with other sectoral planning, e.g. infrastructure planning[81],
   - Communication - Development of a digital platform for information, e.g. in the ongoing planning and approval process,
   - Conflict management - Establishment of regional and local moderators who can mediate in RE conflicts (as proposed in /41/ as a "central position"),
   - Conflict management - supplementing formal planning and approval procedures with information and dialogue elements, setting up preparatory environment analyses and conflict screenings to analyse conflict potentials and situations (cf. /41/, p. 91 ff.),

---

[77] For this purpose, the EU cooperation programme Interreg Europe can be used for example.

[78] These indicators are also needed for the EU climate expenditure monitoring and tracing system.

[79] See /46/, p.4: "There is a major political agenda for climate and environmental policy, but benchmarking at regional level is poor and uncertainties are high. The chapter on energy is missing from Eurostat's regional yearbook. In Eurostat's regional statistical databases only heating and cooling degree days by region are available, which are indeed robust aggregated meteorological data. Similarly, regional energy statistics are more advanced and disaggregated in the Nordic countries and Germany, less so in the Baltic States and Poland. Strategic decisions at the regional level are therefore not based on facts, figures and evidence, but on political will and principles".

[80] E.g. demand-driven planning approach in Poland versus white area mapping in Germany (report of Roskilde University 2017).

[81] Pro: RE are becoming increasingly important for securing the future of our societies (among others climate protection); Contra: RE are just one type of infrastructure.

4. Strengthening their supporters
   - Consultants - Strengthening administrative and institutional capacities, e.g. national and regional energy and climate protection agencies, energy competence centres[82] (/41/, p.85 ff.),
   - Public - Strengthening the acceptance of RE through further developed public participation procedures (e.g. involvement of representatives of civil society who can represent a wider public that is otherwise affected but for various reasons does not participate /41/, p.93 ff.),
   - Public - Strengthening the acceptance of RE through further developed information materials for the public, which present the complex contents of planning documents and plans in a form that is close to the citizen and, if necessary, extend them to include information describing the regional and local advantages of certain plans and RE projects,

Further recommendations for a harmonisation of spatial planning for renewable energies in the Baltic Sea Region within the reference framework of the INSPIRE Directive:

1. A user-driven development to create a functional spatial database and spatial data infrastructure is recommended from spatial data practice: INSPIRE relies on decentralised participation, in particular in the relevant Annex 3 (Energy) (e.g. clarifying data requirements for planning issues and further developing data models, providing data in accordance with the "specified criteria").
2. The harmonisation of spatial planning for renewable energies is important for the EU Commission's Energy Strategy and Energy Union (https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union).
3. User-controlled "lobbying" for the challenges of energy + INSPIRE with the ministries/ administrations of the participating countries in the Baltic Sea Region with authority to issue directives, since INSPIRE only obliges the member states to provide standardised geodata, but not to collect specific geodata that is missing from the point of view of spatial planning for renewable energies. Lobbying both by the project partners (user level) -> bottom up as well as by VASAB (strategic-political level) -> top down.

3. Conflicts in the spatial planning for renewable energies

There is probably hardly any energy supply without conflicts. Also the use of renewable energies holds a not inconsiderable potential for conflict. Conflicts arise because RE are connected to:

- Demands on (already distributed) resources such as energy markets, areas, grid capacities, financial resources,
- Effects on spatially neighbouring areas and sites such as emissions - noise, odour - and other impairments such as visibility,
- Effects on the activities of third parties such as impairments of tourism or species protection,
- Effects on remote regions, such as displacement of native energy products, influence on energy prices, or
- Action requirements for third parties such as grid expansion and feed-in management.

Thus, the use of renewable energies always involves or affects several actors who voluntarily or involuntarily participate in a renewable energy project.

Renewable energy conflicts are therefore conflicts of objectives and/or resources, i.e. the actors either have different objectives (generating returns, supplying energy, protecting the climate, etc.) or resource requirements, or both.

And like other technical infrastructures, people need time to integrate this new form of energy generation into their lives. Similar to other technical infrastructures, people are often directly affected by various side effects of renewable energy plants, e.g. loss of value of real estate. And similar to other

[82] See also Skåne Wind Academy (section 3.2.1).

technical infrastructures, attempts are being made to reduce the potential for conflict in the case of renewable energies through careful planning studies: wind project developers sometimes complain that they have to spend time and money to carry out a complete environmental impact assessment - and that the project in question is not approved after all. Many projects have been rejected because of protected animal species at the sites concerned. Of course, project developers also support species protection, but they also find it important to discuss proportions. One argument is that many species will die out anyway if wind energy cannot contribute to climate protection. In Sweden (Gotland), for example, it is reported that only 2 % of all deaths of local eagles are caused by wind turbines. Another point of criticism concerns administrations: They should pave the way for renewable energies. At the same time, however, they may also have to reject such projects if they are incompatible with the preservation of cultural values and the protection of historical monuments. Here the question can and must always be answered anew: What is the most important thing? Where should we draw the line?

On the one hand, renewable energies create real local conflicts for which solutions have to be found. On the other hand, it is often overlooked that some of these local conflicts are subordinate to global problems caused by the burning of fossil fuels or nuclear energy.

3.1 Typical Renewable Energy Conflicts in the Countries of the Baltic Sea Region

In the Baltic Sea Region, various conflicts arise in the planning of renewable energies, which are similar in their basic structures and can therefore be described as typical. Some conflicts can already be mitigated by the technical improvement of renewable energy plants.

A common feature of conflicts over renewable energies is the perception that interest groups are treated unfairly. This can occur, for example, when a renewable energy project is rejected by a decision-maker in an already advanced planning process without any apparent reasons. In addition, such conflicts can intensify if the decision-makers are suspected of certain attitudes and preferences that are not allowed to play a role in the decision-making process - e.g. positive or negative preference towards wind energy. The fact that the level of renewable energy use can vary considerably even in neighbouring regions or municipalities proves that such conditions can exist.

Some conflicts over renewable energies are related to their visibility or to the specific resources they use. One important resource is space. Since some renewable energies have a high land consumption, special planning considerations are necessary when expanding renewable energies. This can be particularly important in regions with a pronounced economic dependence on resources such as landscape (tourism).

3.1.1 Onshore wind energy

Onshore wind energy is probably the renewable energy that causes the most conflicts and is also the most difficult one to manage. Typical conflicts in land use planning for onshore wind turbines are:

- Social conflicts related to the influence of wind turbines on the health of the population, on their living comfort, on property prices, etc.,
- Conflicts with nature and species conservation (especially birds, habitats, FFH, ESP, Natura 2000),
- Landscape conflicts caused by the influence of wind turbines, e.g. through visual effects, on cultural landscapes and cultural assets.

Due to such conflicts, wind energy often encounters insufficient and possibly decreasing social acceptance. This lack of acceptance can - even to the point of complete rejection - be even greater in cases where, on the one hand, large wind energy profits are achieved and, on the other hand, adequate financial participation by the communities and residents concerned is lacking, even if only perceived.

At the same time, however, this perception shows a way forward, especially for the management of wind energy conflicts: An increase in acceptance may be achieved by more participation, i.e. by greater participation in planning, decision-making, communication and monetary gain. To this end, it may be necessary to extend consultation and consideration in the search for sites for new wind turbines. However, wind project developers and their trade associations would like to see changes to the contrary[83]: They expect spatial planning to provide more meaningful and efficient communication of plans for potential wind energy sites and to avoid long consultation processes[84]. These would not only make project development more expensive, but could also lead to more serious conflicts /3/, p. 15.

A further important contribution to conflict resolution for careful planning: Regardless of whether an EIA is required for a specific wind energy project or not, land use planning should include appropriate investigations, e.g. on noise and flicker, natural values and the effects on the landscape.

Careful planning also means considering the objections of various interest groups in a balanced way. Wind project developers may feel unsettled by a municipality: Sometimes they invest a lot of time and money in a project, which is then rejected by the municipality. Sometimes decision-makers in municipalities are susceptible to public opinion and sometimes project opponents raise their objections particularly loudly (e.g. NIMBY). In most cases, such opponents only become active at the end of the negotiation of a concrete wind project. Many project developers want more consistency from public decision-makers and municipalities (in Sweden).

Spatial planning for renewable energies is thus exposed to complex interrelations and sometimes has to deal with unintended effects of changing legal frameworks. Such changes took place, for example, in Sweden in 2009, where the municipalities received a veto right for wind energy projects, which has been the subject of much discussion since then. The intended effect was to accelerate and simplify the expansion of wind energy. Before 2009, the municipalities first examined a project with their planning and construction law, before the district administration decided in accordance with the Environmental Code ("Miljöbalken"). After the legal changes, however, the procedures took longer than before because one decision maker waited for the other before making his own decision.

3.1.2 Solar energy (photovoltaics)

Solar energy is seen as a renewable energy with comparatively low conflict potential[85]. In Skåne, for example, very few conflicts are registered in connection with solar installations. In the West Pomeranian Voivodship, too, no significant conflicts are seen in the localisation of PV systems. A concrete example from Estonia[86] also supports this observation. Typical areas of conflict around photovoltaic systems are:

---

[83] Trade associations are interest groups that participate, among others, in working groups and that are involved in the provision of specialist knowledge. In this way they support networking and the exchange of information.

[84] Many other actors, such as local residents or nature, landscape or monument conservationists, obviously expect the opposite. There are many countries and regions that can provide urgent arguments and examples for providing sufficient time and space for communication in new projects for the social discourse on renewable energies.

[85] None of the participating regions show no conflicts related to the installation of solar energy /2/. For Sweden: Compared to wind energy, there are fewer spatial planning conflicts and the implementation of photovoltaic projects is comparatively quick /1/.

[86] For the Värska solar park (200 kW), acceptance was achieved by the public design of a detailed spatial plan. The authority confirmed that this was in accordance with the legislation, the objectives of the solar park and the overall plan of the site. The design (at least 14 days) included several instruments and steps for awareness raising and participatory planning. The municipality responded to written comments within 30

- The architectural design of new buildings, especially in urban areas: Architects may believe that solar panels interfere with the design of the building.
- The architectural design of old buildings and the protection of historical monuments in the cultural sector: City planners and architects may be of the opinion that solar panels distort an area or a building of cultural value or that solar panels are not permitted at all. In such cases, it is difficult to obtain a building permit for a solar system.
- Interaction with other infrastructures: For example, large solar parks can disrupt road or air traffic. Therefore, authorities such as road administrations, defence authorities or aviation authorities can reject solar installations.
- An important conflict exists between large PV parks and agriculture (therefore in Mecklenburg-Vorpommern a special approval procedure is necessary to build solar parks on fertile soils).
- Sometimes criticism of solar systems is linked to security of energy supply.
- The potential environmental impact of the production and recycling of PV modules can also lead to disagreement.

One possible solution for new buildings is to integrate solar panels into the building design at an early stage. For old buildings and listed buildings, coloured and roof-integrated solar panels can be an almost invisible solution. However, in Sweden, for example, it is very difficult to obtain building permits for solar roof systems. In Estonia, too, solar systems are regarded as an optical nuisance. They are not allowed or strongly regulated in urban and rural areas and buildings as well as in protected areas and landscape parks. Other energy systems (grids, transformers, etc.), on the other hand, are treated "more positively" even in the case of major optical and ecological impairments.

3.1.3 Biogas

The most frequent conflicts relate to agricultural biogas plants or to biogas plants used for heating and/or electricity generation and fuel production for vehicles:

- Environmental conflicts: Biogas plants can conflict with air quality and noise protection. They can affect water, wastewater or waste management (disposal of residues), hydrogeology and water resources. Odour issues are particularly relevant when biogas plants are to be built near residential areas and settlements.
- Landscape conflicts: Biogas plants can have an impact on cultural landscapes and cultural assets. They can induce changes in land use if cultivated biomass is to be used as input material (monocultures, e.g. maize is problematic for soils and landscape). Damage to the landscape and biodiversity is also possible.
- Social conflicts: There is a lack of social acceptance for the sites of planned biogas plants, since there are fears of effects on the health of the inhabitants, on their living comfort, on real estate and land prices, etc.[87].
- Conflicts between supply and demand for energy: In Mecklenburg-Vorpommern and possibly also in other participating countries or regions, there is often a lack of heat consumers, especially in rural areas. If a biogas plant cannot sell one of the two combined heat and power products, its economic viability is at risk[88]. The creation of additional heat demand in rural areas is an unsolved problem. The profitability problems of biogas plants are exacerbated by the imminent expiry of subsidies (such as the feed-in tariff in Germany - typically 20 years after launch).

---

days of the end of the design. A proposed amendment was adopted and incorporated into the detailed plan. The authority then arranged a public discussion on the plan (within 45 days). Based on the results of interpretation and discussion, necessary plan changes were made and adopted into the plan afterwards.

87 Local residents and garden owners fear that unpleasant smells will reduce the quality of life and thus the value of their property.

88 A possible and partly already realised solution is the conversion of biogas plants from energy production to the conversion of biogas into biomethane, if this can be fed into the local natural gas grid.

All these specific conflicts can be further aggravated by the increased heavy transport, e.g. of input materials or residual materials in the vicinity of biogas plants[89]. Therefore, in Sweden a local dialogue is usually conducted before the construction of a biogas plant. Social conflicts could also be managed by better information of the population.

3.1.4 Biomass combustion in combination with district heating

Conflicts also arise in connection with biomass plants that are integrated into district heating systems. This applies in particular to participating countries and regions in which district heating systems have a high share in the heat supply, e.g. in Lithuania and Mecklenburg-Vorpommern. The following typical conflict potentials can be identified:

- Technological conflicts: In Lithuania, e.g. in the district of Kaunas, bioenergy is used in heating (power) plants[90]. The integration of independent energy producers into the heating networks of municipal district heating companies offers advantages such as competitive tariffs for consumers, the use of renewable energies or additional jobs. However, it can also bring disadvantages if, for example, the technical requirements for feeding renewable heat into district heating systems are limited or require complex grid adjustments (in the case of several independent feeders). This also leads to conflicts between heat supply companies and feeders because there are gaps in legislation /16/, p. 28/29.
- Environmental conflicts: Air pollutant emissions (NO_x, particulate matter/PM and dust) as well as noise emissions from plant operation and from heavy biomass transports, from loading and unloading in industry, e.g. when industrial wood residues from furniture production are used[91].
- Planning conflicts: The solution of planning conflicts requires transparency and communication. If planners or property developers only set or fulfil minimum requirements for participation, this can lead to conflicts with residents of planned plant sites.
- Resource conflict: The pressure on the use of biomass resources is an increasing problem. The energetic use of biomass, especially in CHP plants, is accepted to a comparatively high degree in the participating countries. Potential for conflict arises in connection with the production or extraction of biomass - here, for example, sustainability issues can lead to conflicts between the various interest groups.
- Systemic conflict: The conflict occurred in Denmark in connection with the preparation of municipal heat plans. It is typical to the extent that the expansion of a biomass-based district heating supply can be at the expense of the market shares of fossil energy sources such as heating oil and natural gas (possibly, both alternatives are supplied by the same company). Also, earlier planning for an area possibly already obliged the supply with natural gas or fuel oil. Finally, conflicts also arise if the heat supply is to be switched from individual natural gas heating systems to district heating, for example.

---

89 It is usually easier to build a biogas plant on a farm, at a wastewater treatment plant or at a waste disposal company, as there are already odours and other pollutants. The search for new sites without such pre-existing pollution and/or in the immediate vicinity of residential areas has proved difficult, although not impossible.

90 Lithuania has fundamentally restructured its heating sector since 1997. The sector was divided by Lietuvos energija, UAB ("Lietuvos energija") into independent companies and transferred to the municipalities. The management and regulation of the heating sector also changed: the municipalities that had taken over the shares of the state-owned heating companies acquired the right to manage these companies independently. At the same time, the municipalities also assumed responsibility for the operating results of the companies. Source: https://enmin.lrv.lt/en/sectoral-policy/heat-sector-1.

91 In Sweden, for example, the construction of large biomass power plants in a town or village is a major conflict. The inhabitants also fear additional pollution and heavy transports to the construction site.

Bioenergy is often used in biogas plants or combined heat and power plants to supply district heating. There is additional potential for conflict along the supply chains for input materials or biomass. The conflict risk increases with the number of supply and contractual relationships.

3.2 Examples of conflicts and solutions in the countries of the Baltic Sea Region

In the following examples, conflicts and possible solutions are outlined on the basis of statements made by project partners from different project areas.

3.2.1 Onshore wind energy

Example of a typical conflict and solution from Sweden, Skåne

The establishment of wind energy projects often leads to several interwoven conflicts in which different stakeholder groups can be involved. It is not uncommon for these groups to argue more subjectively and possibly even aggressively for or against a wind energy project. It is not uncommon for pseudo arguments to be used. Frequently affected groups or actors who stand up for or against a particular wind energy project are:

- Neighbours to planned wind turbines (typically contra),
- Investors, landowners, energy companies (typically pro),
- Associations (sometimes/partially pro or contra).

The implemented solution aimed at the most objective information and communication possible as well as more constructive dialogues on wind energy and power generation with wind turbines. To this end, important players in Skåne have founded the *Skåne Wind Academy*. Its aim is to promote the exchange of knowledge and experience between the various players in the wind energy industry in Skåne. The Academy strives for a balanced approach: it wants to address technical, economic, ecological and perceptual aspects and thus promote the development of wind energy in Skåne. The Academy's members come mainly from industry, government, academia and associations. Over the past ten years, the competencies of all stakeholders in the region have increased. As a result, the processes surrounding wind energy projects have become more professional, reducing conflicts and confrontations. Thanks to organisations such as the *Skåne Wind Academy*, there is now more research in this field.

Example of a typical conflict and solution from Poland, West Pomerania

The conflict arose in connection with a planned wind energy project in the municipality of Wolin. The local spatial development plan placed the wind turbines on an agricultural area of 325 ha. However, as was shown by the presentation of a concrete project, there were protection needs for the natural and cultural environment and for human health in the area. The investor then adapted his project by studies and presented it to the Mayor of Wolins, with the aim of changing the classification of the area as an agricultural area and thus enabling the wind energy project. The analysis of the effects of the project on the landscape, however, showed that the wind turbines erected at the planned site would surpass the Wolin church tower and disrupt the valuable cultural urban landscape. The preservation of the voivodship's historical monuments therefore rejected the project. Affected groups or actors who are in favour of or against this wind energy project are thus:

- The municipalities of Wolin responsible for spatial planning, which elaborate the project in their local spatial planning plan (pro),
- Preservation of monuments in the voivodship, other regional planning procedures were subject to their approval (contra),
- The investor who has submitted the application for the preparation of the local spatial development plan to the Mayor (pro).

The conflict resolution started with informal negotiations between the mayor and the investor. This procedure made it possible to resolve the conflict directly between the parties involved. As a result of the negotiations, it was decided to change the location of the wind energy project. Thus the spatial conflict of the project with the church tower was eliminated. A new landscape study examined the changed project location. Thereafter, the construction of a limited number of wind turbines proved to be permissible. It was proven that the agreed location would not have any negative effects on the cityscape. The project was now also approved by the Voivodship's Historic Preservation Department.

The landscape study is an essential part of the project acceptance review. It enables the graphic representation of the visual changes of the landscape caused by the wind energy project. The described case confirms the appropriateness and usefulness of such an approach.

Example of a typical conflict and solution from Mecklenburg-Vorpommern

In Mecklenburg-Vorpommern, many wind turbines have been erected in recent years. With their growing number, however, the acceptance of many residents for these wind turbines has declined. On the one hand, conflicts about the designation of wind suitability areas and about the definition and application of the planning criteria provided for this have increased. In recent years, the conflict has become much more intense.

In view of the social importance of a solution to this conflict, the federal state government of Mecklenburg-Vorpommern has developed a legal option. Its basic idea was to oblige the wind project developers to invite the direct neighbours of a planned wind energy project to participate financially. To this end, the *Citizens' and Community Participation Act M-V* was implemented in 2016. It obliges wind project developers to set up a company and to offer up to 20 % of the shares in the project to the neighbouring citizen or the community in their area. Considering the purchasing power of many citizens, the maximum price of a business share is limited to 500 euros[92]. A second possibility for the project developer is to offer the municipalities within a radius of 5 km an annual compensatory levy as an alternative form of participation. This not only involves new wind energy projects, but also repowering projects. Finally, there are other options such as a cheaper local electricity tariff or a savings product with reduced financial risk such as savings bonds or fixed-term deposits.

3.2.2 Solar energy (photovoltaics)

Examples of a typical conflict and solutions from Tartu, Estonia and the Solar Region Skåne, Sweden

The planning conflict arises over roof PV systems, which are countered by aesthetic and architectural considerations, especially in areas that are classified as historically or culturally valuable, e.g. historic city centres. In Tartu, for example, the historic ensemble includes an 18th and early 19th century university campus and historic Soviet residential buildings. These buildings require extensive renovation of the building envelope and energy technology. Nevertheless, it is difficult to obtain building permits for solar roof systems. Groups or actors involved or affected in the conflict are

- Building owners: They want to invest in solar roof systems (typically pro).
- Municipalities: They have a dual function: as approval authorities they have to correctly apply the building regulations in terms of building design, safety, functionality, etc. In Tartu, urban planning also aims to implement the Old Town Charter. On the other hand, the municipality also has the task of supporting the use of solar energy as a sustainable energy technology (typically pro & contra).
- The inhabitants of unrenovated buildings: (non-uniform pro & contra). In Tartu, for example, they were confronted with numerous contradictory situations in the fields of monument protection, construction/energy technology and real estate management.

92 Source and further information: https://www.regierung-mv. de/Landesregierung/em/Energie/Wind/Buerger-und-Gemeindebeteiligungsgesetz.

- Housing companies: In the event of conflict, they do not take a clear position, their administrative and legal framework remains non-transparent and they tend to act conservatively in the event of uncertainty.
- Municipal actors: In Tartu, city initiatives for solar energy have often failed. On the other hand, the monument protection authority has often imposed too strict conditions on planning.
- The public has a positive attitude towards solar energy and would like to see more realised. However, this attitude can be overturned as soon as many solar systems are present in the cityscape and not every individual case "fits" well into the building or the urban environment.

Skåne Solar Region and Skåne Energy Agency have adressed the planning conflict by organising dialogue meetings between different municipalities and other stakeholders. These should encourage discussions as to whether aesthetic considerations in the building permit process constitute an (unnecessary) obstacle to solar energy. The Skåne Energy Agency has also published an overview of municipal guidelines for assessing building applications for solar energy[93]. According to the guidelines, many municipalities do not require building permits for smaller solar installations. The survey was disseminated in the municipalities to harmonise their "solar energy policy".

In Tartu, special guidelines were drafted (2012 - 2015) by the monument protection authorities, put up for public discussion and then adopted by the city council with minor changes (2016). There were no public objections to renewable energies. The subsequent planning regulation for renewable energies, however, determined that solar systems on the roofs of historic inner-city buildings are only permitted if they are installed on the same roof level and are not visible on the street level and from the most important sights. Solar systems are completely prohibited in listed buildings[94]. With regards to the planning and approval of residential renovation and the improvement of energy efficiency up to energy class "A", a framework is provided by the *smart city agenda* (2017). There are some technical innovations on the solar energy market that can be part of conflict solutions, e.g. solar modules in different colours and installation concepts that can be integrated into the roof, making the modules less visible[95]. Overall, issues such as the energy efficiency of the housing stock and renewable energies have moved to the top of the general planning priorities. City planners and preservationists developed detailed guidelines. A current overall plan simplifies the further expansion of solar energy and fine-tuning at project level.

These two solutions demonstrate the need for continuous negotiation between the promotion of roof solar energy and the preservation of aesthetics, cultural and historical values. Conflict management must find compromises that allow solar roof systems to operate without destroying these values, with limited additional costs compared to standard options. To achieve this, the following is required:

- An increased focus by installers and building owners on the correct design and integration of solar systems,
- A change of perspective and openness to the idea that not all types of solar energy on roofs destroy the aesthetic, cultural or historical values of existing (old) buildings, and
- Technical innovations for better solutions such as more colour options for solar panels.

---

93 There are 38 municipalities in the two regions, about half of which have implemented guidelines for solar energy in building permits. One of the municipalities (Malmö) has published a brochure with recommendations for the architectural integration of solar modules. The overview was produced as part of the "Sol i Syd / Sun in the South" project, described at www.solisyd.se/english.

94 Heat pumps may also only be installed on the courtyard side (not visible from the street).

95 So far, these technical solutions are rather unusual, probably because of their higher cost and/or lower efficiency compared to standard products.

3.2.3 Biogas

No information on exemplary conflicts is available from the participating countries and pilot regions. However, a conflict described in the context of bioenergy has some typical characteristics **that could also be significant** in conflicts over biogas plants.

Example of a typical conflict and solution from Finland

Bioproduct Mill is the largest investment ever made by the Finnish forestry industry. *Bioproduct Mill* will not only produce pulp, but also renewable energies (heat and steam as well as solid fuels from bark).

Due to possible impacts, this project held various conflict potentials, e.g. impacts on water quality and productivity in the downstream lakes (sulphur, phosphorus, nitrogen), noise and transport problems. These conflicts affected a wide range of actors:

- Approval and environmental authorities, e.g. the national EIA contact point (Ely),
- The *Bioproduct Mill* operator: Metsä Group,
- The city of Äänekoski, i.e. the municipality where the project is located (planning authority),
- Environmental NGOs such as the WWF at national and regional level,
- The local population.

In order to proactively manage the conflict potential, the operator Metsä Group worked very closely with Ely. The Metsä Group was also very active in informing the population. Among other things, the Metsä Group organised public information events on the EIA process.

The result was a smooth and fast EIA process and thus a quick and high quality preparation of the environmental permit. This solution shows that an open and transparent approach by the experienced applicant towards all parties involved can create a constructive atmosphere. In addition, quick reactions of the operator and the authorities responsible for the approval led to an active dialogue during the entire process. A good quality of the reports and studies could be guaranteed by the selection of professional consultants.

3.2.4 Biomass combustion in combination with district heating

Example of a typical conflict and solution from Riga, Latvia

A typical planning conflict arose around a project of a private company to build a 100 MW heating plant for wood chips. However, this capacity was not planned in the city's development plans and was also too large for the heat supply in Riga, as existing natural gas CHP plants already cover the demand. Although wood chips promised cost advantages, there were fears that the air quality in Riga would be severely impaired (fine dust) and that the price of electricity would rise as a result of the construction of such a heating plant (underutilisation of the natural gas CHP plant).

In addition to the project developer (typically pro), the City of Riga and its municipal energy agency "Riga Energy Agency" (REA) were involved in this conflict. The REA Advisory Board, consisting of 16 leading experts from the energy and housing industry, advises and solves questions of energy efficiency and the use of renewable energies. Both actors are responsible for the strategic development planning of the energy sector in Riga. Further actors were the JSC "RTGAS SIL TUMS", the main heat supplier of Riga, which is interested in purchasing heat at a favourable price, and the state-owned JSC "Latvenergo", which operates large CHP plants in Riga. In order to overcome the planning conflict, the project in the form of a large heating plant was rejected. Instead, several smaller heating plants were planned.

Renewable energies are sometimes used as an argument to promote business interests. However, these are not always in line with planning, e.g. the action plan for sustainable energy supply to municipalities. However, negotiations between the actors, supported by independent experts, led to solutions that were acceptable to all actors involved and that had no negative impact on "uninvolved" third parties such as the population, who have to pay heat prices and live with emissions.

3.3 Priority of Renewable Energy Planning Conflicts in the Baltic Sea Region

In order to investigate the significance and priority of planning conflicts in the field of renewable energies, a survey of renewable energy and planning institutions in the participating regions was conducted. The questions presented concerned the following planning fields:

- DRS - development of regions and settlements,
- DIS - development of infrastructure,
- DNE - development of the natural environment,
- EI - economic issues,
- SI - social issues

as well as best practice solutions of exemplary planning conflicts. From the analysis of the responses of the participating pilot regions, political and technical recommendations for conflict management can be derived.[96] If there are differences in the priority of conflict areas between the participating regions or countries, this should be considered when deriving recommendations. Conversely, recommendations can be formulated independently of conflict priorities if no differences can be identified.

Table 7 provides an overview of the survey and the determined prioritisation of planning conflicts in renewable energies.

For column 3 of the table, the priorities from the questionnaires were weighted.[97] This means that the difference between each priority and an average priority was calculated (symbolised by the red centre line in Figure 6). Thus, the conflict areas evaluated in the participating regions become visible as a higher or lower priority than in the Baltic Sea Region as a whole (measured as an average priority in each planning area across all pilot regions). Column 4 lists the typical planning conflicts identified and described by the participating regions.

---

96 This analysis should be understood more as a proposal for future secondary studies than as a concrete study with valid results: The number of "test subjects" is too small and the institutions in question are not representative of the spectrum of actors in the field of renewable energies (the actors surveyed, e.g. regional or renewable energy agencies, are likely to be predominantly in favour of renewable energies - with a specific awareness and reflection of such conflicts. Nevertheless, the presented results are interesting, helpful for deriving recommendations and represent the perception of an important and widespread group of experts for renewable energy planning in the Baltic Sea region.

97 Database: Evaluation of priority conflicts. The priorities named by the participating countries were graded by points (highest priority = highest score). In the next step, the average scores were calculated. Finally, the average priority was indicated for each planning field, so that the differences between the scores of the individual planning fields and their average scores could be calculated:

- Difference > 0 – Conflicts in a planning field are more important in the concerned pilot region than on average in this planning field across all pilot regions,
- Difference = 0 – Conflicts in a planning field are similar to the average,
- Difference < 0 – Conflicts in a planning field are less important.

Table 7: Prioritization of planning conflicts in the participating countries

Project partners		Priority[key]	Example Conflict
1	2	3	4
PP1	Ministry for Energy, Infrastructure and Digitalisation Mecklenburg-Vor-pommern (DE)	DRS, DIS, DNE, EI, SI	Wind energy (e.g. designation of suitable sites)
PP2	Skåne Ass. of Local Authorities (SE)	DRS, DIS, DNE, EI, SI	Wind energy, rooftop solar panels
PP3	Blekinge Region (SE)	DRS, DIS, DNE, EI, SI	(no example given)
PP4	Energy Agency for Southeast Sweden		
PP5	Regional Council of Central Finland	DRS, DIS, DNE, EI, SI	Competing interestes of increased need of wood for processing and biodi-versity
PP6	Tartu Regional Energy Agency (EE)	DRS, DIS, DNE, EI, SI	RE plants in a listed old town
PP7	Zemgale Planning region (LV)	DRS, DIS, DNE, EI, SI	(no example given)
PP8	Baltic Environmental Forum – Latvia	DRS, DIS, DNE, EI, SI	100 MW biomass district heating plant
PP9	Lithuanian Energy Institute	DRS, DIS, DNE, EI, SI	Housing modernisation, heating plants, large RE plants
PP10	Regional Office for Spatial Planning of Westpomeranian Voivodship (PL)	DRS, DIS, DNE, EI, SI	Wind farm planning
PP11	Roskilde University (DK)	DRS, DIS, DNE, EI, SI	Wind farm planning

key – Planning Fields: DRS - Development of regions and settlements, DIS - Development of infrastructure, DNE - Development of the natural environment, EI - Economic issues, SI - Social issues

Figure 6 shows the conflict priorities for the planning fields summarised as "typical" priority profiles. Typical profiles indicate that regions with similar profiles were aggregated to an average priority profile (as the figure shows, at least two regions could be aggregated to each typical priority profile). Four typical profiles could be found that apply to all regions (the corresponding regions are named in the key). The individual country- or region-specific priority profiles for the planning fields are shown in Figure A-1 in Annex 1.

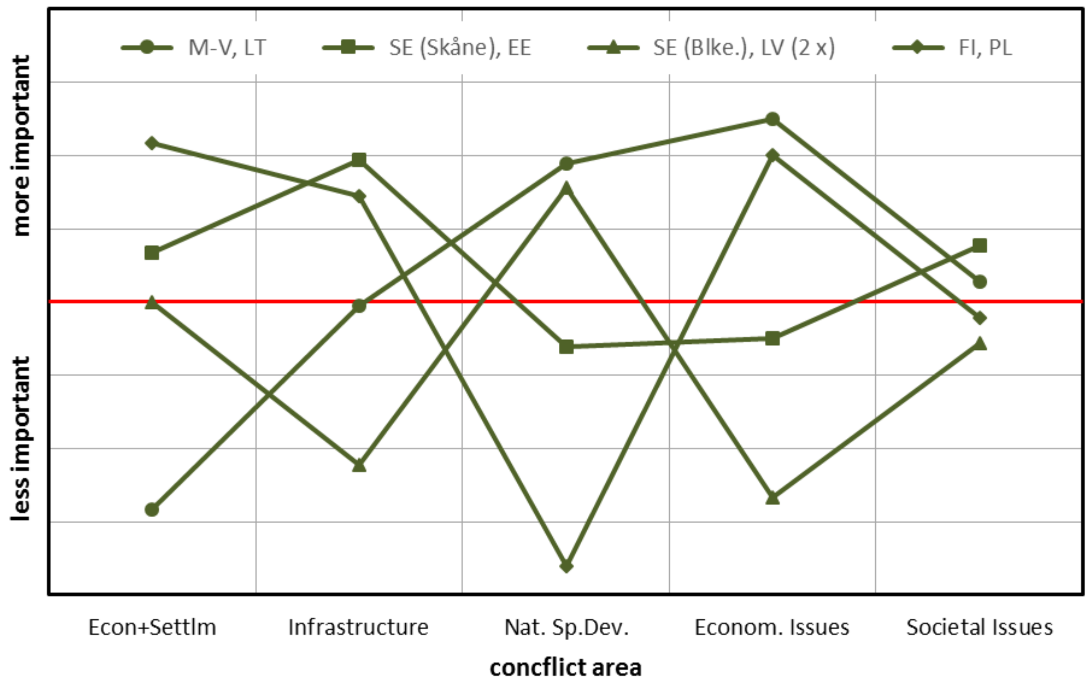


Figure 6: Priority profiles on RE planning conflicts in the participating countries

There are both differences and similarities in the profiles between the participating regions: Thus - despite minor differences in individual planning fields - similar priority profiles can be identified for the following countries

- Mecklenburg-Vorpommern and Lithuania - with a higher priority of infrastructure in Lithuania,
- Skåne (Sweden) and Tartu (Estonia) - with a higher priority of the natural environment in Sweden,
- Blekinge (Sweden) and Latvia (BEF and Zemgale) - with a higher priority of economy and society in Latvia,
- In Central Finland (Finland) and in Westpomeranian Voivodeship (Poland) - with a higher priority of society in Finland.

In contrast, differences in priority profiles[98] can be found between the groups mentioned, e.g. between Mecklenburg-Vorpommern and Poland (both agree only on economic issues). In addition, further observations can be made. To derive recommendations for RE conflict management, the following should be considered:

- In the priority profiles of Skåne (Sweden) and Tartu (Estonia), all priorities are close to those of the average profile of the Baltic Sea Region.
- In Blekinge (Sweden) and Zemgale (Latvia), most conflict areas are less important than in the other regions. Only nature conservation (in Blekinge) and regional and settlement development (in Zemgale) are slightly more important than average.
- In Central Finland (Finland) and Estonia (Tartu), most conflict areas are more important than in the other regions (only nature conservation is of lower priority in Finland).

98 Different priorities mean that a field of conflict may be more important than average in one country while it may be the other way around in another country, i.e. less important than average.

- Economic conflicts have lower priority in Sweden (Skåne and Blekinge) and in Zemgale than in any other country or region.
- The most significant deviations from the average can be seen in the priority of environmental conflicts: In Central Finland (Finland), Sweden (Skåne) and especially in Poland, environmental conflicts have a lower priority than in the other regions. In Latvia and Lithuania, on the other hand, this planning/conflict field is rated much higher than the average for all countries or regions.

3.4 Interim Conclusion

The expansion of renewable energies is accompanied by conflicts that are similar or even comparable in their constellations, in the actors involved and in the conflict matters across the participating countries in the Baltic Sea Region. This applies particularly to wind energy. As with solar energy, conflicts arise, among other things, over the visibility of the installations, which could impair cultural assets such as historic towns or listed buildings. Otherwise, solar energy is described as the least conflict-associated renewable energy. In the case of biogas plants, the conflicts are similar, among other things, because of the induced transports, the odour nuisances that may occur, etc. Conflicts over the use of bioenergy in district heating systems occur particularly in the Baltic States, where district heating is of great importance.

Because of the similarities between the participating countries observed in the previous sections, the conflicts associated with renewable energies and their spatial planning are similar. In some cases, they are only of varying significance due to the different stages of development of renewable energies. It is only logical that, with the continued expansion of renewable energies, the potential for conflict and disputes will also increase. They could take on dimensions as can currently be observed in wind energy in Mecklenburg-Vorpommern. Minimising and managing conflicts will therefore depend on the planning itself on one hand and on efficient conflict management and avoidance options on the other (e.g. economic participation of affected actors).

4. Priorities for improving common planning perspectives

In order to obtain information on the priorities of the participating countries and regions in improving common planning perspectives for renewable energies in the Baltic Sea Region, a survey was conducted among the participating regions. A questionnaire was developed for this purpose. The following core statements can be derived from the answers and from the additional detailed explanations and comments that were provided:

Political Framework

A more harmonised energy policy for the countries in the Baltic Sea Region is conceivable for the future. On one hand, we observe that these countries are characterised by similar conditions and have similar prerequisites. However, measures of implementation are considered to be more important for the expansion of renewables. On the other hand, the Baltic Sea Region could also become more recognisable as a result of the

Development and Communication of a common Energy Vision (Questions 1 and 2)

Common guidelines for energy policy action can be one way of harmonising energy policy.

Specific energy targets for the Baltic Sea Region for 2030 or 2050 as a contribution to meeting EU targets are not necessarily preferred. The common EU targets are regarded as sufficient.

A transnational long-term strategy to achieve common goals is not preferred. The Baltic Sea Region should be an example of the highly developed use of renewable energy, but this does not necessarily require an additional strategy. Rather, the focus should be on *implementation*.

A harmonised renewable energy policy in the Baltic Sea Region does not seem necessary. Similarly, the development of common long-term targets for renewable energies is not appropriate, as such targets already exist at various levels (UN, EU, national and regional). (Question 2)

However, a transnational strategic orientation for the *networking of regions and countries in the Baltic Sea Region* is clearly advocated in order to exchange renewable energies.

Technical Framework

Spatial Planning and Renewable Energies (Questions 3, 4 and 5)

The harmonisation of spatial planning for renewable energies does not seem to be an option for the countries in the Baltic Sea Region. On one hand, the differences in the national legal and technical framework conditions (planning systems) are referred to as reasons for this. These different approaches are regarded as necessary for achieving the national renewable energy targets. On the other hand, it is also pointed out that the national framework conditions already implement common EU requirements. (Question 3)

For the same reasons, the development of common transnational strategies and formal plans for the generation and use of renewable energies is not an option.

There is clear support for *informal measures*. In addition, there should be a focus on joint action and on the exchange and use of best practice examples to understand different aspects of spatial planning and renewable energy.

There was also a clear 'yes' for the *development of joint projects and sites for centralised renewable energy plants*, where large quantities of renewable energy can be generated for exchange within the Baltic Sea Region. These can also include, for example, shipping (use of renewable energy on ships and in ports) or the joint development of charging infrastructures for electric mobility.

A *closer link between spatial planning for renewable energies and the planning of transnational energy infrastructures* is also advocated. Since such large projects affect society and planning both in the individual countries and in the Baltic Sea Region, cooperation is an indispensable prerequisite for such projects. (Question 4)

The question of whether the countries in the Baltic Sea Region need a *more interconnected infrastructure* for future energy supply, which is largely based on renewable energies, was also clearly answered in the affirmative. This necessity is seen in particular for electricity grids, for offshore installations and for transport grids road/rail/ship (LNG), but less for gas grids, fuels or energy storage.

The majority of respondents agree with the *need for intergovernmental institutions* to support the transformation of regional energy systems (replacing fossil fuels with renewable energies).

Such institutions should, for example, represent the renewable energy interests of the Baltic Sea Region countries within the EU. They should be *platforms for transnational cooperation*. They should support the exchange of knowledge, policy development and joint measures as well as the pooling of know-how, experience and best practice - e.g. through *mutual learning* regarding the management of renewable energy conflicts, the development of common tools and the *creation of a common database* for renewable energies in the Baltic Sea Region (there is little interest in building up joint monitoring of the transformation process in the Baltic Sea Region away from fossil fuels towards renewable energies). In particular, however, such institutions should support the establishment of stakeholder networks for renewable energies in the Baltic Sea Region.

There is a consensus that the countries in the Baltic Sea Region should find a more development-oriented approach to the implementation of renewable energy projects. One reason given for this is that, in contrast to regional development, spatial planning in the countries is clearly regulated. However, it is not clear whether this can be achieved through more or less regional development. It is clear, however, that *spatial planning is indispensable for the expansion of renewable energies* and that the role of r*egional development in the expansion of renewable energies should be strengthened.* (Question 5)

<u>Harmonisation of the legal framework for spatial planning for renewable energies </u>(Question 8)

It is difficult to decide whether the differences between the many national legislations for the planning of renewable energies should be reduced. On one hand, this could be an interesting path for the future; on the other hand, the difficulties of such a project are pointed out by the participants. Moreover, spatial planning is a privilege and the responsibility for it lies with the countries and their municipalities. (Question 8)

The harmonisation of the legal framework is clearly rejected when it comes to concrete laws for planning and construction: According to this, no laws should be considered for harmonisation that apply to planning, environmental impact assessments or even permit procedures. This also applies to regulations concerning the construction or dismantling of renewable energy plants (Question 8.5).

Planning guidelines, instructions and planning methods and procedures for the planning of renewable energy installations in the individual countries should not be harmonised. (Question 8.1/8.3)

Planning Criteria (questions 8.2 and 8.6)

In contrast, *specific planning criteria* applied in spatial planning for renewable energies should be *harmonised* for all renewable energy sources (especially for wind energy because of its transnational and maritime significance, and possibly also for energy storage). However, it is pointed out that the application of harmonised criteria in different planning systems could also be difficult. (Question 8.2)

The *general planning criteria* developed by the participating countries should be implemented and used in (large-scale) spatial planning for renewable energies. They may be less suitable for smaller-scale regional planning and regional development and should therefore not be applied there. In particular, however, they are not suitable for approval procedures. (Question 8.6)

Conflict Management (Question 6)

It would be met with approval for countries in the Baltic Sea Region to *harmonise or jointly develop their approaches to the management of renewable energy conflicts*. Conflict management and participation will gain in importance in the countries of the Baltic Sea Region. Best practices and management methods should therefore be shared. However, this refers only to the management methods and not to common instruments such as a transnational conflict database, which may contain, for example, fields of conflict, actor constellations, the conflict issues as well as conflict solutions. On the other hand, given the wide range of potential conflict, guidelines or recommendations on how conflicts can be resolved are suggested. These should, for example, describe solutions that have already proven effective in real conflicts.

However, joint or even harmonised conflict management is not met with broad approval.

5. Recommendations for improving spatial planning for renewable energies

In the following, recommendations will be derived from the previous analyses and the conclusions drawn above. These recommendations are addressed in particular to VASAB.

5.1 Introductory Remarks

The jointly agreed long-term energy perspective of the EU are the energy union and Europe's transition to a low-carbon energy supply. To this end, the strategies and instruments of a post-2020 cohesion policy are currently being developed in the EU. For this purpose, there are joint intergovernmental projects such as Baltic InteGrid, COMMIN, Baltic LINes or BEA-APP[99] as well as further measures and instruments. One example is the "INSPIRE Directive" 2007/2/EC, which is both an instrument for harmonisation in the (geo)data field and for improving spatial planning. In the energy sector, too, concrete steps have been taken in the last several years to link energy systems and markets, e.g. projects of common interest (PCI) [100] or the Baltic Lines Baltic Energy Market Interconnection Plan (BEMIP).

When it comes to the use of renewable energies, however, the EU member states in the Baltic Sea Region still show great differences and untapped potential. One reason for this are different energy policy and legal frameworks, i.e. national framework conditions. The Baltic Sea countries can therefore be roughly divided into three groups:

A. Denmark and particularly Sweden are already very successful as leaders in the use of renewable energies. Both countries primarily use bioenergy (Sweden additionally use hydropower, Denmark use wind energy). Thanks to renewables, they are already relatively independent of fossil energy imports. Both countries have very ambitious targets for the expansion of renewable energies.
B. B. Poland and Germany still have small shares of renewable energy in their energy consumption but could use more renewable energy due to their potential. In Poland, but also in Germany, bioenergy is the most important source of renewable energy. Germany, as well as Poland, use wind energy to a greater extent. However, the countries also want to continue using their domestic resources such as coal (or oil shale in Estonia). Germany is working intensively on the further expansion of renewable energies. Poland is not involved in Nord Stream and plans to strengthen its energy security with its own pipeline project.
C. Finland, Estonia, Latvia and Lithuania are primarily striving to secure their energy supply. They have a higher demand for heating energy due to the climate, which in many cities is covered by district heating. Bio energies are therefore of comparatively high importance (approx. 90 % of the total energy generation stem from renewable energies).

Further reasons for the different levels of use of renewable energies are the differences in the legal framework conditions for their expansion.

At the same time, however, the Baltic Sea Region consists of EU member states which, due to similar conditions for energy production and consumption in important areas, are able to expand and intensify their existing cooperation, e.g. in developing their potential for renewable energies - and in solving the obstacles and conflicts that arise.

---

[99] Baltic InteGrid - Integrated Baltic Offshore Wind Electricity Grid Development, BalticLines - Coherent Linear Infrastructures in Baltic Maritime Spatial Plans, BEA-APP - Baltic Energy Areas - A Planning Perspective, COMMIN - Promoting Spatial Development by Creating COMmon MINdscapes.

[100] PCI ("Projects of Common Interest") are energy infrastructure network development projects deemed necessary to ensure the achievement of the common European objectives.

Along with others, these aspects provide an important indication for making recommendations for the Baltic Sea Region, the implementation of which will achieve the common interest of increasing the share of renewable energies in energy consumption more quickly and efficiently than through different initiatives and strategies in individual countries.

These recommendations should and could consider the different conditions and interests of these countries. It is impossible to eliminate all the differences mentioned, and these differences are also an expression of a diversity that is worth preserving. This diversity must be used in the various aspects of spatial planning with regard to the expansion of renewable energies, while learning from each other.

On the one hand, the recommendations thus seek to harmonise national systems and framework conditions for spatial planning. On the other hand, they also aim at the transnational planning of large transnational renewable energy projects, with which the expansion of renewable energies could be intensified significantly. It would, for example, be highly desirable to coordinate the transnational planning of such projects. National planning systems would have to be put into service and further developed, links and hubs for transnational planning should be implemented and central actors - including those from businesses - and institutions should be involved.

Another argument in favour of such a harmonised strategy is the need to secure the necessary acceptance of renewable energies and their more widespread use: as we see in Germany, the increased expansion of renewables will place greater emphasis on improving acceptance for regional planning. It is possible that many "small" renewable energy plants will be more of a strain on the acceptance of the population than a few plants. Thus, a double focus is necessary:

1. focusing on the installation of many small renewable energy systems in suitable applications, such as buildings, with immediate benefits for residents, and
2. focusing on the use of larger renewable energy potentials, which are usually linked to certain sites or areas, and few large renewable energy plants at selected sites. [101]

The existing spatial planning strategies are characterised by their specific national features, which makes transnational cooperation between spatial planners more difficult. Since the cooperative planning of transnational projects has so far been limited to some isolated cases, methods and criteria for planning are still inadequate. In addition, the existing planning systems have so far only required and used methods and procedures of participation and conflict prevention strategies that were developed for national, i.e. local or regional projects for the use of renewable energies. Many of the following technical recommendations aim to reduce or eliminate these deficits.

5.2 What is politically necessary?

In order to push ahead with the expansion of renewables in the Baltic Sea Region it is necessary for this push to be supported by a strong political commitment: "The realisation of any potential, however great it may be, depends on politics. . . "[102] . Where renewable energies and climate protection are an integral part of energy policy, spatial planning also has a good chance of improving the necessary planning.

---

[101] One possible transnational solution: One country could develop a site for a large joint renewable energy plant. The other countries pay a fee for this project and supply the site and share the generated energy. Large projects occupy fewer locations, can generate economies of scale and generate less NIMBY resistance than many small renewable energy plants.

[102] EU: Seventh Report on Economic, Social and Territorial Cohesion. Available at: http://ec.europa.eu/regional_policy/en/information/cohesion-report/.

The primary objectives of transnational spatial planning for renewable energies are to strengthen a sense of togetherness, to communicate mutual energy security, to support cohesion, to bring all countries closer to a high level of planning and use of renewable energies, as has been achieved, for example, in Sweden and Denmark, and to harmonise guidelines, methods and instruments in the Baltic Sea Region.

To achieve these goals, the respective strengths of the countries should be used and strengthened while existing weaknesses and problems should be avoided or mitigated. This is accomplished through

- → Joint learning processes: to make success factors such as framework conditions, methods and experience from Group A usable for all countries (e.g. strong municipalities, high RE acceptance, goal of a carbon-free society),
- → Mutual motivation: to jointly develop strategies and measures to strengthen acceptance of the energy transition to renewable energies, in particular those that make them cheaper and thus - in Group B - offer alternatives to the continued use of fossil fuels (coal[103] and possibly nuclear energy),
- → Mutual reinforcement: by ensuring energy security in Group C, through mutual integration via transnational electricity and gas networks; by energy networks for renewable energy sources which, like natural gas, are suitable for district heating,
- → Joint actions: Development of institutions and platforms that develop transnational initiatives for renewable energy policy, renewable energy projects and, if appropriate, for phasing out the use of fossil and nuclear energy sources.

5.3 What do transnational spatial planning and institutions have to contribute?

In order to achieve progress in the expansion of renewable energies in the Baltic Sea Region more effectively and faster than before, **informal cooperation** in spatial planning should be intensified. It should

- → extend spatial planning for renewable energies to include spatially relevant aspects of large-scale production and logistics of renewable energy **raw materials**,
- → Identify **sites** for the construction of large renewable energy plants at which large quantities of renewable energy can be generated for common supply (transnational supply) - including the investigation of site conditions and, if necessary, the derivation of recommendations for site development,
- → Proposing **routes** for the further expansion of transnational energy networks linking the production sites with the main points of consumption (electricity networks, gas pipelines, transport routes for high-quality bioenergies, e.g. next-gen biofuels).
- → Participate in the development of national or multinational **projects** for the construction and operation of such RE facilities and transport networks,
- → participate in the development of the necessary transnational **planning methods** and data sources and
- → Making use of experiences with national and regional renewable energy projects with regard to **reconciliation of interests** and conflict management in transnational projects.

[103] In 2017, as part of its "Clean Energy" package, the EU Commission has created a platform for transitioning coal regions to develop long-term strategies and projects and exchange best practices and experience.

Figure 7 shows the connection between these steps by presenting them as part of a value chain for large transnational RE projects and giving examples of their links.

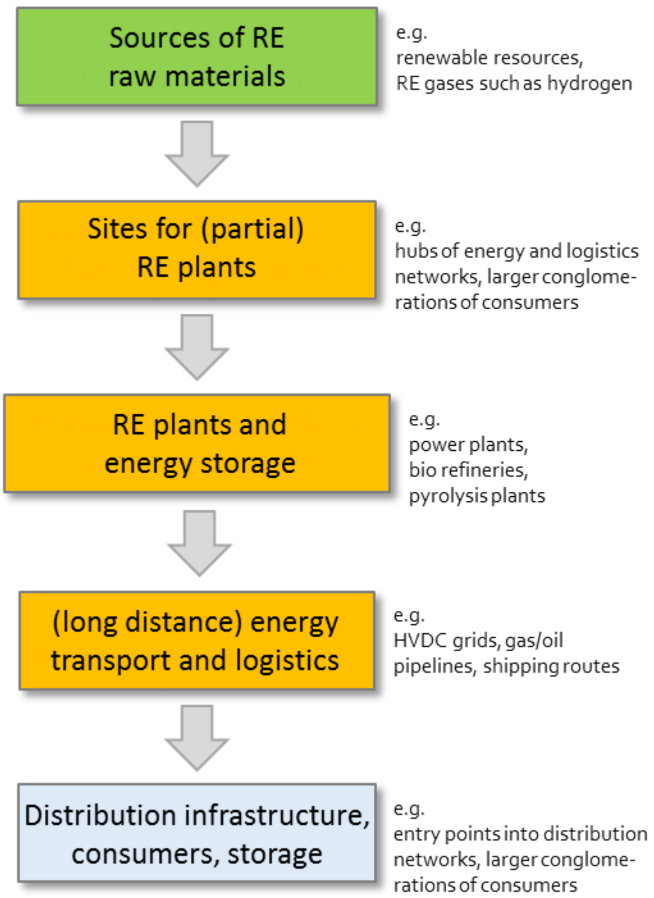


Figure 7: Value chain for transnational renewable energy projects

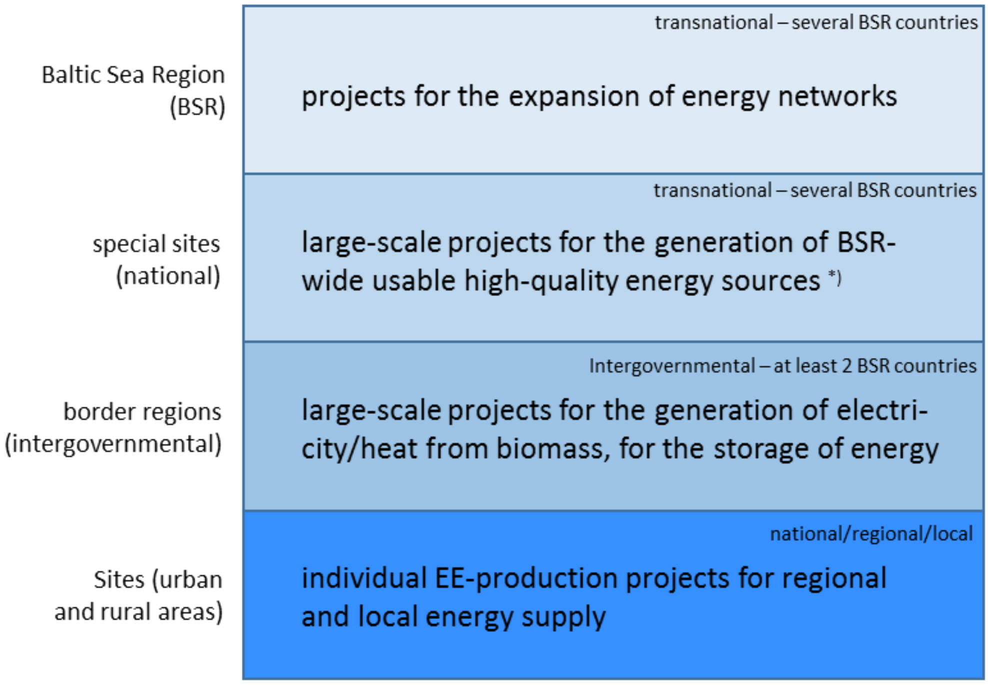
In some countries of the Baltic Sea Region (so far at least) the development of renewable energy projects takes place outside spatial planning, since it is not envisaged as a task of spatial planning. Instead, spatial planning can and must create the planning prerequisites for these projects. However, it can do even more: Table 8 lists possibilities derived from a general value-added chain as to how spatial and regional planning as well as actors in regional economic development and regional spatial development can work more closely together in the future. In any case, spatial planning and regional development can no longer be clearly distinguished from each other. So far, for example, potential assessments have been more of an object for regional development. Their planning significance will increase with the number and size of new renewable energy projects and spatial planning could draw such instruments closer and develop them further. This would also enhance their value and thus strengthen the planning of renewable energies as a whole.

Table 8: Possibilities for cooperation between spatial planning and regional development in transnational renewable energy projects

Planning Aspects of Renewable Energies (RE)	Value Added Stage:	**Regional development and value creation**
analyses of RE potential, production, demand and economic viability	**provision RE raw materials**	development of products, producers and transnational markets for RE raw materials
Location analysis and planning, location strategies (e.g. supply and disposal)	**RE site locations**	Site development, establishment of suppliers and service providers
Concepts for renewable energy systems and storage, monitoring technology, system planning	**RE plants, energy storage**	Development of manufacturing, maintenance and service industries (e.g. storage operators)
Planning of network and grid routes, logistics concepts	**(long distance) energy transport and logistics**	Construction and expansion of energy networks and grids, logistics networks (non-grid-bound RE)
Demand analyses, storage concepts	**Distribution infrastructure, consumers, storage**	Development/establishment of transnational markets and trading centres for renewable resources/energy

In order to make the structure of the following recommendations and the connections between the individual recommendations more accessible, Figure 8 shows transnational renewable energy projects together with other renewable energy projects with regard to their possible locations. According to this, transnational projects - infrastructures and large-scale renewable energy projects - are distinguished from intergovernmental and national projects. The recommendations are aimed in particular, but not exclusively, at improving the framework conditions and spatial planning for transnational projects.

As explained in section 5.1, improving the planning perspectives for renewable energies in the Baltic Sea Region is an indispensable prerequisite for their further expansion. As described in section 2.4.2, the new EU cohesion policy after 2020 illustrates that the priorities for renewable energies and climate protection in the EU will continue to rise. As a result, spatial planning, if it accepts the associated planning challenges, is also facing a considerable increase in importance. It can and must use this increased importance to demand improvements in its framework conditions, as recommended below.



*) In order to be economically viable, such projects - e.g. bio refineries, hydrogen terminals – must have a minimum size/plant capacity which may exceed the possibilities and/or requirements of individual countries (use of economies of scale).

Figure 8: Location-related classification of renewable energy projects

5.4 Recommendations for improving the perspectives for spatial planning for renewable energies

Table 9 gives an overview of the recommendations that can be derived to improve the perspectives for spatial planning for renewable energies in the Baltic Sea Region. The recommendations are arranged according to their focus - e.g. as political or technical recommendations - and according to their spatial "area of responsibility".

5.4.1 Political recommendations

The recommendations for improving the political framework conditions for spatial planning for renewable energies aim firstly at strengthening the political commitment to expanding the use of renewable energies in the countries of the Baltic Sea Region. Secondly, recommendations are given to this end, which should contribute to an improved exchange of information and communication between all participants. And thirdly, the political recommendations aim to strengthen participation and involvement in the field of spatial planning for renewable energies. The following political recommendations are made in these three areas:

1. Strengthening the national political commitment to renewables through the development of joint energy policy guidelines, strategies and targets for renewables, in line with the energy policy interests and potential of the Baltic Sea countries,
2. Establishing a joint institution for the development of large transnational renewable energy projects (e.g. in a more developed form of BASREC),
3. Strengthening the integration of renewable energies into the EU Strategy for the Baltic Sea Region, which identifies the improvement of energy security, access to energy and energy

efficiency as important tasks for the region and also underlines the importance of joint infrastructure projects for solving these tasks - but without emphasising the leading role of renewable energies.

4. Establishment of a VASAB subgroup "Terrestrial (renewable energies) spatial planning" in a similar way to the already active group on maritime spatial planning.
5. Development and invitation to competitions for joint renewable energy (demonstration) projects,
6. Strengthening transnational thematic cooperation between universities and colleges to improve accompanying research and development,
7. Further development of informal instruments for spatial planning for renewable energies,
8. Strengthening the motivation for cooperation in the development of renewable energies and acceptance through information, communication, participation and inclusion, e.g. by countries and regions reporting on their contributions to cohesion in the Baltic Sea Region and describing their achievable benefits,
9. Present information and communication on the demand and benefits of joint renewable energy projects, specialised sites and routes,
10. To invite proposals for location audits for the establishment of joint renewable energy projects (e.g. power to heat), if necessary initially to demonstrate the technical feasibility and achievable regional economic advantages,
11. Information on planning and economic participation opportunities for stakeholders at the sites where joint renewable energy projects are implemented and at the energy networks connecting them,
12. Development of regional discourses on these sites and networks in order to gain the support of the population and other regional actors, balancing the benefits and the associated burdens,
13. Development of participation models for the regions in which special sites - preferably resulting from location competitions - are located (evaluation of the transferability of existing participation models (e.g. in Germany) to strengthen local participation and acceptance),
14. Support of the location competitions by regional project competitions in which proposals can be submitted on how the renewable energy plants in the special sites are to be designed in specific terms (participation, inclusion of local knowledge in project development).

5.4.2 Technical recommendations

The recommendations for improving the technical framework conditions for spatial planning for renewable energies aim firstly at improving spatial planning for renewable energies. Further recommendations relate secondly to the further development of the planning criteria to be applied in spatial planning and thirdly to conflict management for renewable energies. The following technical recommendations concern these three areas:

1. Improving the links between spatial planning and the planning of renewable energies and the spatial planning of energy infrastructures,
2. Further development of procedures and methods for transnational, i.e. cooperative planning of sites, routes and infrastructures and connecting these procedures to the national planning systems - using findings from the Joint Maritime Spatial Planning (e.g. experiences from the transnational planning of the offshore wind park “Kriegers Flak”),
3. Further development of the set of general planning criteria, which are preferably applicable for the development, evaluation and planning of large transnational renewable energy projects,

4. Harmonisation of the specific planning criteria for the planning of renewable energy plants (e.g. priorization of nature- and species protection),
5. Development of common guidelines for major transnational renewable energy projects,
6. Development of balancing mechanisms for diverging national interests,
7. Development of common planning methods for transnational energy projects,
8. Linking transnational planning with the national planning systems - using knowledge and experience from the joint maritime spatial planning (MSP) of HELCOM and VASAB,
9. Development of instruments that can support the planning of transnational renewable energy projects, e.g. checklists with areas such as criteria, acceptance, participation, technical aspects, added value,
10. Improving spatial planning processes by providing INSPIRE-compliant data sets, particularly in the Annex III area of application, e.g. solar radiation and wind atlases and other approaches; by reporting requirements for the provision of energy geodata,
11. Undertaking studies on national interests, which may impede the development, planning and implementation of joint renewable energy and infrastructure projects,
12. Development of instruments to strengthen local balancing discourses,
13. Development of intergovernmental concepts for sites with large renewable energy installations,
14. Development of concepts for their connection to grids/pipelines.

Table 9: Overview of the recommendations for spatial planning for renewable energies in the Baltic Sea region

Area	Political Framework			Technical Framework		
	Strengthening of political commitment	Information and Communication	Participation and Involvement	Spatial Planning and Renewables	Planning criteria	Conflict Management
1	2	3	4		7	8
Baltic Sea Region (BSR – transnational)	1. development of joint guidelines and implementation strategies for RE policy, 2. establishment of joint institutions and platforms	3. integration of RE into the Baltic Sea Strategy, 4. establishment of a VASAB subgroup "terrestrial (RE) spatial planning"	5. competitions for joint RE projects, 6. initiating R&D co-operation between universities and colleges for accompanying research	1. strengthening of links between RE and spatial planning and between RE and infrastructural planning, 2. (further) development of procedures and methods for transnational, i.e. cooperative planning	3. further development of the set of general planning criteria, 4. harmonisation of the specific planning criteria for the planning of RE plants	5. development of guidelines for joint RE projects, 6. development of balancing mechanisms for diverging interests,
BSR countries (BSR – national)	7. (further) development of informal instruments for spatial planning for renewable energies	8. information on country contribution to cohesion and its shared benefits, 9. information on the demand for RE projects	10. invite proposals for location audits for the establishment of joint RE projects (demonstration sites and projects)	7. developing planning methods for transnational energy projects, 8. linking transnational planning with national planning systems	9. development of checklists for RE special locations and grids, 10. improving the geo database for RE spatial planning	11. studies on national interests that may impede joint RE interests, 12. development of instruments to strengthen local balancing discourses
Regions (BSR – regional/local)		11. information on possibilities of participation on RE special sites and grids, 12. development of regional discourse on special sites and grids	13. development of participation models for actors at special locations with large-scale RE plants and grids, 14. invitations to regional project competitions	13. development of intergovernmental concepts for sites with large renewable energy installations, 14. development of concepts for their connection to grids/pipelines	15. … 16. …	17. …, 18. …

Figure 9 summarises the approach on which the recommendations are based.

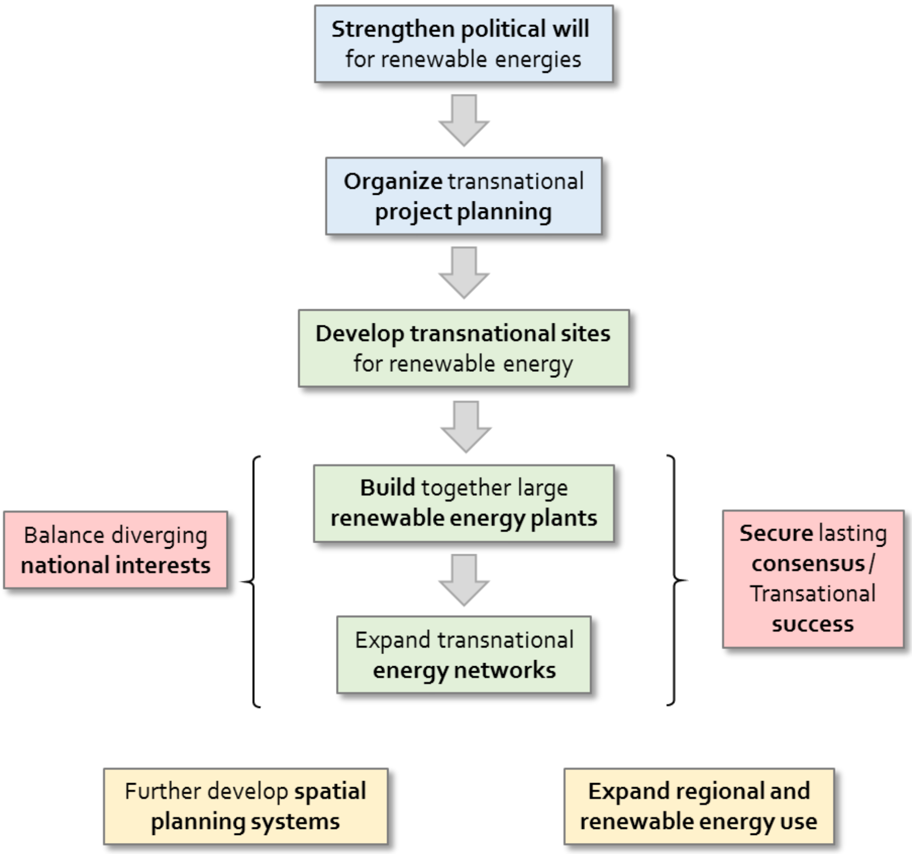


Figure 9: Relationship between political and technical recommendations

Spatial planning is carried out on the basis of legal framework conditions - e.g. spatial planning and subordinate implementation regulations. In Mecklenburg-Vorpommern, for example, these are the Spatial Planning Act (Raumordnungsgesetz, ROG) and the State Planning Act (Landesplanungsgesetz (LPlG M-V)). Similar to other participating states, this legal framework regulates

- general regulations (e.g. principles of spatial planning, general regulations on spatial planning strategies, environmental assessment, participation),
- the demarcation of spatial planning between the federal and state governments,
- cooperation between the two and
- participation in the preparation of spatial development plans in neighbouring countries.

One of the principles of spatial planning is, for example, that the spatial prerequisites for the expansion of renewable energies must be created in spatial development (§ 2 ROG). The Spatial Planning Act does not contain any further regulations on spatial planning for renewable energies.[104] The State Planning Act also regulates tasks and principles of spatial planning and land use planning, contains provisions on spatial development programmes, on the organisation of spatial planning and land use planning and on their safeguarding (instruments). One principle of spatial planning relates to energy

[104] It does, however, contain further regulations on energy supply. Only a few years ago, for example, power lines and related installations were integrated into the ROG as part of the supply and disposal infrastructure, for which sites and routes must be assured (§ 13 ROG).

supply.[105] The principles of spatial planning with regard to renewable energy, i.e. wind energy, which is most important for spatial planning, are specified here.[106] In the Land Use Development Programme (Landesraumentwicklungsprogramm, LEP), the basic features and coordination of overlapping spatial requirements of individual sectoral plans are to be presented with regard to the energy industry, among other things, for the orderly development of the area (§ 6 LPlG M-V). From these findings, the following further recommendations for improving the technical framework conditions of spatial planning for renewable energies can be derived:

15. Approximation of the spatial planning laws in the participating countries with regard to the stipulations of spatial planning schemes - these should be adopted in such a way that the plans of neighbouring regions are connected to each other and are comparable in their structure and quality,
16. Approximation of the spatial planning laws with regard to the provisions on transnational spatial planning - for neighbouring regions and countries as well as for the Baltic Sea Region,
17. Development of a regulation (ordinance or directive) which specifies the spatial planning law in the participating countries with regard to spatial planning for renewable energies and which will be enacted in the countries as part of their national spatial planning law,
18. Development of a planning manual for transnational spatial planning, especially dedicated to the spatial planning of joint renewable energy projects,
19. Development of a principle of spatial planning which will locate large renewable energy projects in structurally weak regions and areas as a measure of regional economic development.[107]

The implementation of these political and technical recommendations will lead to significant improvements in the planning perspectives for spatial planning for renewable energies. It will support the countries in the Baltic Sea Region in achieving their national and European targets for the use of renewable energies, for climate protection and for improving their energy security as well as in strengthening their renewable energy economies. It will facilitate the joint transition of their energy systems and the establishment of the European Energy Union.

The timeframe for the implementation of these recommendations is thus set in particular by the timeframe for achieving these objectives. Finally, it is suggested that the recommendations be reviewed and further developed at regular intervals.

[105] According to this, - as in the Spatial Planning Act- the prerequisites for a secure, environmentally compatible, affordable and rational energy supply are to be created in all parts of the state, taking into account all possible ways of saving energy (§ 2 LPlG M-V). The Spatial Planning Act of the Federal Government also explicitly names the energy grids, the expansion of which is to be taken into account (§ 2 ROG).

[106] The changes in the landscape associated with the expansion of wind energy and the resulting conflicts in spatial planning should be taken into account by securing economic opportunities for citizens and municipalities to participate (§ 2 LPlG M-V). The (regional) spatial development programmes could or should designate areas which are reserved exclusively for wind energy, provided that this includes the possibility of participation; further prioritised or reserved areas are to be designated for such specialist areas as agriculture or securing raw materials - or to be further specified if the Land Use Development Programme already contains such designations (§ 4 and § 8 LPlG M-V).

[107] In Mecklenburg-Vorpommern, for example, these could be the rural planning areas.

6. Summary

The subject of this report is the improvement of transnational planning perspectives for renewable energies in the countries of the Baltic Sea Region. This improvement is necessary in order to supply the countries in the Baltic Sea Region with secure and affordable energy, to limit climate change, to conserve non-renewable resources, to protect the environment and to generate regional economic growth and employment. The aim of improving joint planning perspectives in the countries of the Baltic Sea Region is to harmonise and improve the spatial planning framework conditions for the continued or increased expansion of renewable energies. This expansion must not only be prepared and accompanied by spatial planning. Rather, the requirements for planning, criteria and conflict management will also increase with an intensified expansion of renewable energies (Section 1).

The political and technical framework conditions for spatial planning for renewable energies are in many respects similar in the countries of the Baltic Sea Region, but there are also differences. For example, the planning in the participating countries in the Baltic Sea Region is not uniform due to their different political systems. The respective national circumstances influence the possibilities of forming political opinion, the ability to reach consensus on long-term goals and the political decision-making process in the field of renewable energies. There are also differences in socio-economic conditions, which in turn influence the energy consumption of the countries and thus the possibilities of meeting demand with renewable energies. Further differences are reflected, for example, in the energy policy preferences of the individual countries. And there are not only similarities in the political and legal framework conditions for spatial planning, but also differences, e.g. in the basic structures of spatial planning systems and in the spatial hierarchies as well as instruments and decision-making structures. For renewable energies, different planning approaches are practised in the participating countries, which differ in the evaluation of renewable energies (" remaining" area approach vs. resources approach). Other aspects of spatial planning worthy of harmonisation in the countries are procedures relating to the planning and approval of renewable energy installations, the diverse planning requirements and technical or sectoral planning. Important shared characteristics are the similar or even identical national targets that the participating countries have set themselves for the expansion of renewable energies by 2020, 2030 and 2050. Another important common feature are the socio-economic similarities, which are also expressed in comparable energy structures. Last but not least, all participating countries also have large and comparable renewable energy potentials and connectable infrastructures (Section 2).

The primary and final energy consumption of the participating countries form framework conditions for the expansion of renewable energies, as does the status of their current use. On the basis of specific parameters that can be derived from this, the participating countries can be divided into rough groups: Latvia, Lithuania and Poland consume relatively little primary and final energy per capita. Significantly higher values are recorded for Denmark, Germany, Estonia and Sweden. Finland has the highest per capita consumption of energy. These differences are partly due to differences in climate conditions. However, at over 40 %, Sweden and Finland also have the highest renewable energy shares in their energy consumption. For Latvia, Denmark, Estonia and Lithuania, the average shares range between 25 and 40 %. Germany and Poland, on the other hand, have so far only been able to achieve renewable energy shares of less than 20 %.

Bioenergy is the most important source of renewable energy in all participating countries: In Estonia, Lithuania and Latvia, over 90 % of the renewable energy used derives from bioenergy. In Poland and Finland these shares are slightly above 80 %. In Germany, Denmark and Sweden, bioenergy accounts for about 60 to 70 % of renewable energy production. Hydropower accounts for a further 35 % in Sweden and about 15 % in Finland. Wind energy has so far been used particularly in Denmark (approx. 35 %), Germany (nearly 20 %) and Poland (nearly 15 %).

Finally, the countries in the Baltic Sea Region are already cooperating in a variety of ways, particularly in the field of spatial planning and energy supply. Some of these are based on measures of the European Union (e.g. PCI - *projects of common interest*) while others are specific to the Baltic Sea Region (e.g. VASAB/MSP, HELCOM).

Spatial planning for renewable energies is based on specific criteria that have been developed for specific renewable energy sources in the spatial planning of the countries in question. A comprehensive comparative overview of these planning criteria does not yet exist. In this case, one such study was developed for onshore wind energy. It shows that some criteria are applied in many or all participating countries. Other criteria, on the other hand, are country-specific and therefore less widespread. These specific criteria were supplemented by more general spatial planning criteria from the participating countries, which are suitable for determining the most suitable sites and growth areas for renewable energies. These general planning criteria relate to central aspects of spatial planning for renewable energies in the Baltic Sea Region and can therefore be divided into the areas of planning (designated areas for renewable energies and standard planning processes), society (participation models for spatial planning), economy (economic participation models) and other & overarching aspects (natural renewable energy sources, energy grid capacity, renewable energy plant sizes and conflict potentials) (Section 2).

The expansion of renewable energies is accompanied by conflicts that are similar or even comparable in their constellations, in the actors involved and in the conflict matters in the participating countries in the Baltic Sea Region. This applies particularly to wind energy. As with solar energy, conflicts arise, among other things, over the visibility of the installations, which could impair cultural assets such as historic towns or listed buildings. Otherwise, solar energy is described as the least conflict-associated renewable energy. In the case of biogas plants, the conflicts are similar, among other things, because of the induced transports, the odour nuisances that may occur, etc. Conflicts over the use of bioenergy in district heating systems occur particularly in the Baltic States, where district heating is of great importance. Due to the similar framework conditions and the similarity of the conflicts concerning renewable energies and their spatial planning, it can be expected that these will increase with the continued expansion of renewable energies. The reduction and management of conflicts will therefore depend on the planning itself on the one hand and on efficient conflict management on the other (Section 3).

In order to facilitate the derivation of recommendations for the improvement of spatial planning for renewable energies in the countries of the Baltic Sea Region, their priorities were examined. This showed that the actors surveyed could well imagine a more harmonised energy policy - especially in the field of renewable energies. This policy should aim at a transnational strategic networking of regions and countries in the Baltic Sea Region to jointly generate renewable energies and exchange them in a future common energy supply. Joint projects and sites for central renewable energy plants, at which large amounts of energy can be generated for exchange within the Baltic Sea Region are supported. A closer connection between spatial planning for renewable energies and the planning of transnational energy infrastructures is considered necessary for this. Informal instruments are preferred, and common measures as well as the exchange and use of best practice examples should be planned to understand the various aspects of spatial planning and renewable energies. In contrast, the harmonisation of the legal framework is not supported by the actors surveyed. This also applies to harmonised conflict management. Conversely, specific planning criteria used in spatial planning for renewable energies should be harmonised (Section 4).

Spatial planning in the participating countries is based on legal framework conditions which also have similarities and differences. First of all, there are spatial planning laws in all countries which regulate fundamental aspects of spatial planning. In addition, there are a large number of subordinate laws that specify spatial planning for renewable energies. In the Baltic countries, the focus is also on improving or guaranteeing their energy security. A comprehensive comparison of the existing legal framework conditions for spatial planning in the participating countries could not be conducted in this study. In order for such a comparison to lead to recommendations for a harmonisation or improvement, it should not only be limited to the spatial planning legislation, but should also at least include the energy laws concerned with renewable energies of the respective countries[108] In addition, the benefit of such a comparison of the legal framework conditions of spatial planning would also be limited, because 1) as a survey has shown, the countries or local actors are not equally receptive to such standardisation; 2) such efforts are made by EU legislation and have a higher impact or greater success there. The recommendations are implemented because the member states incorporate EU law into national law and thereby establish compatibility with their legal systems and traditions; 3) the diversity in the legal framework conditions is also well-founded and beneficial, because, despite all common features, the countries are constituted differently. For this reason, the recommendations concentrate on the harmonisation of the legal framework and on joint projects, i.e. on the construction of large transnational renewable energy plants (and connecting infrastructure). Efforts to harmonise and improve the legal framework - spatial planning laws and systems - must aim to enable and support the transnational planning, implementation and use of such projects. It is therefore advisable, for example, to orient future planning in the countries in such a way that the resulting plans can be spatially connected to each other and that they use uniform planning symbols in the interest of a higher level of readability. The resulting advantage would be that these plans could be placed next to each other in transnational planning, thus enabling or facilitating large-scale analyses of, for example, renewable energy potential or energy consumption. It is therefore recommended to develop handbooks for joint usage in the planning of transnational energy projects in order to better coordinate the understanding of the spatial planners in the individual countries with regard to their concepts, definitions, procedures, relevant planning contents etc. Such handbooks could be based on the Maritime Spatial Planning in the Baltic Sea Region or on the Handbook for Planning *Projects of Common Interest* in the EU (Section 5).

The political and technical recommendations for improving spatial planning for renewable energies derived here are thus based on an analysis of the countries in the Baltic Sea Region and their targets for renewable energies. Furthermore, fundamental structures of their spatial planning systems and the legal framework including the planning criteria were surveyed. As a result, the following challenges for the improvement of the planning perspectives for renewable energies can be identified:

1. The political commitment in the countries to the continued and accelerated development of renewable energies is a fundamental prerequisite for their planning and must be strengthened.
2. This political commitment must be applied to national and transnational spatial planning - through planning mandates, by improving spatial planning in the countries, by expanding joint informal and planning activities and by an increasing focus on renewable energies and transnational energy networks.
3. The development of renewable energies in the Baltic Sea Region must be planned in such a way that it also contributes to the fulfilment of EU objectives - EU cohesion policy and its financial instruments can provide valuable assistance in this regard.
4. Spatial planning must further develop its methods, planning criteria and database for planning, participation and conflict management.

Spatial planning - if it accepts these challenges - will become considerably more important and responsible. This supports the improvement of planning perspectives, but at the same time also requires such perspectives.

The political and technical recommendations derived in this study aim to meet these challenges. A further, general recommendation is to encourage the European Union and all its bodies (Commission, Council, Parliament) to continue the common energy and cohesion policy and to raise the profile of renewable energies and climate protection (Section 5).

[108] An analysis of the spatial planning systems was carried out in a previous project, it too is lacking a comparison (synopsis, SWOT, etc.).

7. Bibliography

/1/ VASAB: Long-Term Perspective for the Territorial Development of the Baltic Sea Region Towards better territorial integration of the Baltic Sea Region and its integration with other areas of Europe. Riga. 2010.

/2/ Landt,C.C.; Kjær,T.: Transnational report on state of play in spatial planning for renewable energy in the participating regions: Creating space for renewables. WP 2.1 Report. Roskilde University. 2017.

/3/ Bremere,I.; Indriksone,D.: Regional stakeholder maps and analyses of decision flows. Baltic Environmental Forum – Latvia. 2017.

/4/ Dühr,S.; Colomb,C.; Nadin,V.: European Spatial Planning and Territorial Cooperation. Routledge. New York. 2010.

/5/ European Commission: Third Report on the State of the Energy Union. COM (2017) 688 final. Brussels. 23.11.2017.

/6/ Energy Security Research Centre: Lithuanian energy security. Vytautas Magnus University/Lithuanian Energy Institute. Kaunas. 2017.

/7/ Švedas,R.: EU Energy Island – Characteristics, Threats, and How to Break out of it: A Case Study of Lithuania. Lithuanian Annuals Strategic Review 2016-2017. Volume 15. DOI: 10.1515/lasr-2017-0008.

/8/ IEA: Energy Policies Beyond IEA Countries Estonia. International Energy Agency. Paris. 2013.

/9/ DIRECTIVE 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

/10/ Amendments adopted by the European Parliament on 17 January 2018 on the proposal for a directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast) (COM(2016)0767 – C8-0500/2016 – 2016/0382(COD)).

/11/ National Development Plan of the Energy Sector until 2030 (Approved on 20.10.2017). Available at: https://www.mkm.ee/sites/default/files/ndpes_2030_eng.pdf.

/12/ Energy concept for an environmentally-friendly, reliable and affordable energy supply of 28th September 2010 (Energiekonzept für eine umweltschonende, zuverlässige und bezahlbare Energieversorgung vom 28. September 2010.) Available at (in German): https://www.bundesregierung.de/ContentArchiv/DE/Archiv17/_Anlagen/2012/02/energiekonzept-final.pdf.

/13/ Sustainable Development Strategy of Latvia until 2030 (Latvia 2030). Available at: http://www.pkc.gov.lv/nap2020/latvija2030.

/14/ Rubins,M.; Pilvere,I.: Development of Renewable Energy Policy in Latvia. In: Proceedings of the 2017 International Conference "ECONOMIC SCIENCE FOR RURAL DEVELOPMENT" No 44 Jelgava, LLU ESAF, 27-28 April 2017, pp. 281-291.

/15/ Minister of Energy of the Republic of Lithuania: Recommended Key Guidelines of the National Energy Strategy of Lithuania. 24 November 2016 No. 1-314.

/16/ Tartu Regional Energy Agency: Report on regional added value of renewable energy in Baltic Sea Region. WP2.3 Fostering regional development through renewable energy in Baltic Sea Region. Tartu. 2018.

/17/ Finnish Ministry of Economic Affairs and Employment: Government report on the National Energy and Climate Strategy for 2030. Publications of the Ministry. Helsinki. 2017.

/18/ Minister of Economy: National Renewable Energy Action Plan. Warsaw. 2010. Available at: https://ec.europa.eu/energy/en/topics/renewable-energy/national-action-plans.

/19/ German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety Environment: Climate Protection Action Programme 2020. Approved by the cabinet on 3 December 2014. (Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (Hrsg.): Aktionsprogramm Klimaschutz 2020. Kabinettsbeschluss vom 3. Dezember 2014). Available at (in German): https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Aktionsprogramm_Klimaschutz/aktionsprogramm_klimaschutz_2020_broschuere_bf.pdf.

/20/ German Federal Ministry for Economy and Energy: National Energy Efficiency Action Plan. (Bundesministerium für Wirtschaft und Energie (Hrsg.): Nationaler Aktionsplan Energieeffizienz. Mehr aus Energie machen). Berlin. 2014. Available at (in German): https://www.bmwi.de/Redaktion/DE/Downloads/M-O/nationaler-aktionsplan-energieeffizienz-nape.pdf.
/21/ German Renewable Energy Sources Act of 21st July 2014 (BGBl. I p. 1066), last amended by article 1 on 21 June 2018 (BGBl. I p. 862). ("Erneuerbare-Energien-Gesetz vom 21. Juli 2014 (BGBl. I S. 1066), das zuletzt durch Artikel 1 des Gesetzes vom 21. Juni 2018 (BGBl. I S. 862) geändert worden ist" Stand: Zuletzt geändert durch Art. 1 G v. 21.6.2018. Available at (in German): http://www.gesetze-im-internet.de/eeg_2014/EEG_2017.pdf.
/22/ German Climate Protection Plan 2050 – climate political principles and goals of the Federal Government. (Klimaschutzplan 2050 – Klimaschutzpolitische Grundsätze und Ziele der Bundesregierung.) Berlin. 2016. Available at (in German): https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzplan_2050_bf.pdf.
/23/ Ministry of Energy of the Republic of Lithuania: National Energy Independence Strategy. Vilnius. 2018. Available at: http://enmin.lrv.lt/uploads/enmin/documents/files/National_energy_independence_strategy_2018.pdf.
/24/ Republic of Lithuania: Law on Energy. 16 May 2002 No IX-884. Vilnius. Available at: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/cc700b403c3f11e68f278e2f1841c088?jfwid=-19kda1ip8y.
/25/ Republic of Lithuania: Law on Energy from Renewable Sources. 2011 May 12 No XI-1375. Vilnius. Available at: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/648259603c3b11e68f278e2f1841c088?jfwid=rivwzvpvg.
/26/ Republic of Lithuania: Law on Heat Sector. 20 May 2003 No IX-1565. (A new version of 20 November 2007 No X-1329, as last amended on 12 May 2009 No XI –250). Available at: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.350871?jfwid=tu0odnswl.
/27/ Danish Energy Agency: Strategic Energy Planning in Denmark at Municipal und Regional Level. Copenhagen. 2015.
/28/ Finland: Land Use and Building Act (132/1999, amendment 222/2003 included). Helsinki. 1999.
/29/ Finland: Land Use and Building Decree (1999-0895). Minister of the Environment. Helsinki. 1999.
/30/ Finland: Nature Conservation Act (1996-1096; 2011-0058). Helsinki. 1996/2011.
/31/ OECD: Land-use Planning Systems in the OECD: Country Fact Sheets. OECD Publishing. Paris. 2017.
/32/ Danish Ministry of the Environment: Spatial Planning in Denmark. Copenhagen. 2007. Available at: www.blst.dk.
/33/ German Office of the Minister's conference on spatial planning: Mission statements and action strategies for spatial development in Germany. Approved by the Minister's Conference on 9 March 2016. (Geschäftsstelle der MKRO (Hrsg.): Leitbilder und Handlungsstrategien für die Raumentwicklung in Deutschland. Verabschiedet von der Ministerkonferenz für Raumordnung am 9. März 2016.) Berlin.
/34/ Germany Spatial Planning Act of 22 December 2008 (BGBl. I p. 2986), last amended by Article 2 Section 15 of the Act on 20 July 2017 (BGBl. I p. 2808). (Raumordnungsgesetz vom 22. Dezember 2008 (BGBl. I S. 2986), das zuletzt durch Artikel 2 Absatz 15 des Gesetzes vom 20. Juli 2017 (BGBl. I S. 2808) geändert worden ist.)
/35/ German Building Code in the version of 3 November 2017 (BGBl. I p. 3634). (Baugesetzbuch in der Fassung der Bekanntmachung vom 3. November 2017 (BGBl. I S. 3634)).
/36/ State Land Planning Act of Mecklenburg-West Pomerania, last amended by Article 3 of the act on 20 May 2011 (GVOBl. M-V S. 323). (Gesetz über die Raumordnung und Landesplanung des Landes Mecklenburg-Vorpommern - Landesplanungsgesetz (LPlG), zul. geänd. durch Art. 3 d. G. v. 20. Mai 2011 (GVOBl. M-V S. 323)).
/37/ State Building Code of Mecklenburg-West Pomerania in the version of 15 October 2015. (GVOBl. M-V S. 221, 228). (Landesbauordnung Mecklenburg-Vorpommern (LBauO M-V) in der Fassung

der Bekanntmachung vom 15. Oktober 2015. GVOBl. M-V 2015, S. 344. Stand: letzte berücksichtigte Änderung: § 72 geändert durch Artikel 4 des Gesetzes vom 5. Juli 2018 (GVOBl. M-V S. 221, 228)).
/38/ German Building Usage Ordinance in the version of publication on 21 November 2017 (BGBl. I p. 3786.) (Baunutzungsverordnung in der Fassung der Bekanntmachung vom 21. November 2017 (BGBl. I S. 3786.))
/39/ German Federal Nature Conservation Act of 29th July 2009 (BGBl. I p. 2542), last amended by Article 1 of the act on 15 September 2017 (BGBl. I p. 3434). (Bundesnaturschutzgesetz vom 29. Juli 2009 (BGBl. I S. 2542), das zuletzt durch Artikel 1 des Gesetzes vom 15.September 2017 (BGBl. I S. 3434) geändert worden ist.)
/40/ Ministry of the Environment, Ministry of Employment and the Economy, Ministry of Transport and Communications, Ministry of Agriculture and Forestry: A Renewable and Enabling Finland. Development overview of the regional structure and traffic system 2050. Helsinki. 2015. Available athttps://helda.helsinki.fi/handle/10138/158222.
/41/ Roßnagel, A. et. al.: Entscheidungen über dezentrale Energieanlagen in der Zivilgesellschaft. Vorschläge zur Verbesserung der Planungs- und Genehmigungsverfahren. Universität Kassel. 2016.
/42/ Lundstrom, M.S., Fredriksson,C.; Witzell,J. (eds.): Planning and Sustainable Urban Development in Sweden. 2013.
/43/ European Court of Auditors: Special Report No. 31: "Spending at least one euro in every five from the EU budget on climate action: ambitious work underway, but at serious risk of falling short." Brussels, 10 March 2017.
/44/ European Parliament: Report on building blocks for a post-2020 EU cohesion policy (2016/2326(INI)) of 24 May 2017.
/45/ Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32013R1303&from
/46/ -: Urban Agenda for the EU – Pact of Amsterdam. Agreed at the Informal Meeting of EU Ministers Responsible for Urban Matters on 30 May 2016 in Amsterdam, The Netherlands. Available at: https://ec.europa.eu/futurium/en/content/pact-amsterdam.
/47/ The Danish Ministry of Climate and Energy: Energy Strategy 2050 – from coal, oil and gas to green energy. Copenhagen. 2011. Available at: http://www.danishwaterforum.dk/activities/Climate%20change/Dansk_Energistrategi_2050_febr.2011.pdf.
/48/ Energy and Climate Roadmap 2050. Available at: https://tem.fi/en/energy-and-climate-strategy und https://tem.fi/documents/1410877/3437254/Energy+and+Climate+Roadmap+2050+14112014.pdf.
/49/ -: The Danish spatial planning system. Short description within Baltic Sea Region Interreg III B project "Promoting spatial development by creating common mindscapes - COMMIN".
/50/ Eurostat: Key Figures on Europe. 2017 edition. Luxembourg. 2018. (Available at: http://ec.europa.eu/eurostat).
/51/ Spitzer, H.: Einführung in die räumliche Planung. Verlag Eugen Ulmer. Stuttgart. 1995.
/52/ Tränkle, T.; Hüffmeier, J.: Interim summary of the EU and country targets for 2030 and 2050. Baltic Lines - Project report. Swedish Agency for Marine and Water Management & RISE Research Institutes of Sweden 28 April 2018.
/53/ European Commission: EU Energy in Figures. Statistical Pocket Book 2017. Available at: http://ec.europa.eu/energy/en/data-analysis/energy-statistical-pocketbook.
/54/ IEA: Energy Policies Beyond IEA Countries Sweden. International Energy Agency. Paris. 2013.

/55/ The Swedish National Action Plan for the promotion of the use of renewable energy in accordance with Directive 2009/28/EC and the Commission Decision of 30.06.2009. Annex to Government Decision 2010-06-23, I27, Doc. No. 2010/742/E (in part) 2009/7789/E.
/56/ Koglin, T.; Pettersson, F.: Changes, Problems, and Challenges in Swedish Spatial Planning - An Analysis of Power Dynamics. In: Sustainability 2017, 9, 1836; doi: 10.3390/su9101836.
/57/ Eurostat: Eurostat regional yearbook 2017 edition. Luxembourg: Publications Office of the European Union. 2017.
/58/ REN21: Renewables 2017 Global Status Report. Paris: REN21 Secretariat. 2017.
/59/ Statistics Denmark: Statistical Yearbook 2017. Copenhagen. 2017.
/60/ -: The Planning System of Estonia. Short description within Baltic Sea Region Interreg III B project “Promoting spatial development by creating common mindscapes - COMMIN“.
/61/ -: Lithuania Planning System. Short description within Baltic Sea Region Interreg III B project “Promoting spatial development by creating common mindscapes - COMMIN“.

Annex

A.1 Priority of planning conflicts for renewable energies in the participating countries

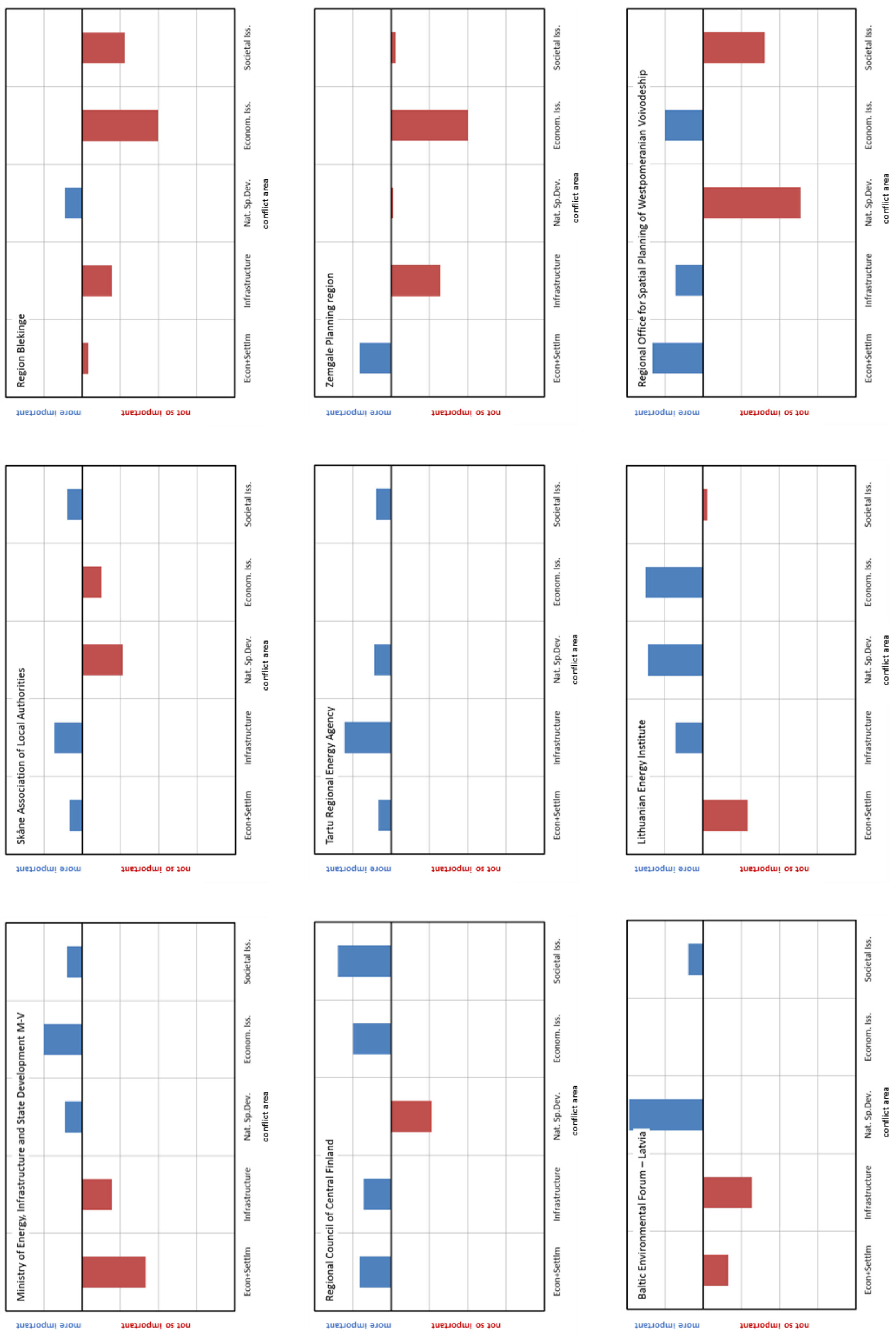


Figure A-1: Priority of conflicts in the planning fields in the participating countries

A.2 Legal framework for spatial planning for renewable energies in the participating countries of the Baltic Sea Region

A 2.1 Introductory Remarks

For the following overview, project information from institutions in the participating countries and regions has been evaluated, updated and supplemented. It lists the most important legal regulations currently in place in the participating countries in the area of spatial planning for renewable energies:

A 2.2 Legal framework of the participating countries or regions

Denmark: The Danish spatial planning for renewable energies is defined by the following legislation:

- Renewable Energies Act (2009, in effect)[109] - for various small and large RES (electricity) sources: Wind onshore/offshore, bioenergy, biomass for electricity, geothermal energy, hydropower, ocean, solar energy,
- Energy Strategy 2050 – from coal, oil and gas to green energy /47/[110].

Germany/Mecklenburg-Vorpommern: Spatial planning for renewable energies in Germany and Mecklenburg-Vorpommern is essentially defined by the following legislation:

- Federal Act on Spatial Planning (ROG) /34/, State Planning Act Mecklenburg-Vorpommern (LPlG M-V) /36/,
- Federal Building Code (BauGB) /35/ and State Building Code Mecklenburg-Vorpommern (LBauO M-V) /37/,
- Federal Emission Control Act (BImSchG),
- Federal Nature Conservation Act (BNatSchG) /39/,
- Environmental Impact Assessment Act (UVPG).
- Renewable Energy Act (EEG),

Germany has an "Energy Concept 2050" /12/. In Mecklenburg-Vorpommern, a Citizen and Municipal Participation Act came into effect on 28 May 2016. It stipulates the obligation to offer economic participation on newly erected onshore wind energy plants to “neighbours” and municipalities.[111]

Estonia: The following laws are in force in Estonian spatial planning for renewable energies:

- The Planning Act by promoting energy-efficient and RES solutions. 12 (3) When drawing up spatial plans, preference shall be given to solutions that are as environmentally friendly and energy-efficient as possible. It also determines the planning functions including energy planning.
- The Energy Industry Organisation Act defines the measures to achieve the national goal of energy efficiency and renewable energies.
- The Local Administrative Organisation Act lays down the principles for the preparation of the development plan, including the sustainability aspects (§ 37).
- The Act on Environmental Impact Assessment and the Environmental Management System provides the legal basis and procedures for the assessment of expected environmental impacts, including the strategic environmental assessment of strategic plans for the energy sector.

---

[109] An abridged version is available at: http://www.ens.dk/sites/ens.dk/files/supply/renewable-energy/wind-power/onshore-wind-power/PromotionofRenewableEnergyAct-extract.pdf.

[110] Energy Strategy 2050 – from coal, oil and gas to green energy. The Danish Ministry of Climate and Energy. Copenhagen. 2011. Available at: http://www.danishwaterforum.dk/activities/Climate%20change/Dansk_Energistrategi_2050_febr.2011.pdf.

[111] Reference and further information (in German): https://www.regierung-mv.de/Landesregierung/em/Energie/Wind/Buerger-und-Gemeindebeteiligungsgesetz.

- The Building Code aims to promote sustainable development and ensure the safety, suitability and usability of the built environment.

The planning system and procedure, including spatial planning for larger and smaller renewables, is based on the new Planning Act (2015). The previously introduced plans will be ratified in accordance with the old law.

In addition, a "National Development Plan for the Energy Sector until 2030" has been in existence since 2017. /11/.

Latvia: Latvia's national legislation is based on older local laws as well as European Union directives and economic instruments on renewable energy[112]:

- Ordinance on the Production of Electricity from Renewable Energy Sources and the Procedure for Setting Prices (2010) - Economic Instruments,
- National Renewable Energy Action Plan (NREAP, 2010) - Policy support/strategy planning,
- Regulations on the production of electricity and the fixing of prices for the production of electricity from cogeneration (2009),
- Provisions on the production of electricity from renewable energy sources and price fixing procedures (2009, superseded),
- Financial instrument on climate change (CCFI, 2009),
- Excise duty reduction for biofuels in the transport sector (2007), Biofuels Act (2006, finalised), mandatory blending of biofuels (2005), biofuel production and use programme (2003-2010) (finalised),
- Exemption from electricity tax (2007),
- Regulations on electricity production from renewable resources (2007, replaced),
- Guidelines for the use of renewable energies 2006-2013 (2006),
- Rules for cogeneration electricity production (2006, replaced),
- Guidelines for energy development 2007-2016 (2006),
- Electricity Market Act (2005),
- Energy Act (1998).

Lithuania: In the case of district heating: Spatial planning for renewable energies in Lithuania mainly refers to the planning of district heating supply, which takes place at the municipal level:

- The Energy Supply Act (IX-884) /24/ specifies as the main objectives of energy supply in Lithuania the safety and reliability, availability and adequacy of energy sources, energy efficiency and sustainability as well as promotion of the use of domestic and renewable energy sources in the energy sector. The individual sections of the Act regulate the management of energy activities (jurisdiction), the development and regulation of the energy sector (including Article 14: National Energy Independence Strategy with references to Renewable Energies), the management of national energy crises and complaints.
- The Renewable Energy Sources Act (XI-1375) assigns the municipalities the task of developing renewable energy sources, including the development and harmonisation of municipal action plans, the provision of thermal energy in the municipal sector, the development and adoption of financing programmes and the establishment of priorities for their use.
- The Municipal Act (I-533) defines the function of the planning and design of heat supply in municipalities and the use of renewable energies in public buildings.
- The Heating Act (IX-1565) /26/defines requirements for the drafting of a national development programme for the heating sector, including the use of renewable energies, residual energy

[112] Reference: https://www.iea.org/policiesandmeasures/renewableenergy/.

sources and municipal waste, financing requirements and funding. The municipalities are responsible for maintaining the municipal heating sector on the basis of sectoral plans aimed at supplying consumers at justifiable costs within environmental limits.
- The Spatial Planning Act (I-1120) requires municipalities to develop sectoral plans that define existing and planned areas of new heat consumers and provide the main technical solutions for the use of alternative energies and fuels for each area. The social partners - heat, electricity and gas suppliers and other groups as well as consumer protection organisations - participate in the planning process. Environmentally friendly energy sources should be available throughout the municipality.
- The Environmental Impact Assessment Act for Planned Economic Activities (I-1495) requires an EIA assessment to be made for thermal and other incineration plants and other industrial facilities to generate electricity, steam or hot water if the output exceeds 20 MW.

The municipalities thus have a great responsibility in the planning and development of renewable energies in the heating sector. The municipal administrations function as decision-makers. However, the municipal planning indicators for renewable energies in the district heating/cooling sector should match the national renewable energy indicators and framework conditions that have been defined in the meantime.

Poland: Spatial planning for renewable energies in the West Pomeranian voivodship is defined by the following legislation:

- Spatial Planning and Administration Act of 27 March 2003,
- Building code of 7 July 1994,
- Environmental Protection Act of 27 April 2001[113],
- Ordinance of the Minister of Agriculture and Food of 7 October 1997 on technical requirements for agricultural businesses and their sites,
- Act on the Provision of Information on the Environment and its Protection, Public Participation in environmental protection and Environmental Impact Assessment of 3 October 2008,
- Council of Ministers Regulation of 9 November 2010 on projects with significant environmental impacts,
- Renewable Energy Sources Act of 20 February 2015,
- Energy Act of 10 April 1997,
- Poland's energy policy until 2030 (2009),
- National Renewable Energy Action Plan (2010),
- Energy security and environment strategy (2014),
- Ordinance of the Minister of Economy on the operation of the electricity supply system (2007),
- Poland's climate policy,
- Spatial Policy - The Concept of National Spatial Planning 2030,
- Act on Investments in Wind Turbines (2016),
- Act on the amendment of certain laws in connection with the strengthening of landscape protection instruments of 24 April 2015
- Water Act (2001) and Geology and Mining Act (2011) (both concerning heat pumps).

Finland: Finland has regulated its spatial planning for renewable energy through a Land Use and Building Act. Its basic principle is a hierarchical planning system in which a higher-level plan controls

113 Environmental Protection Act. Available at: https://esdac.jrc.ec.europa.eu/Library/Themes/Contamination/workshop_Nov2003/legislation/PolandEnvironmentalProtectionAct.pdf. Legal acts - 2015-04-22 The legal basis for the General Director for Environmental Protection and Regional Directors of Environmental Protection. Available at: https://www.gdos.gov.pl/legal-acts.

the lower-level plans. The aim of the law is to ensure that the use of land and water and construction activities create a favourable living environment.

A further law regulates environmental impact assessments: the EIA obligation and the EIA procedure, which consists of two phases: In the first phase, usually referred to as the EIA programme, a report with a project description and a plan for its impact assessment are prepared. In the second phase, usually referred to as the EIA report, the relevant impact assessments are carried out and their results reported.

In addition, there is a whole range of other laws: Nature Conservation Act, Environmental Protection Act, Water Act, Electricity Market Act, Fermentation Quality and Utilisation Act, Aviation Act (for wind energy projects), National Fertilizer Act and the EC By-product Ordinance.

There is also a roadmap for the development of energy supply and climate protection 2050 /48/.

Sweden: Swedish spatial planning for renewable energies is regulated by the National Planning and Building Law (PBL). This law also contains provisions on building permits. The local authorities function as the decision-makers. Other laws such as the Environmental Act are applicable in certain cases, e.g. wind energy projects.[114] They aim to

- protect human health and the environment from damage and inconvenience, whether caused by pollution or other influences,
- protect and maintain valuable natural and cultural areas,
- preserve biodiversity,
- use land, water and the natural environment in such a way as to ensure sustainable management from an ecological, social, cultural and economic point of view; and
- promote the reuse or recycling and other management of materials, raw materials and energy in such a way as to create cycles.

Further laws[115] apply to biogas plants for the generation of electricity/heat or vehicle fuels, e.g.: MB - Environmental Law, The Environmental Ordinance, PBL - Planning and Construction Law, LBE - Law on Flammable and Explosive Goods, ABP - EU Regulations on Animal by-products, waste framework directive, environmental impact assessment, IED - industrial emissions directive.

The Swedish government has also presented two bills with measures to implement the EU renewable energy directives 2009/10:128 and 2009/28/EC and the sustainability criteria for biofuels and bio liquids 2009/10:164.

The national planning framework for wind energy, adopted by the Swedish parliament, provides for an annual electricity production of 30 TWh to be achieved by 2020, of which 20 TWh are produced onshore and 10 TWh offshore. The approval procedures for wind energy projects have been simplified.

---

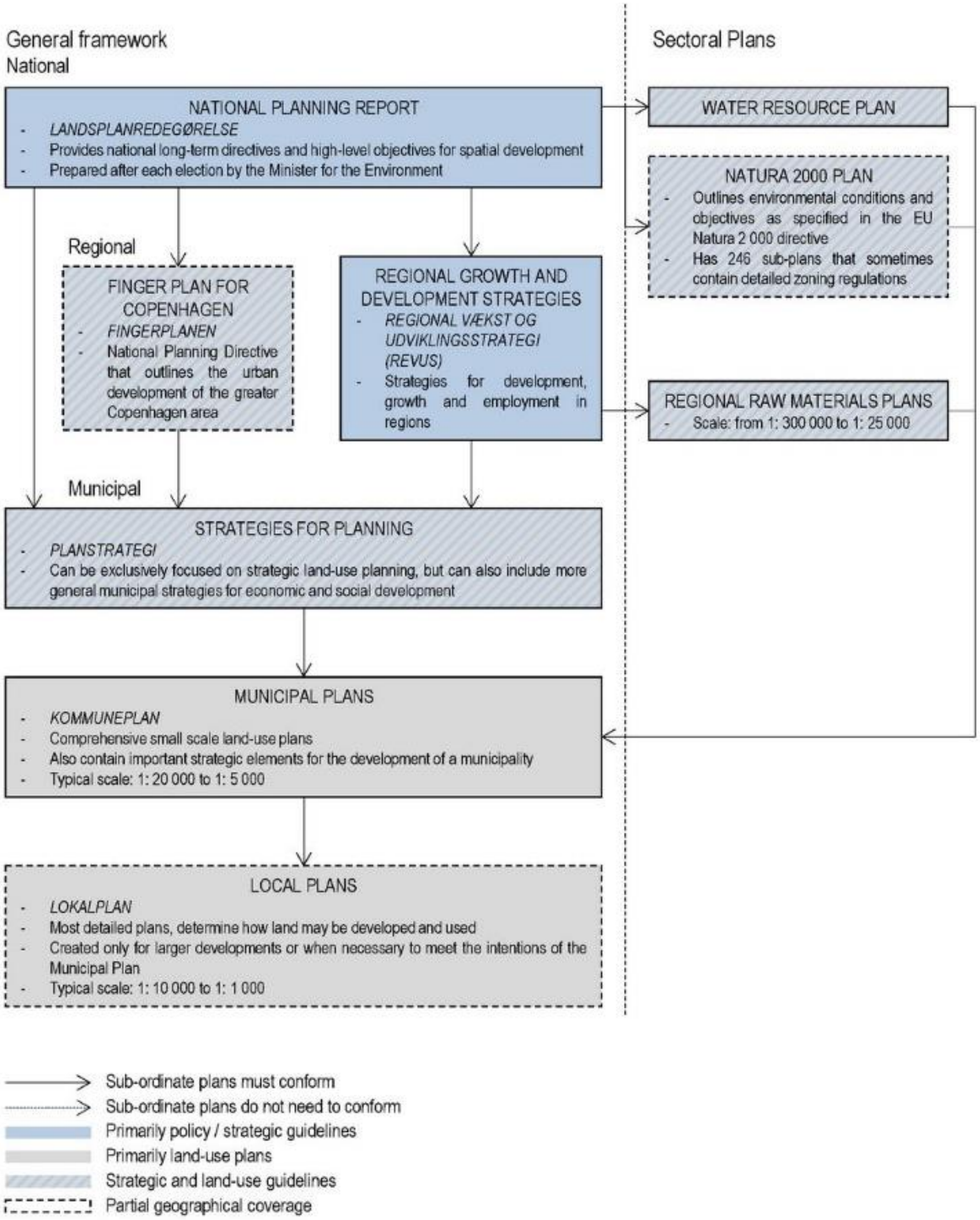
114 Under the Environmental Code, municipalities have been responsible for approving wind energy projects since 2009: Chapter 16 and paragraph 4 of the Swedish Environmental Code state that municipalities have a veto right when it comes to approving or rejecting wind turbines. The District Council also uses the Environmental Code to decide whether to approve or reject planned projects.

115 Reference: ”Vägledning – Miljöprövning av biogasanläggningar”, Biogas Öst 2013.

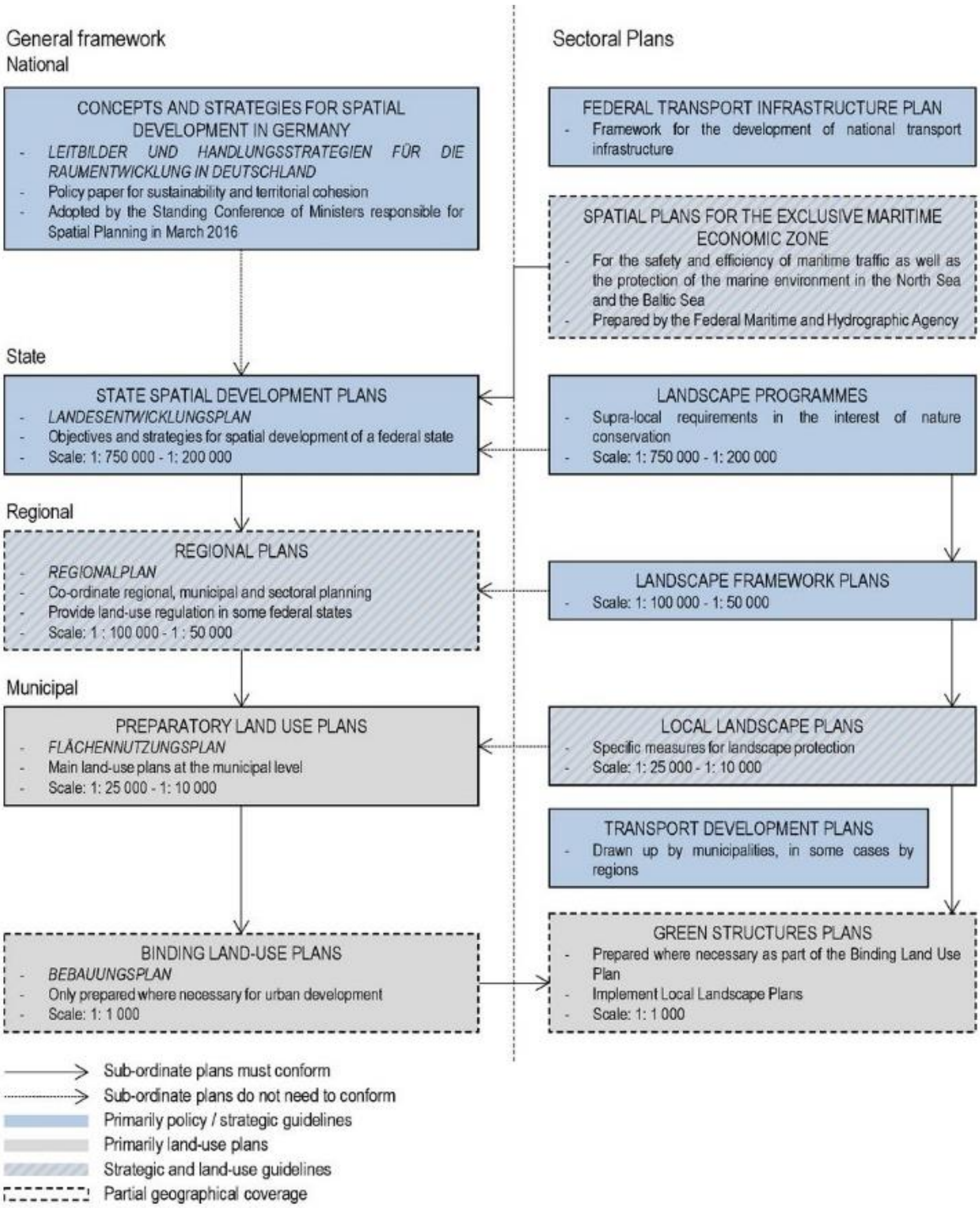
A.3 Overview of selected regional planning systems in countries of the Baltic Sea Region

The following diagrams in this annex are adopted from /31/.

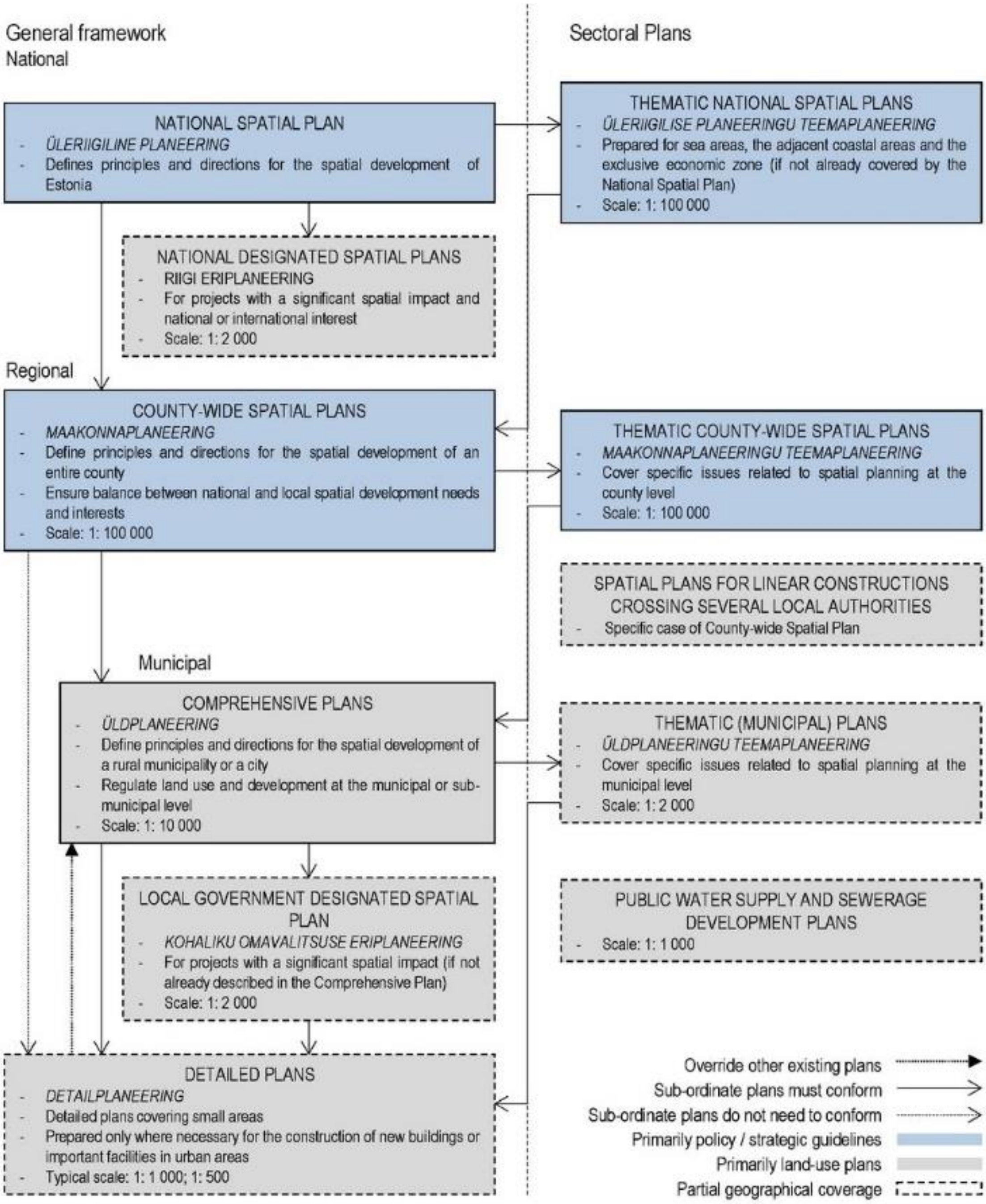
A 3.1 Organisation of spatial and land use planning in Denmark



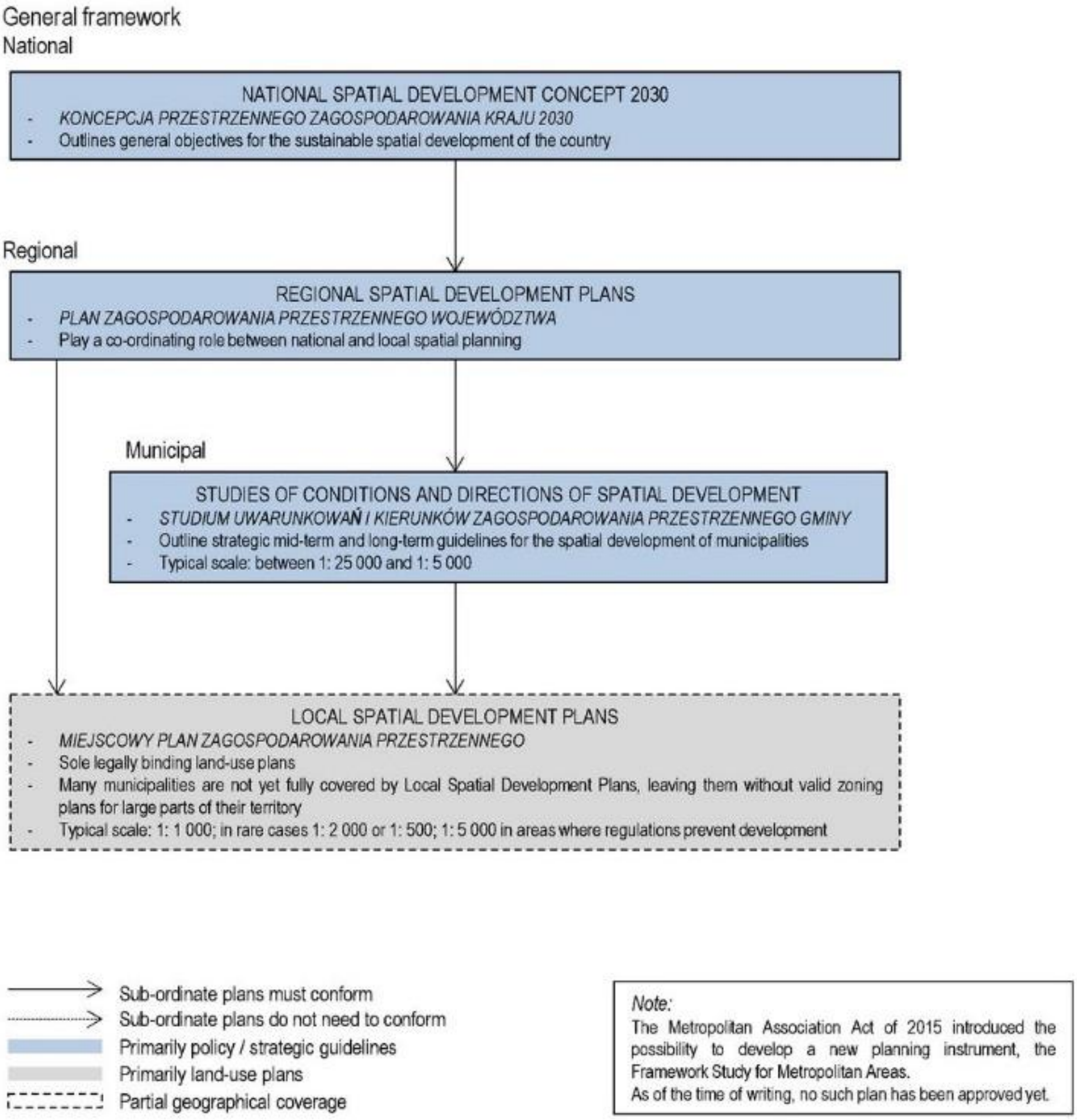
A 3.2 Organisation of spatial and land use planning in Germany



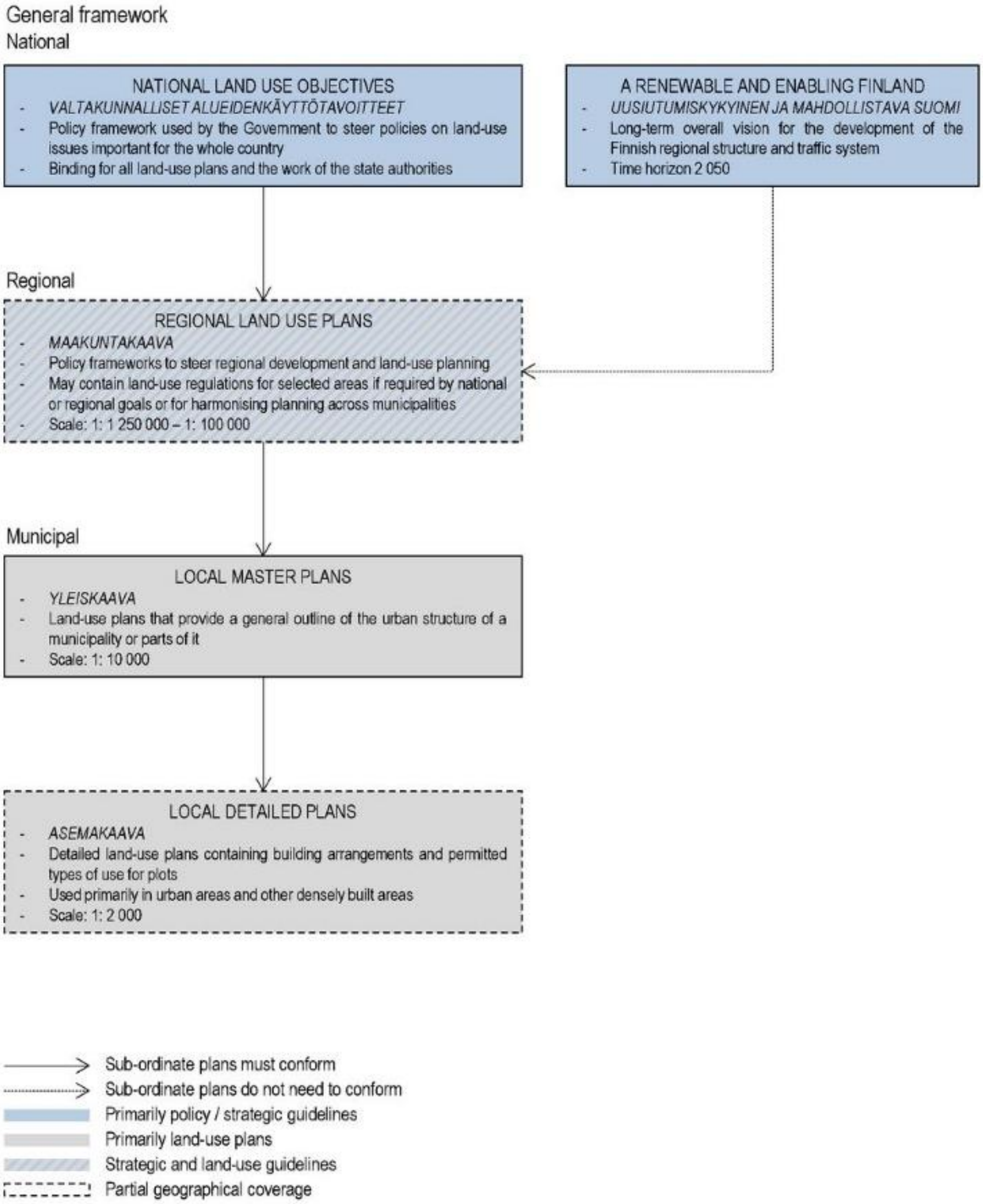
A 3.3 Organisation of spatial and land use planning in Estonia



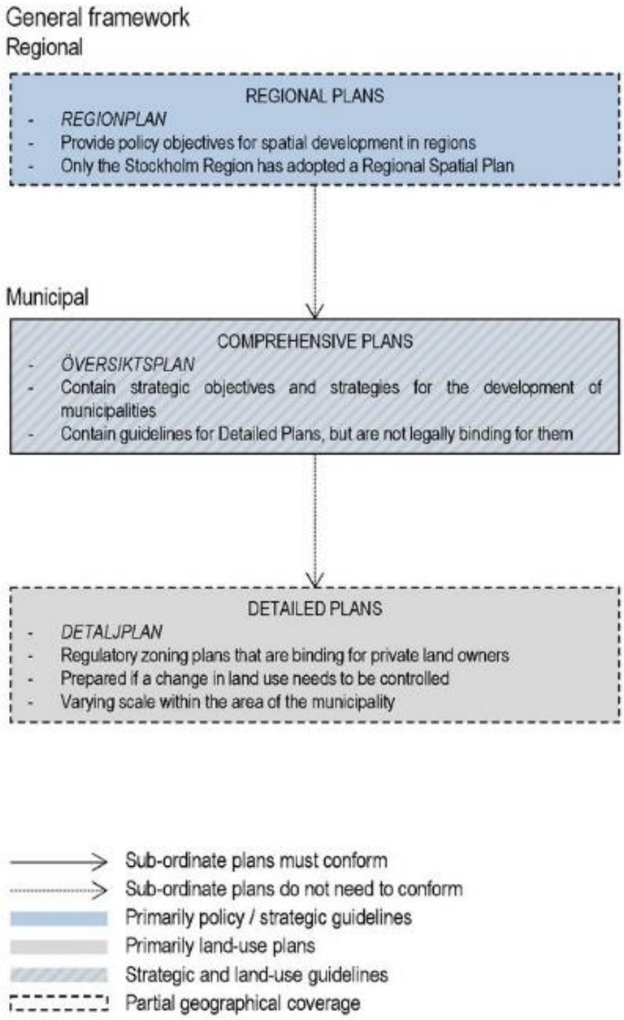
A 3.4 Organisation of spatial and land use planning in Poland



A 3.5 Organisation of spatial and land use planning in Finland



A 3.6 Organisation of spatial and land use planning in Sweden



A.4 Questionnaire on recommendations for planning renewable energy