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Comparison of Wood Based Energy Related Policies in Russia and Finland: Case Study of the Republic of Karelia and North Karelia

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Tekijät
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Tiivistelmä
The present analysis reports on key policy documents regarding wood based energy in Russia and Finland and their development in regional plans. A comparison of key policy and legislative documents regarding wood based energy is developed. Furthermore, the study highlights the impact of climate and energy policies developed at international and community level on the selected countries' performances.

The results suggest that international and community treaties have had a positive effect on wood based energy policies in both countries. However, the measures adopted at national level are developing at a different pace. While Finland has a wide variety of policy documents promoting wood based energy, more specific policies and measures are needed on the Russian side.

Regarding regional policies' performance, wood based energy is gaining importance. The development of renewable energy from wood is seen as positive in both the Republic of Karelia (Russia) and the province of North Karelia (Finland). Nevertheless, in Russia, more supportive measures from the State and attracting investors are crucial to strengthen the wood based energy sector within the Republic of Karelia.

Asiasanat
Wood based energy, policies, Russia, Finland, climate change

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1 Introduction

1.1 Policy preconditions for national policies in the field of renewable energy

The emissions of greenhouse gases (GHG) to the atmosphere are one of the major drivers of the climate change process (Crowley 2000; Stern 2007). During the past decades human activities have contributed to increases in GHG emissions of about 1.6% per year (UNFCCC 2010a). According to the World Meteorological Organization (WMO) the main factors inducing emissions to the air during the past century are "the growing use of energy and the expansion of global economy" (UNFCCC 2010b).

In 1992 most countries joined an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC). One of the milestones set out by the agreement is the Kyoto Protocol. Under this treaty countries are committed to reducing or limiting their emissions to the 1990 level by 2012 (UNFCCC 2010c).

The nations bound by the treaty account for 63.7% of the global emissions (UNFCC 2010a; EC 2011a). This figure reveals that countries within the Protocol have a key role in the global emissions account. At present, the absence of one or several countries is a step backwards in curbing climate change. Simultaneously, all the measures or decisions adopted at global scale may have a great impact on each country, as well.

The treaty focuses on four sectors: energy supply, industrial processes, waste management, and land use, including agriculture and forestry. However, the contribution of the energy and forestry sectors to GHG emissions is receiving most of the attention. More than half of the emissions come from one of the above mentioned sectors (see Fig. 1). Many experts agree that the largest contribution by far to the discharge of gases appears to come from energy supply and transport (UNFCCC 2009; ACME 2006).

Despite the fact that the member countries are already developing policies and mechanisms focusing on the above mentioned sectors, increasingly the Protocol is facing increasing difficulties. On the one hand it is doubtful that all the countries will be able to meet their objectives for 2012 (Klean industries 2008, Science 2009). On the other hand the Protocol is about to expire in 2012 and uncertainty about future agreements is high; negotiations continue but a final decision has not been reached yet.

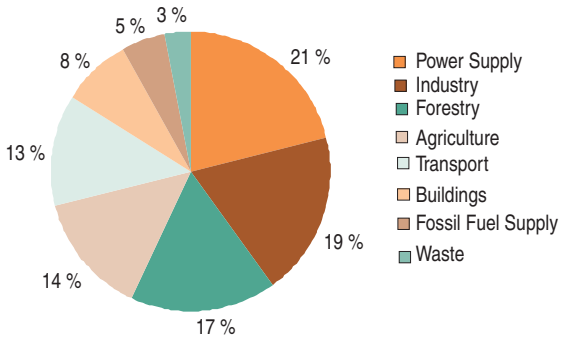

Fig. 1. Contribution of the different sectors to greenhouse gases emissions (based on UNFCCC 2009)

In the light of these findings keeping a common policy framework globally is an important as well as challenging task. This policy framework sets minimum targets that countries must follow. Moreover, it takes into account the differences among countries (in terms of economic, social, and cultural dimensions).

In order to achieve tomorrow's objectives it is necessary to first build a better today. One of the ways to implement this is through cooperation, especially by improving relations between neighbouring countries. Some countries have the potential to contribute to their own wealth and to the global account. However, the lack of proper instruments and experience required for development is hindering their economic growth. On the reverse of the coin, countries that already have experience and that have already developed a consistent policy based on knowledge and experience lack natural resources.

For instance, this is the situation of the Russian Federation and Finland. Due to their location, the countries share history and have close economic and social relations. However, they have followed different paths. Their domestic political, social, and economic performances are significantly different. There are great differences between the countries' forest sectors, for example in forest ownership (which is mainly private in Finland but purely public in Russia), harvesting methods, and technologies.

Regarding climate and energy issues the Russian Federation is among the major players within the Kyoto Protocol. Russia's relevance stems from two divergent streams. On the one hand Russia holds abundant natural resources in terms of oil, gas, and coal and is the largest exporter of natural gas and the second in the oil supply chain (Zeller 2009). These facts lead us to the first statement: Russia is considered one of the largest emitters of GHG globally, accounting for 1594 million tonnes of CO2 annually (see Fig. 2).

On the other hand the country presents a huge potential to diversify its energy market towards a low carbon economy. The availability of renewable energy sources (RES) within the country, especially wind (far northern and eastern territories), solar (southwest Russia), and biomass (most

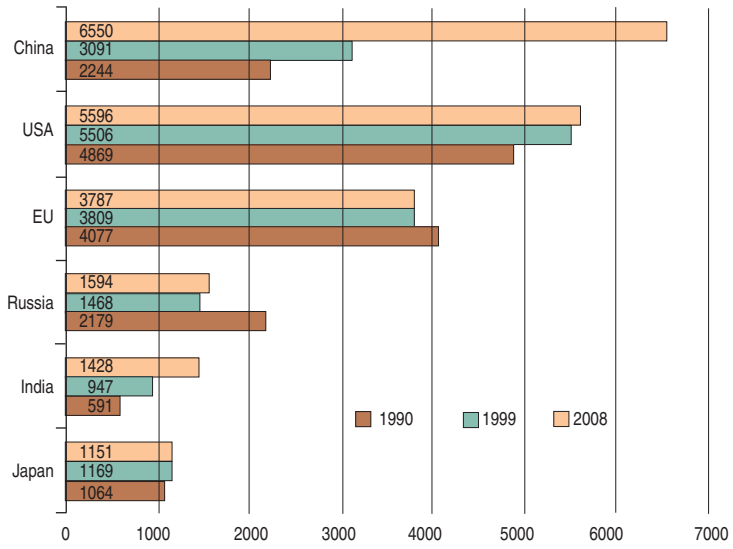

Fig. 2. World largest emitters of CO2 (million tons) until 2008 (Eurostat 2011a)

likely in northwest Russia) is also greatest (Gati 2008). This fact drives us to the second statement: the intrinsic resources of the country places Russia as one of the best positioned countries to boost the market of RES. The country might be a major beneficiary, since it is likely to experience a rapid modernization and is likely to be a greater benefactor as it is one of the largest countries. Hence, its carbon footprint may have a great impact on the global account.

Finland's shortage of certain natural resources such as crude oil, coal, or natural gas means that the country is dependent on imports. Nevertheless, in the Finnish case this "scarcity" of resources has turned into an opportunity. It has prompted the shift from fossil fuels to renewable energy sources, mainly to bioenergy. Finland's bioenergy resources are mainly woody biomass in different forms: round wood, logging residues, and by-products of the wood processing industry.

In order to move towards a low carbon economy, governments are promoting policies to boost the development of RES within the total primary energy supply (TPES). Russia and Finland have set specific targets (see Table 1). Bioenergy, including to some extent wood based energy, is supposed to be one of the RES that will be expanded due to its importance within the Protocol. Table 1 shows general figures from both countries' profiles.

At a national level Russia and Finland have already made steps towards becoming low carbon economies. Under the Kyoto protocol, both countries started to develop policies which address RES production and consumption. At national level Finland relies on the Long-Term Climate and Energy Strategy up to 2020 while Russia has developed a complex energy strategy including RES. Nevertheless, the Russian Federation is still at the beginning stage of establishing regulatory norms for bioenergy promotion and standards for biofuels (Biofuels Annual 2010) while Finland has already developed specific renewable energy policies.

1.2 Objectives

The aim of this study was to analyse and compare Russian and Finnish national policies related to energy from forest woody biomass (hereafter wood based energy policy) and their implemen-

Table 1. Russia's and Finland's general profiles (Energy Delta Institute 2007; Bunseki.info 2008; Forest.fi 2009; Indexmundi 2009; Statistics Finland 2010; Federal State Statistics Service 2010; Forest.ru 2010; Eurostat 2011b; State of the World's Forests 2011e)

	Russia	Finland
Population, millions (2010)	141.9	5.4
GDP, per capita (Euros)	10.900 (2010)	24.035 (2009)
Energy consumption (Mtoe*)	758 (2007)	34 (2009)
GHG emissions (CO2) per capita (2006) Mtoe*	10.9248	12.6763
Current share of RES in the TPES	Less than 1%	26.3% (2010)
Targets for share of RES	4.5% (by 2030)	38% (2020)
Forest area (total)	45%	73%
Forest area (million ha)	About 809	About 22
Forest ownership	100% state	52% family forests, 35% state, 8% industrial private, 5% other

*Mtoe= Million Tonnes of oil equivalent

tation in regional plans in the province of North Karelia (Finland) and the Republic of Karelia (Russia).

The specific targets were:

- to synthesize the current policies dealing with wood based energy at national and re gional levels;
- to provide a better understanding of wood based energy related policies;
- to identify strengths and weaknesses in the wood based energy policy of the Russian Federation as well as potential interactions between Russian and Finnish wood based energy related policies;
- to identify possible interactions between Russian and Finnish wood based energy sectors caused by the national wood based energy policies.

One of the main focuses of bilateral cooperation between Russia and Finland refers to the promotion of cooperation in international climate policy (Ministry of Environment 2008), where wood based energy plays a key role. Thus, comparison between countries' policies is needed to identify gaps in the current climate and energy policies for future improvements in cooperation.

The paper is divided into two different themes. The first, named international and community drivers of RES development, is a general overview of international and community measures enhancing climate and energy policies, specifically regarding bioenergy consumption and production. The significance of bioenergy in the global agenda is highlighted. The second theme focuses on current documents regarding RES promotion in Russia and Finland and consists of the analysis and comparison of principal policy documents in Russia and Finland with a special emphasis on the Republic of Karelia and the province of North Karelia in the field of wood based energy.

1.3 Overview of the province of North Karelia in Finland and the Republic of Karelia in Russia

The Republic of Karelia is located within the Northwest Federal District of Russia, in the European part of the country. The area covers about 1% of the Russian Federation (see Table 2). It has 700 km of common border with Finland.

Table 2 shows that there are 16 municipal districts and two urban districts (Petrozavodsk and Kostomuksha), with 808 inhabited localities, including 13 towns. The urban population accounts for 75% of the population. More than the 60% of the population are of working age and about 14 000 people are unemployed (Administration of the head of the Republic of Karelia 2011).

The strategic location of the Republic of Karelia places the region in a favourable position to develop industrial complexes and international relations. The forest sector is one of the leading industries in the region, and trade with Finland is an important source of income (Regional council of North Karelia 2010a).

The province of North Karelia in Finland is located in the eastern part of the country. The capital city of the province, Joensuu, is often called Europe's forest capital, because several well-known forest research and education organizations – the Finnish Forest Research Institute, the European Forest Institute, and the University of Eastern Finland – are located in Joensuu and nearby. There are also leading manufacturers of forest machines, such as John Deere and Kesla, who have lo-

cated their production facilities in the province of North Karelia (Regional council of North Karelia 2010a).

Forests in both regions are seen as one of the most valuable assets, since they cover a large surface area (see Table 2), with pine, spruce, and birch as dominant species. Within North Karelia the percentage of renewable energy sources is significant, accounting for 63% of the total energy use. In this context wood based energy plays a key role, with black liquor, industrial side products, pellets, firewood, and woodchips being major sources. For instance, the usage of forest chips within the region increased about 65 times from 2000 to 2009 (Pitkänen 2010).

The position of wood based energy is strong and the bioenergy sector accounts currently for a turnover of €120 million (Regional council of North Karelia 2011). In addition, the province shares 296 km of border with Russia, placing it in a good position for conducting business.

Regarding the policy status of the region, it is expected to be free of oil for power and heating by 2020 and completely oil free by 2030. Meaning that the region not depend longer on fossil fuel, and that North Karelia is also producing more renewable energy products than using totally energy (Regional council of North Karelia 2011). The cornerstone which currently directs the future of wood based energy is the North Karelia Bioenergy Programme 2015. The first draft of the Regional Climate and Energy Programme to 2020 was published in 2011.

Despite the fact that the regions share history and that the forest sector is leading in one region (see Table 2), deeper differences remain. One of the most significant examples arises from the fact that while Russia has a centralized policy, decentralization prevails in the neighbouring Finland.

2 Material and methods

Table 2. General information about the Republic of Karelia and North Karelia (Löfman 2006; Välkky, Nousiainen, & Karjalainen 2008; Gerasimov, Karvinen, & Leinonen 2009; RussiaTrek 2009; MEDRK 2010; Joensuun kaupunki 2010; Regional council of North Karelia 2010a)

	Republic of Karelia (Russia)	North Karelia (Finland)
Population	684.200	165.000
Municipalities	18	14
Area	180.500 km^2	21.585 km^2
Regional centre	Petrozavodsk (271 000 inhabitants)	Joensuu (72 000 inhabitants)
Percentage of the territory covered by forest	55%	84%
Density of roads [2009]	2.0 m/ha (0.8 m/ha*)	12 m/ha
Leading industries in the region	Forestry	Bioenergy (forest sector)
	Mining	Stones and mining
	Metallurgical	Metal
	Food-processing industry	Food
		Plastic
		Tourism

*Density of roads in forest land (m/ha) in winter

The materials used in this study consist of:

- Legislation and policy documents in force in English, Finnish, and Russian in 2010:
  - o Major international and community treaties and policies
  - o National policy
  - o Regional policy documents
- Working papers and articles, mainly in English

In order to assess the policies we focused on three main qualities according to the studies developed by James D. Arthur and K. Todd Stevens (Arthur & Stevens 1990). The three categories employed are accuracy, completeness, and usability. Following the methodology proposed to measure these categories we selected some factors that are related to the characteristics of documents as shown in Fig. 3.

The work plan was divided into two parts: the first part constitutes the pillars of the research. Identification of policies directly related to wood based energy from official sources (e.g. the United Nations, the European Union, or government web-sites of Finland and Russia). For that purpose the study considered documents to be directly related to wood based energy only if they referred to the following key terms: "forests", "bioenergy", "biomass", or "renewable energy sources" (Fig. 4).

The second step was the differentiation of wood based energy related policies according to three different hierarchic levels:

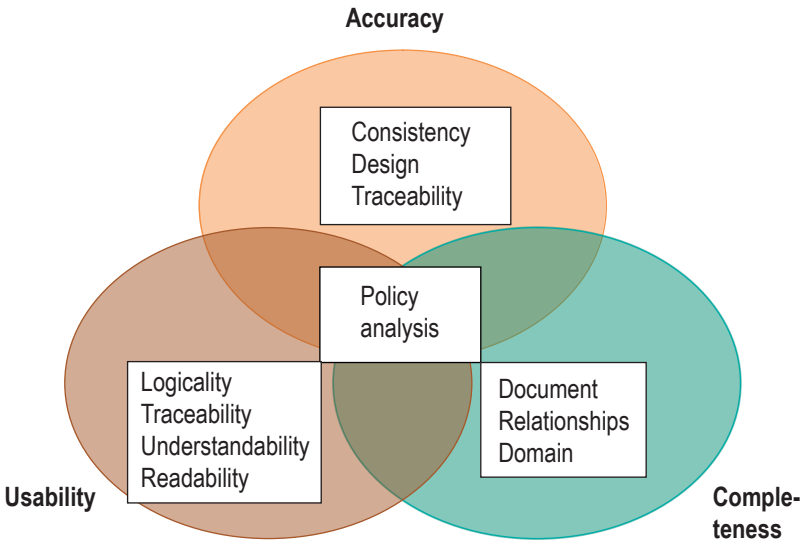

Fig. 3. Main factors defining an adequate documentation for policy analysis (Arthur & Stevens 1990; NFCG 2001)

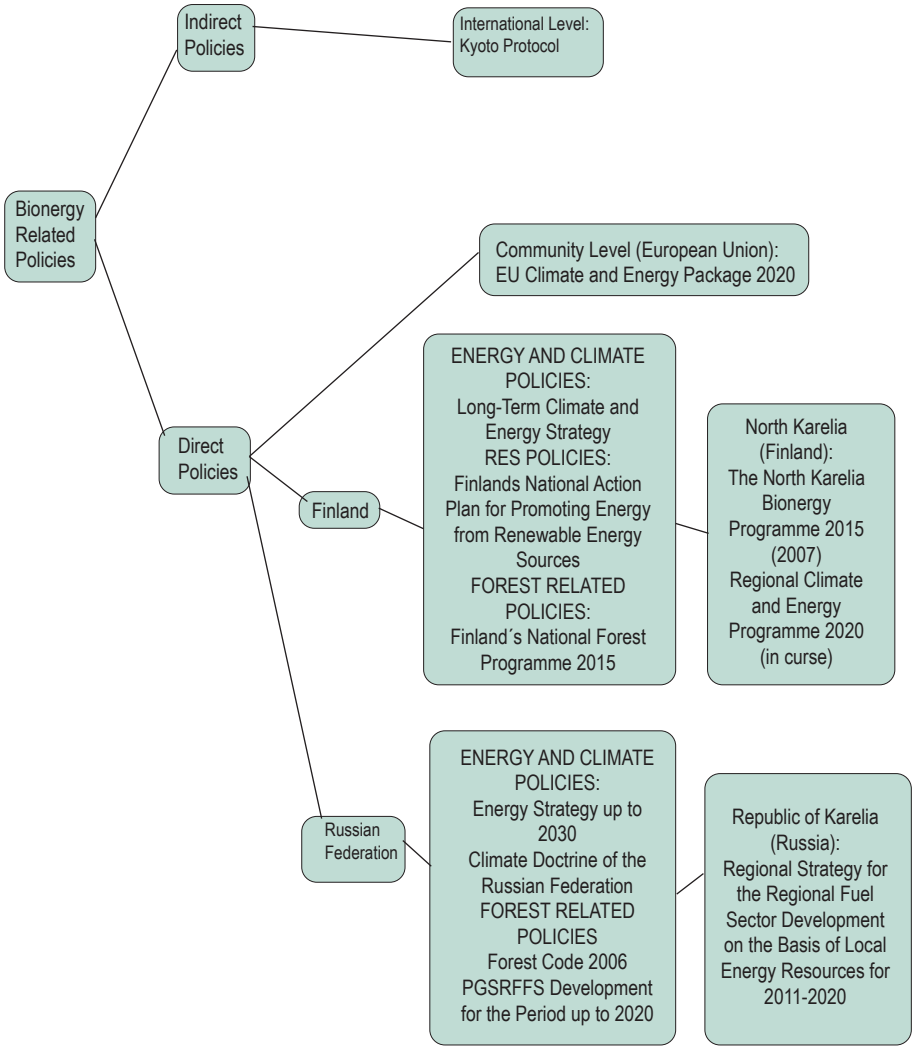

Fig. 4. Core policies and documents used in the study (note: in the diagram PGSRFFS refers to the Principal Guidelines for the Strategy of the Russian Federation Forest Sector Development).

- international and community (European Union) levels (which were studied together since the scope was too wide);
- national level, divided into three types (energy and climate policies, renewable energy policies, and forest related policies) according to the number of sectors that the policy covers;
- regional level; at this level the implementation of national policies through regional plans in the province of North Karelia and the Republic of Karelia was the main focus.

After the identification, the policy documents were analysed using the methodology proposed by Arthur and Stevens (1990) and NWCG (2001). Furthermore, the documents from both countries were compared, looking at similarities and differences in targets, timeframes, support measures, and technologies.

3 International and community drivers for renewable energy sources

3.1 The Kyoto Protocol open window of wood based energy related policies

In 1992 most countries joined the United Nations Framework Convention on Climate Change (UNFCCC) (UNFCCC 2011a). This convention resulted from the negotiations of the United Nations Conference on Sustainable Development in 1992 (Conference of the Earth or Rio Summit), which aimed to prevent more severe consequences of global warming.

Under this premise the Kyoto Protocol was developed. This instrument was endorsed in 1997 during the third conference of the parties of the UNFCCC in Japan. The Protocol entered into force, becoming a legally binding document, in February 2005, after the Russian Federation's ratification (Science 2009).

Renewable energy sources play a key role in climate change mitigation within the protocol. Beyond the measures adopted towards emission reduction, in addition there are two more groups of measures that are related to increasing the percentage share of RES and other actions related to moderating energy consumption. Regarding the increment of RES the government of Finland committed to increase the share of RES to 38% by 2020 while in Russia RES is expected to account for a 4.5% share of the electricity produced by 2020. Nevertheless, Russia is committed to reducing its energy intensity by 45% to 55% by 2020 (Low Carbon Economy 2011).

The Protocol brings opportunities for industries and supports economic development. The Russian Federation as a part of the Annex I countries and defined by the Protocol as an economy in transition can benefit from two of the three flexible mechanisms: emissions trading and joint implementation projects.

Emissions trading is defined in the 17th Article of the Protocol and allows countries with a surplus in emission reduction units to exchange them on the market. For instance, carbon is a commodity that is currently is traded on what is known as the carbon market (UNFCCC 2011b). Joint implementation allows investment in projects for emission reduction in countries included in Annex I. The investments benefit both countries since the investor reduces its costs and the host country may benefit from foreign investment and technology transfer (UNFCCC 2011c).

Forests are highlighted in a wide variety of documents due to their impact on climate. The forest sector and particularly wood based energy may also benefit from the Protocol due to the low emissions compared to other energy sources. However, some experts on forest and climate from the NGO Ecosystems Climate Alliance (ECA) warn about the risk of considering wood based energy as a carbon-neutral source (Wetlands International 2010).

The Kyoto Protocol was the first binding step encouraging countries to think globally to reduce the human footprint through their local action. The Protocol is the impetus towards global awareness as well as transparency, through the countries' reporting, and responsibility with regard to human activities in each country. Nowadays, many countries are on track to meet the goals set by the Protocol. However, the future beyond the treaty remains uncertain.

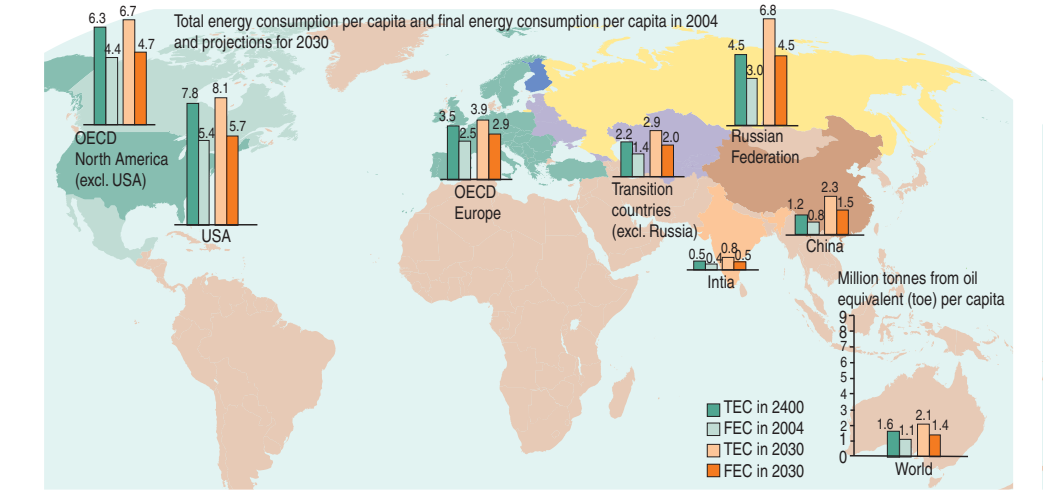

Fig. 5. Energy consumption per capita in 2004 for the Pan-European Union (EEA 2007)

Amongst other factors that contribute to this image of the Kyoto Protocol we find firstly that some of the countries who ratified the agreement have already reported that they might not meet the requirements, such as Canada. Other countries such as Spain or Austria appear likely to fail. Secondly, the United States is the only developed country that has not ratified the agreement and is also considered the largest emitter. Finally China and India, which are exempt from making reductions, are considered to be amongst the most polluting countries after the United States (Science 2009).

The Kyoto Protocol expires in 2012 and negotiations to replace the pact started in 2008 (Thailand). A new agreement was expected to be made at the Copenhagen conference in 2009. However, no international agreement has been reached yet. Some authors, including the European Commission, believe that a new more ambitious pact should be developed. This pact should include all countries and each country should contribute its fair share (EC 2009a).

As shown in Fig. 5, the total energy consumption per capita is likely to increase globally. However, the commitment to this international agreement is indirectly forcing countries to be more efficient and innovative and to search for new methods of adaptation. At the same time it is forcing countries to reduce the usage of fossil fuels and to replace them with alternative sources. This means the usage of renewable energy sources is ranked in a good place to diversify the energy sector. At the same time this contributes to the development of markets such as the wood based energy market and new policies to enhance them.

3.2 Outlooks of major international and community policies and documents arising from the Kyoto Protocol

The demand for alternative energy sources is growing fast, resulting in some benefits for the forest sector: diversification of energy sources, new applications for woody biomass, modernization of technologies, investment in cost effectiveness, and job creation. Simultaneously there are some risks for the development of the sector such as the competition for land or between material and energy use of woody biomass and the risk of growing emissions due to land use (IEA 2009).

All these topics are cause for concern. Thus, policies that take into account these matters, reinforcing the role of renewable energy sources, are necessary. The Kyoto Protocol has contributed to the promotion of policies at different levels.

The European Union (EU) has been more active among the communities with regard to climate and energy policies. The latest roadmap announced in March 2011 proposes a reduction of GHG emissions from 80% to 95% by 2050 from the 1990 baseline for the EU (McKenna Long & Aldridge 2011). In order to reach this target the role of RES within the EU climate and energy policy seems essential.

RES have been promoted in the White Paper since 1997. At that time the objectives of the EU focused mainly on reducing the dependency on fossil fuels imported from non-member countries (EC 2011a). Now, with the new Renewable Energy Directive (2009/28/EC), the EU members have set legally binding goals for RES development in electricity generation and transport.

Each of the member states has adopted a National Renewable Action Plan, which provides a roadmap for how to reach the 20% share of RES in energy generation and the 10% share of renewable fuels in the transport sector by 2020 (EC 2011b; EC 2011c).

The EU is trying to boost the competitiveness of the RES sector through supportive measures. Regarding wood based energy development, the EU is giving direct incentives in transport and grants for electricity, heat, and transport (IEA 2010c) However, financing of RES is likely to be better addressed in the future (EC 2011a).

The Kyoto Protocol has also boosted documents and policies at the national level. For instance, each country that signed the treaty has to submit an annual report and a periodic report called a National communication. The annual report contains, among other subjects, information on GHG inventory and land use, land use change, and forestry (LULUCF). The National communication contains supplementary information, including policies and measures implemented under Article 2 (see Chapter 4) (UNFCCC 2008).

Each National communication is subject to an in-depth review by a committee of experts. The report should include the countries' circumstances, current trends, projections, adaptability, and instruments and measures developed to face climate change. Within these documents there is a summary of policies and measures related to Article 2 of the Kyoto Protocol, as well as the incentives developed to support them (UNFCCC – Finland 2010)

Both Russia and Finland have reported and have therefore been analysed by the committee of experts. The in-depth review of Russia reveals an interesting point. Despite the fact that there are policies, legislation, and ongoing plans, the committee highlighted that there is an absence of clear objectives and activities in these instruments.

Nothing regarding lack of targets or measures was specially highlighted in the Finnish report. The only significant matter was that the committee mentioned that due to the increasing competition in the global market some industry products, for instance related to the pulp and paper industry, are likely to decrease, taking into account that the availability of biomass (logging residues and wood pellets) is likely to be reduced (UNFCCC – Russia 2009; UNFCCC – Finland 2010).

During the years that have passed since the Protocol entered into force, many different documents have been issued. On the one hand, a lot of research and work has been done and the policies developed seem to help not just wood based energy development but also RES in general. On the other hand, a large number of policy documents may generate overlaps and conflicts of interests.

4 Current policies regarding wood based energy development in Russia and Finland

4.1 Analysis of national strategies considering the use of wood based energy production

Three major groups of policies regarding wood based energy were identified:

- Energy and climate policies: long-term strategies and measures aimed at curbing the effects of global warming through reducing the impact of the anthropogenic footprint;
- RES policies: documents addressing the promotion of alternative energy sources in place of traditional fossil energy sources as a means to combat climate change as well as to enhance rural development and increase national energy security;
- Forest related policies: the legal basis and national guidelines and programmes focusing on the sustainable management of forests.

4.1.1 Long-term energy and climate policies

Russian Federation

There are two main policy papers dealing with climate and energy within the Russian Federation: the Climate Doctrine of the Russian Federation 2009, a multisectoral document focusing on challenges and opportunities related to climate change; and the Energy Strategy of Russia for the period up to 2030, an in-depth analysis of the current state of the country's energy sector and a roadmap for its development providing definitions of targets and priorities.

The Climate Doctrine of the Russian Federation was made law on 17 December 2009. This document represents a framework policy within the Russian Federation aimed at unifying the international and national levels of the country's public policy (IEA 2010a). The document emphasizes the importance of mitigation of climate change for the country's security and serves as a basis for developing and implementing the climate policy of the federal state (Climate Doctrine of the Russian Federation 2009).

Amongst the main cornerstones of this legislative document is the call for clarity and transparency, which are heavily stressed. This can be noticed in the second chapter, where the term "transparency" is highlighted several times. Concurrently, the Doctrine informs about the difficulty of developing a climate change policy taking into account the pros and cons in such a vast and diverse country (Climate Doctrine of the Russian Federation 2009).

The responsibility for actions aimed at increasing the use of RES together with the exploitation of forest falls to the Federal State. Moreover, the Doctrine states that the performance of the country involves development of the basis at federal level as well as in regional programmes and action plans.

The promotion of RES is highlighted within the objectives of the Climate Doctrine. The call for expansion of RES is stated in Articles 23 and 24 (Climate Doctrine of the Russian Federation 2009). However, there is no clear specification of what energy sources will be boosted and how the usage of these alternative sources will be implemented.

The Energy Strategy of Russia for the Period up to 2030 (hereafter the Strategy), approved by decree on 13 November 2009, is the most recent umbrella document in a series of national policy acts regarding energy. The first energy policy resolution of Russia after the collapse of the Soviet Union, the so-called Energy Policy Concept of Russia in the New Economic Condition, was adopted in 1992. Three years later, the Major Revision of the Energy Strategy of Russia up to 2010 was approved, and it was with the next document, the Energy Strategy of Russia up to 2020 (developed in 2003) that Russia included the usage of RES in the agenda for the first time (IEA 2010b).

As a result of the implementation of the national strategy, regional governments in many parts of Russia have started to develop regional strategies for renewable energy. In addition, the call for the intensification of alternative energy sources goes with the plans on the building of new hydro energy power stations (IEA 2010b).

About twenty years after the first document, the new Strategy builds the future of the Russian energy sector on the diversification of energy sources. The idea of the Strategy is to serve as a tool for guiding other documents but in any case it seeks to displace other programmes (IES 2010).

The document sets priorities taking into account the objectives that were already achieved in the previous Strategy up to 2020 as well as the economic global situation and sustainability matters. As in the Climate Doctrine, transparency seems to be a key factor for the State in the energy sector too. This fact is expressed through the accuracy of the definitions of concepts, goals, and measures for some of the related energy sources. Among the State's priorities are the reduction of energy consumption, improvement of energy efficiency, and State support for investment to develop the domestic economy.

The anticipated results out of the Strategy are expressed in two different scenarios for socio-economic development: one more optimistic, the other more conservative. They cover the three implementation phases of the Strategy. The document sets the first implementation phase as approximately 2013 to 2015 (the beginning of the post-crisis period). In this phase the country is expected to develop socially and economically at the rates stated in the document (the end of this phase coincides with the end of the first scenario). The second implementation phase covers from the end of the first phase (expected in 2020) up to about 2022 (also the end of the second scenario). This phase is where the level of the country's socio-economic development expressed in the conception is expected to be reached due to the rapid development of the country in the after the current crisis period. The third phase will last until 2030 (ESR 2010: 18).

The Strategy does not separate different renewable energy sources and they seem to be one priority area of development. However, the information available about how they will be implemented within the Strategy is scarce. Taking a closer look, the development of most of the energy sources is considered in the document following the same basic structure: first the introduction of strategic objectives, then development of natural sources in relation to the Strategy, trends and prospection of the mentioned source, main problems and goals, and finally outlining of different measures to solve them.

On the contrary, the frame followed regarding the use of RES and local energy resources differs. Chapter 10 on RES promotion lacks an analysis of the main problems associated with the use or development of alternative energy sources. Similarly, specific measures to implement RES are not considered. In the Strategy the only exact figure referring to the development of RES is the target for RES to reach a 4.5% share of the electricity structure by 2030 (Energy Strategy up to … 2010). Information about which RES is to be considered the key source of renewable energy is not given, however.

The last part of the document covers the development of the energy sector within the seven federal districts of Russia which existed when the Strategy was prepared, according to the phases previously mentioned. The Strategy concludes with expected results. According to the Strategy, the share of RES in the energy balance will presumably grow because it is expected that the attention paid to GHG emission reductions will grow. The areas of implementation of the Strategy constitute the last part of the document.

Based on the Climate Doctrine of the Russian Federation 2009 and the Energy Strategy of Russia for the Period up to 2030 it is possible to conclude that the role of bioenergy and therefore wood based energy within the RES in Russia remains unclear. In spite of the vast wood resources, there are no exact figures for the share of wood based energy in the total use of RES. The information available on wood based energy in the chapter on RES does not present concrete measures or significant information. No supporting measures are included. However, special emphasis is given to the usage of bioenergy or biomass for fuel production. Moreover, the Strategy also urges a rapid development of renewables and the creation of a long term policy addressing them. Across the document the importance of bioenergy for the fuel and energy balance is emphasized (ESR 2010).

One of the most relevant parts on bioenergy concerns its value at a regional level. The Strategy highlights the fact that the use of biomass or RES is clearly present in all regions except the Volga and Urals federal districts. Moreover, the use of bioenergy is especially enhanced in the Siberian and Far Eastern federal districts owing to the need to supply isolated areas.

Finland

The First National Strategy was developed in 2001 under the leadership of the Kyoto Ministerial Working Group. The document provides the measures needed to meet the target decrease in GHG emissions stated in the Kyoto Protocol (National Climate Strategy 2001). The Second National Strategy was published in 2005 and it reviews the measures accomplished within the first strategy as well as illustrating the future trends of climate and energy policy at a national level (MTI 2005).

The main objective of the current Long-Term Climate and Energy Strategy of Finland, as in the two past strategies, is devoted to the Kyoto Protocol and seeks to fulfil its requirements and obligations. In the latest Strategy there are two different scenarios: the baseline scenario is consistent with the present measures and its performance while the target scenario outlines the country's development while meeting EU and national targets. Within the expected results of this policy document the progress in the diversity of the Finnish energy system is highlighted. Moreover, the Strategy presumes that the share of domestic energy sources will grow considerably mainly due to the growth of the use of RES (LTCES 2008).

The document presents policy measures up to 2020 as well as giving suggestions for the period up to 2050. The fact that this document looks as far ahead as 2050 emphasizes the long-term nature

of the Strategy (EC 2008). Furthermore, the objectives set in this document are in line with those of the EU's strategy, which shows the strong influence of the European Union on national policies within the member countries.

Energy savings and efficiency together with the promotion of RES constitute the main foundations of this policy document. Amongst the measures adopted in the document the increasing share of renewable energy, which should rise to 38% by 2020, and the 10% share of RES in transport stand out (Government report 2008). In order to fulfil these requirements it is planned to increase the use of biogas and utilization of forest chips and to prioritize wood-based energy amongst other renewable sources (EC 2009b).

To achieve this target it was planned to increase energy and climate financing up to €550 million in 2009 (EC 2009b). Throughout, the supporting measures (see Table 3) for electricity, the production of woody biomass for energy, liquid fuel production, and wind power have been the greatest beneficiaries of the co-financing scheme proposed by the government. About 60% of available grants were allocated for this purpose during 2006. Similarly biogas plants have benefited from 7% of the total budget (EC 2009b).

However, as is stated in the summary of the Long-Term Climate and Energy Strategy, a more effective subsidy and diverse measures and changes are needed. The target of a 38% share of RES requires intensification of wood based energy, waste fuels, and biogas among other alternative sources (Government report 2008).

Comparison of the Finnish and Russian climate and energy policies

The climate and energy policies approved by the countries are analogous in several ways. First of all, these documents are long-term framework policies. This fact might result in the vagueness of some actions and targets due to the wide scope that the documents need to cover. The Russian Climate Doctrine and the Long-Term Strategy of Finland emerged in response to the climate change challenge. The Kyoto Protocol initiated the elaboration of these policy documents. The Energy Strategy of Russia emerged to analyse the energy sector and to forecast its development taking into account current problems. Nevertheless, at present the Energy Strategy of Russia up to 2030 is also linked to the GHG emissions. For instance the document refers to the limitation of emissions up to the level of 100 or 105% compared to 1990 levels (ESR 2010)

Taking a closer look, all documents highlight the importance of national energy security, energy efficiency, and the value of energy saving. Likewise, they all emphasize the future contribution of the diversification of energy sources in their global balance (LTCES 2008; Government report 2008; ESR 2010)

The publication dates of all the documents span only two years (see Table 3) and taking into account that they have similar topics a small difference between them can be expected. However, there are big differences regarding bioenergy. For instance, the Long-Term Strategy of Finland actively promotes the usage of RES and specifically wood-based bioenergy. The document sets out measures such as the development of an Action Plan on RES, which was already published in 2010. Furthermore, it establishes specific measures, such as investments in production of solid biomass and biofuels, feed-in tariffs, and measures to accelerate the introduction of new technologies (LTCES 2008).

Table 3. Comparison between long term energy and climate related policies at national level (LTCES 2008; Doctrine of the Russian Federation 2009; ESR 2010)

	Climate Doctrine of the Russian Federation	Energy Strategy of Russia up to 2030	Long-Term Climate and Energy Strategy of Finland
In force since	2009	2010	2008
Timeframe	Up to 2030	Up to 2030	Up to 2020 and suggestions up to 2050
Type of policy	Framework policy	Framework policy	Framework policy
Policy targets	Buildings Energy production Industry Multisectoral policy Transport	Energy production	Multiple RES
Specific targets on RES	Not found	Share of renewable energy to increase to 4.5% of the structure of electricity production and consumption.	Share of renewable energy to increase to 38% by 2020. 12 million m3 of wood chips in 2020. The use of biofuels in transport to reach as high as 20% in 2020.
Support measures	Not specified, but refers to the implementation of financial and tax policy measures in the future.	Not specified	Tax subsidies. Discretionary investments. Subsidies. Guaranteed access to the grid for electricity users and producers.
Technologies	No references		Acceleration of new technologies through investments
Strong points	Defines the limitations of the document. Shows informational transparency as a priority of the climate policy. Highlights the diversification of energy sources.	Introduces an environmental aspect. Considers Regional division.	States clear measures for RES promotion as well as showing its commitment to bioenergy development.
Major weaknesses	No focal points (multisectoral policy) – measures for RES are too general.	Too general when referring to RES. No support measures for RES. Focus mainly on other energy sources.	No support measures from the State to increase energy savings are stipulated.
Other important issues	The documents were elaborated without public discussion		Optimistic regarding the perspective of RES in the energy balance. Outlines the need for subsidies to promote renewable energy.

In the Russian Energy Strategy, on the contrary, the development of renewable energy has a vague perspective without clear specifications. For instance, it is expected that the share of non-fossil energy sources (as mentioned in the Strategy, this refers to nuclear and renewable energy sources) in the primary energy balance will reach 14% in 2030. Regarding hydro energy there are certain plans for constructing new hydro energy facilities, but in the case of renewable energy the strategy does not clarify how it will be implemented. Nowhere it is specified how much will be invested in RES. Regarding the tariffs and pricing in energy markets it is said only that in the third phase of the strategy "a stable pricing policy for producers and consumers of energy sources will be formulated" (ESR 2010: 157).

Table 3 shows that the share of renewable energy in the TPES of Finland is expected to be 38%. This target was established by the Finnish government above any international or European agreements. The contribution of wood based energy is the largest, being about 27% (Pekkarinen 2010). The Russian Energy Strategy sets a 4.5% share of electricity as the target for RES. However, there is no reference to the target share of wood based energy.

Despite the ambiguity shown in certain items in the Energy Strategy of Russia up to 2030 and also in the Climate Doctrine, it seems that Russia is moving towards the targets set out in the Kyoto Protocol. Finland is aiming at more ambitious targets for RES than those stated by international treaties.

The Energy Strategy of Russia at a national level focuses on energy savings and cost-efficiency, owing to their potential, rather than on the use of RES. Even though wood resources are greatest in the Russian Federation, the roles of hydro, wind, or even peat[1] are stressed over woody biomass. In Finland, the energy and climate strategy seeks energy savings and efficiency through innovation in the processes and technologies dealing with bioenergy. Wood based energy is highlighted over other RES (EREC 2009).

Table 3 shows a comparison of the policy documents based on the data collected mainly from the International Energy Agency (IEA) database on climate and energy policies. One of the most significant aspects contributing to the promotion of wood based energy in Finland is the supportive measures developed. The government has enhanced the competitiveness of RES through subsidies and tax exemptions. For instance, "RES has been made exempt for the energy tax paid by en users" (Dongradi 2008:1) and new investments are granted subsidies of up to 30%. Furthermore biofuels benefit from tax exemptions under specific conditions; for example biogas used as motor fuel is exempt from excise duty (Dongradi 2008).

In Finland during 2010 different schemes were introduced or were ready for implementation. Specific measures are addressed at the following fields: wood chips/other energy from wood, small-scale use of wood, transport biofuels, biogas, and pellets. For the promotion of wood chips a three-part aid package was projected. The plan aims to support small-sized wood, with a feed-in tariff to reduce the cost gap between forest chips and alternative fuels and a feed-in tariff for small Combined Heat and Power (CHP) plants. The consumption of biofuels for transport is enhanced by mean of a tax reform (under development in 2010). It was estimated that about €120 million could be financed (Alakangas & Vesterinen 2010). The Energy Strategy of Russia lacks supportive measures. The document mentions the promotion of renewable energy especially by means of payment for electricity produced and reimbursement of the payment for technological connection to the networks.

[1] Peat in Russia is considered as a part of RES (Energy Strategy of Russia...2010)

One of the most relevant items presented within the Energy Strategy of Russia that may give an idea of the importance of RES within the country is a forecast of the capital investment in the development of RES presented in Annex IV. The percentage that the state is expected to spend on RES development is about 5% of the total of the fuel and energy sector for the period up to 2030. In monetary terms, this percentage corresponds to an investment of €76–90 billion (Energy Strategy of Russia… 2010).

The Long-Term Climate and Energy Strategy of Finland states exact targets for RES and provides supportive measures. Therefore, this document looks more applicable in practice compared to the Russian Climate Doctrine and Energy Strategy.

4.1.2 Policies related to renewable energy sources

Russian Federation

When this publication was under preparation, in Russia there were no RES-specific policy documents in force. Due to the closed policy-making process there is no exact information available about the content of RES policy being elaborated.

Finland

During the past few years, significant structural changes have occurred in the Finnish forestry industries and even more significant ones in the pulp and paper subsector (FFIF 2007). Nevertheless, challenges owing to the layoff of personnel or the financial crisis together with the leadership of the European Union have stimulated a large scale of opportunities. For instance, they have prompted the development of policies to support the production and consumption of RES.

The first Finnish National Action Plan for Renewable Energy was launched in 1999 and revised in 2002 (OPET 2002). In April 2010 the Finnish government strengthened the national policy on renewable energy with a new plan based on Directive 2009/28/EC on the promotion of renewable energy.

Finland's National Action Plan for Promoting Energy from Alternative Energy Sources (2009) is a support action for practical implementation of the Long-Term Climate and Energy Strategy of Finland. The aim of the Action Plan, following the principles of the Finnish climate and energy strategy, is to further expand the use of bioenergy (EREC 2009). Moreover, the Action Plan presents practical measures to promote the competitiveness of wood based energy through a support package aimed at increased production and use of forest chips (Table 4). Amongst the mandatory objectives addressed by the European Commission in the RES Directive are those included in the Long-Term Energy and Climate Strategy of Finland: the 38% share of RES in the final consumption of energy in 2020 and the 10% share of RES in transport by 2020. Beyond these targets there are two indicative goals: for the share of renewable energy in gross electricity consumption to be 31% and for the share of biofuels in transport to be 5.75% in 2010 (EC 2009b).

The Action Plan takes into account other renewable energy sources as well as measures to promote forestry. Throughout the targets covered by this policy document the following areas are included: small scale use of wood, transport biofuels, biogas, and pellet production (currently under development). Furthermore, it aims to enhance research and development, focusing on harvesting methods and transport technology.

Table 4. Main measures adopted in Finland's Action Plan regarding forest chips (MEE 2009)

	Energy subsidies for small sized wood harvesting	Support for electricity production from wood chips (feed-in tariff)	Feed-in tariff for small CHP plants
In force		At the beginning of 2011 to support electricity from wood chips	At the beginning of 2011 to support small CHP units using wood fuel
Existing subsidies	Yes (under the Sustainable Forestry Financing Law "Kemera")	No	No
Financial sources	The State's budget		
Aim	To improve the effectiveness under the Kemera. Energy support for small-sized wood, and the supply of pulpwood to the forest industry at large.	To increase the competitiveness of wood against other fuels	To replace heat boilers with small CHP units
About the subsidy	The existing subsidies remain as they are in other aspects however, they are restricted to cases where remaining trees have a 13 cm diameter at breast height. Moreover, the subsidies are paid just for use of timber for energy not for timber as material. (p. 3) Ongoing process to introduce energy support for small sized wood harvesting.	The electricity production that is not covered by the feed-in tariff continues to benefit from a fixed subsidy of 6.90 €/MWh. The use of coal for production of electricity and heat should be partially replaced by biofuels.	The measure facilitates 60 new investments by 2020 and increases the use of wood fuel by 1–1.5 TWh.

The use of biofuels for transport is expected to grow up to 7 TWh by 2020, 2 TWh over the limit set out in the Long-Term Climate and Energy Strategy. Support measures for this will involve modification of the tax system which is currently under development. Moreover, modification of taxes will include other areas such as biogas development.

4.1.3 Forest legislation and policies

Russian Federation

The Russian forest legislation in force consists of the Forest Code 2007 and other federal laws and laws of the subjects of the Russian Federation in accordance with the federal laws (Forest Code of the Russian … 2006). The Forest Code of Russia was adopted by the State Duma on 8 November 2006 and entered into force on 1 January 2007. This document together with the Principal Guidelines for the Strategy of the Russian Federation Forest Sector Development for the Period up to 2020 (hereafter Principal Guidelines) constitutes the current cornerstone of the forest policy in Russia.

Amongst the milestones of the forest legislation, the Foundations of Forest Legislation of Russian Federation, adopted in 1993, constitutes the first legislative document since the Soviet Russian federal forest law. This document considered the principle of sustainability for the first time after

a long period (Baumgartner et.al. 1998). In 1997 the first forest code was developed. Within its features it stands out that the centralization of forest governance was restored (Chubinsky 2011).

The Forest Code of 2007 comprises all subjects related to forests in 16 chapters and 109 articles. Forest uses and the division of the forests are presented according to their final use in three main categories: protective, productive, and reserve forests. Forest renewal, forestation, and forest management planning are some of the main issues addressed in the Code.

Wood based energy is considered primarily in Article 14, which urges the establishment of forest processing infrastructure (production of wood fuels). In addition, when referring to the forest uses listed in the Code, one can find three uses where the use of biomass for energy production can be included but is not directly mentioned: wood harvesting; harvesting and collection of non-timber forest resources (the Code considers logging residues within this item); and processing of wood and other forest resources. In Article 29 it is mentioned that the dead or damaged and over-mature stands shall be the first to be harvested. Thereby, the Forest Code creates preconditions for supply of a large volume of wood biomass for energy, because the quality of wood in such forests is usually not good enough for material use, but their areas are huge.

Another wood based energy related fact is glimpsed in Articles 52 and 53, which refer to fire safety in forests. In other measures to ensure fire safety, harvesting of logging residues can be a solution to benefit both the environment, by reducing the fire risk, and the economy. Reforestation plays also a key role in the Code. In Chapter 4 of the Code within Articles 61, 62, and 63 dealing with forest renewal and forestation it is mentioned that forest renewal should be guaranteed. Within the item the promotion of plantations for energy production should be considered although it is not explicitly quoted in the Code.

It should be noticed too that the power of the federation covers most of the forest activities but some of the rights are delegated to the regional authorities.

Summarizing the Russian Forest Code, it is possible to say that with regard to wood based energy the Code is a reflection of the vagueness of Russia's Energy Strategy. The Code does not directly address the use of wood for energy and does not incorporate it in the national system of forest management. Thereby, the economic and social opportunities related to large scale wood supply for energy do not have a normative basis and cannot be developed in a harmonized way. The Forest Code does not directly mention even such an important issue for rural areas of Russia as harvesting of firewood for their own needs, which has already resulted in a large number of conflicts. At present, it appears that the Code does not match the interests of most of the stakeholders within the forest sector. Most likely it will be modified in the future (Chubinsky 2011).

The Principal Guidelines highlighted at the beginning of the chapter address the problems faced by the forest sector. The strategy focuses on two systemic problems that are hindering the forest sector development: scarcity of forest reproduction and protection and the lack of advanced processing facilities to boost the sector (PGSRFFS 2008).

The document lists nine factors that have impacted the forest complex. Among the most significant for wood based energy development, we found the lack of efficiency of the control of state forests at a regional level, the poor development of road networks, and the low technical level of forestry works. Regarding the road infrastructure, Siberia and the Far East are the regions with major forest resources; however, the lack of investment in forest roads construction is hamper-

ing access. The lack of modern technologies means that a well-qualified working force is not required, which can be translated into lower costs and lower efficiency (PGSRFFS 2008).

Further, the document sets targets to enhance the forest sector. Within the main objectives, bioenergy is a key driver promoting the sustainable use of forest resources and contributing to social satisfaction and environmental safety, for example supporting biofuels development for transport. Another important goal is to develop the domestic market of wood products. This goal seeks to decrease importation and at the same time to satisfy the wood and paper demand while improving quality and competitiveness. According to the paper the target could be achieved through promotion of wood based energy, which will create a market for low quality wood, logging residues, and black liquor. Promoting biomass for energy production can address the double target of ensuring domestic energy security while contributing to the social and economic welfare of the remote regions.

In order to achieve the objectives, the Principal Guidelines urge a better and more effective use of the forest resources, a goal that could be fulfilled with a sustainable use of wood based energy. Improvement of the forest policy and legislative documents is also considered, indicating a certain purpose of doing good for the State, business, and society. Despite the fact that one cannot assume that the first interests to be covered during the implementation are those of the State, when reading the document it does seem that the State is first.

Moreover, the Guidelines present two alternative scenarios. The first one, an inertial scenario, is the result of the current trends. The second one, an innovative reflection, is based on new solutions and technologies including biofuel production. To study the results and progress of the strategy implementation within the scenarios some indicators and indices are used. For instance, the share of renewable power sources in the TPES as an index for the innovative scenario stands out in the document.

For the financing of the strategy, foreign investment and domestic forest companies were seen as major financial backers. However, the guidelines were published before the crisis and the expected volume of investments may not correspond to the actual funding.

Looking at the whole picture, bioenergy is more significant within this document than within the Forest Code. This can be noticed from the anticipated results where the rise in biofuel production is considered. Furthermore, the investment defined in the Principal Guidelines for each of the projects for the modernization and creation of forest infrastructure, including biofuel, was expected to be not less than 300 million RUR or €7.5 million (PGSRFFS 2008).

Finland

The forest legislation in Finland consists of the Forest Act 1093/1996 (including amendments up to 552/2004) and the Forest Decree 1200/1996 (including amendments up to 987/2001). Both documents constitute the core forest legislation in force for about 20 years.

Beyond the core legislation, the main guideline in force dealing with wood based energy production in Finland is the National Forest Programme 2015 (2008). The first National Forest Programme (NFP) was developed after the Earth Summit on Environment and Development (UNCED). NFP 2010 was approved in 1999. The idea of these programmes, in a nutshell, is to promote the sustainable use and management of forest resources (MFA 2011).

In 2005, the revision of the NFP was developed due to important changes caused, among other factors, by the impacts of Russian wood export duties and changes to the Climate and Energy Policy within the European Union (MFA 2008).

The NFP 2015 was finally launched in 2008 and its aim is to contribute to Finnish well-being through the multipurpose use of forests within the concept of sustainable development. For that reason the document sets out priorities, objectives, and measures regarding the forests. Amongst the six priorities stressed in the strategy, the use of forests for energy production is presented. The strategy was developed in tandem with the National Energy and Climate Strategy (MFA 2008).

Within the document, bioenergy is seen as a great opportunity to mitigate climate change as well as an energy generator and a means of development of rural areas. The targets set by the European Union influence the Finnish renewable energy policy, bringing challenges and new opportunities to be innovative and to diversify the forest products market. One of the most demanding targets set by Finland is to triple the use of forest chips.

The second chapter of the programme addresses the linkage between energy production from forests and mitigation of climate change. The programme includes figures for the development of wood based energy in the country's energy balance. For instance the overall use of wood based energy is expected to grow continuously and the volume of forest chips used for that purpose will be about 8–12 million m3/year in 2015. At the same time the targets of the document up to 2015 are developed as well as the measures needed to achieve them.

The energy consumption from woody biomass is expected to grow according to the national programme. Beyond this fact, the document states that the creation of job opportunities together with the development of rural areas will be enhanced. The text refers to the regional policies concerning climate, development, and wood based energy, which should work as drivers to achieve job creation and rural development.

Comparison of Russian and Finnish key documents regarding legislation and forest policies

The Principal Guidelines of the Forest Sector in Russia analyse the capacity of the forest sector and set targets and figures concerning the contribution of different products to the goals set in the most recent strategy. In some cases, for example regarding their contribution to social and economic development of Russia, the analysis is made within regions. However, none of the data sets refer to the use of wood for energy.

The significance of the Principal Guidelines for the Russian forest sector is that they are the first document adopted after the latest Forest Code which has addressed the forest sector. The Finnish NFP, on the contrary, is a continuing process that started in 1993 in accordance with the principles of the Earth Summit.

The Russian Forest Code and the Principal Guidelines of the Forest Sector show little attention to the production of energy from wood. However, the Finnish forest related policies depict bioenergy as a key piece in the whole Finnish energy system, contributing to the diversification and decentralization of energy sources. Moreover, the Finnish policies indicate the significance of forest and energy production for the mitigation of climate change.

The NFP of Finland was drawn up in tandem with the Long- Term Energy and Climate Long-Term National Strategy of Finland (MFA 2008), which prevents overlapping and provides better connections. This creates a harmonized, strong, and wide-focused effective policy framework where the number of gaps is minimized. The Russian policies, in comparison, do not refer to other documents and seem far from precise. Most of the objectives, even those presented in the Principal Guidelines of the Forest Sector, are still too wide. For example, when discussing the target "to increase the forest sector's contribution to social and economic development of the regions", the Principal Guidelines do not provide answers to the questions of how, when, and why this has to be done.

4.2 Analysis of regional applications of the Finnish and Russian wood based energy related policies

In order to see how the national wood based energy related policies are implemented at regional levels in Russia and Finland, two neighbouring regions, the Republic of Karelia and the Province of North Karelia, were selected and their regional policies were analysed and compared.

Republic of Karelia

Rural development and job creation are among the expected benefits from wood based energy market development in many regions of Russia. Several Russian regions, including the Republic of Karelia, have developed regional policies to boost wood based energy applications. However, in general, wood based energy is slowly gaining importance, but the availability of resources and strategic location of the Republic of Karelia may support a faster growth of the sector. In the Republic of Karelia most of the municipalities have enough wood resources for energy production, and a relatively developed municipal heating network creates good preconditions to boost bioenergy and subsequently the wood based energy market in the region (Shegelman, Skyyakskii & Shchukin 2010).

The regional government of the Republic of Karelia has developed programmes aimed at enhancing the wellbeing of the region. For instance, in 2009, the Strategy of the Social and Economic Development of the Republic of Karelia up to 2020 was developed. Within the priorities of this policy document, rising efficiency and competitiveness of the regional economy, innovation, and sustainable management of natural resources are highlighted (Administration of the Republic of Karelia 2009).

The main areas of development related to the economy and society are stressed in the Guidelines of Social and Economic Development of the Republic of Karelia up to 2012. This policy document emphasizes the development of the forest sector (MEDRK 2010).

The Republic of Karelia developed two programmes which directly address bioenergy. The first one was created for the period 2007–2010 and is called Active Involvement of Local Energy Fuel Resources in the Fuel and Energy Sector of the Republic of Karelia. The second strategy, as a continuation of the previous one, is known as the Regional Strategy for the Regional Fuel Sector Development on the Basis of Local Energy Resources for 2011–2020 (hereafter Regional Strategy up to 2020).

Both are aimed at the intensification of the use of biofuels and creation of a bioenergy market in the Republic of Karelia. The main targets are shown in Table 5. The objectives include:

Table 5. Comparative table between the regions (Regional council of North Karelia 2008; Goltsev 2010)

	Republic of Karelia (Russia)	North Karelia (Finland)
Current primary energy resources	Renewables (including peat) (30%): Firewood, forest chips, peat. Non-renewables (70%): natural gas, coal, heavy oil, electricity.	Renewables (63%): black liquor, wood waste, hydro, firewood, and forest chips (including heat, power, private households, and traffic). Peat (6%). Non-renewables (30%): oil, electricity imports, other.
First local programme	2007	1998
Policy documents	• Regional strategy for the development of the regional fuel sector on the basis of local energy resources for 2011–2020	• North Karelia bioenergy programme 2015 • Regional climate and energy programme of North Karelia
Key targets	To guarantee energy security of the region. To enhance domestic bioenergy market. To promote foreign investment in the region. To promote innovation in technology. To reduce the carbon footprint of the energy sector.	General aims: to reduce the consumption of energy. To limit the consumption of oil to half its current value. To limit the use of fossil energy sources by 40%. To cut the growth in electricity consumption. Specific regional goals: to reduce emissions, to improve energy efficiency, to enhance the use of renewable energy.
Main sources of energy	Harvesting residues. Sawmilling residues. Firewood. Peat.	Forest industry by-products (black liquor, bark, and sawdust). Forest chips Firewood and pellets. Agro biomass. Biogas. Energy peat.

- limiting the use of imported fuels (ensuring regional energy security and decreasing costs);
- intensifying the use of local biofuels like wood and peat;
- decreasing the environmental impact.

These are major issues that transfer to regional level the priorities mentioned in the national policies (Shegelman, Skyyakskii & Shchukin 2010). The figures concerning the potential of the Republic of Karelia are shown in Table 6.

Amongst the main renewable sources available, the region stresses two mainstream to boost bioenergy production and the bioenergy market: one energy wood (low quality wood, logging and sawmilling residues, as well as firewood), another peat (the estimated stock and unknown deposits). Nevertheless, the possibilities for feeding regional utilities with these sources are sometimes outweighed by the challenges related to the supply of raw materials. Among the major risks it is important to notice the sparse distribution of biomass resources (one of the major problems at national scale) hampering an even satisfaction of needs. In addition, the precarious condition of the infrastructure seems unlikely to contribute to the sector's development (Shegelman, Skyyakskii & Shchukin 2010).

Due to poor infrastructure, large areas, the difficult economic situation, and so on, the regional authorities and businesses do not have enough financial capability and the materialization of bioenergy development in the region depends strongly on foreign and federal investment (Shegelman, Skyyakskii & Shchukin 2010). For this to happen it is important to secure long-term access to the raw material, to show a low risk business environment, to dismantle the lobbying of oil companies, and to end corruption (World Bank 2004). These actions should also be undertaken at the national level.

However, the regional strategies propose solutions to tackle some of the challenges in the Republic of Karelia. The gradual introduction of the best available technologies and machinery for supply of energy wood and peat stands out. Other solutions that are also considered in the Principal Guidelines of the forest sector up to 2020 include installation of facilities to produce chips and wood pellets, establishment of customs duties for export of all kinds of unprocessed timber, and state incentives for producers and consumers of biofuel, including tax deduction of exemption, subsidies, and other measures, as well as excise tax for fossil fuels (Shegelman, Skyyakskii & Shchukin 2010).

Nowadays, projects have already been developed that were included within the regional target programme. For instance, one of the proposals aims to enhance the biofuel supply. One of the projects tries to promote a system for planning and accounting for processes involving local energy fuel resources. The system is ready for its implementation in the fuel energy sector within North Karelia.

The timber industry sector is the leading sector of the Republic of Karelia. Forest sector exports make the largest contribution to the regional economy (Fact Sheet of the Republic … 2008). Comparing the regional polices with those belonging to the national framework, regional policies present more accurate objectives. The policies developed for the Republic of Karelia include more specific objectives and feasible measures to achieve them. One of the strongest points described by Shegelman, Skyyakskii & Shchukin (2010) in the Bioenergy Potential of Karelia is the exposition of the main risks for the policy implementation and list of proposed solutions. One of the weaknesses is unclear identification of sources which should provide funding to develop and accomplish projects related to bioenergy.

The challenges covered in the document refer to the raw material. For instance, one of the risks mentioned is the uneven distribution of firewood resources in Karelia. The document highlights that part of the volume of firewood resources can cover just part of the local needs. However, the diversification of energy resources, the development of scientifically justified approaches to extract and use local fuel, and the implementation of regional policies are some of the solutions proposed (Shegelman, Skyyakskii & Shchukin 2010).

The province of North Karelia

The development of renewable energy in the North Karelia region has been strong. The objectives of the regional bioenergy policies are even more ambitious than the objectives set by the European Union for all the member countries. Nowadays, several policy documents are addressed at enhancing regional development through cross-cutting topics (Lohilahti 2010).

The measures and policies adopted to promote bioenergy and more precisely wood based energy in North Karelia demonstrate a positive impact on the economy, the environment, and the people

of the region positively. The long-term strategy developed in the province is the Regional Strategic Programme 2030. The programme seeks to boost the competitiveness and the quality of life within the region through fostering expertise and local strengths (Regional Strategic Programme … 2010). The second programme is the Regional Development Programme – POKAT 2014. This local programme covers the period between 2011 and 2014. The core of POKAT 2014 consists of improving the business environment and the wellbeing of the region (Regional council of North Karelia 2010b).

In addition there is a third strategy addressing mitigation of climate change through the development of bioenergy: the North Karelia Bioenergy Programme 2015 (NKBP), which was recently updated through the Regional Climate and Energy Programme 2020. The first bioenergy programme in the region was developed in 1998 and reviewed in 2001. These programmes also respond to global issues such as energy security or environmental problems from a regional perspective. Nowadays, the NKBP is the most important strategy boosting the use of wood for energy production within the region. The document was published in 2008 and sets out three packages of measures within three topics. The first topic is related to the sustainability of the processing and the utilization of energy from wood, emphasizing the energy security of the region. The second item stresses the significance of research and knowledge, seeking to guarantee the qualifications of the working force. The last topic looks for the development and transfer, mostly in technology and skilfulness of the personnel (North Karelia Bioenergy Programme 2008). More specific targets can be found in Table 5.

The regional policy goal is three dimensional: launching new job opportunities for local people while giving a fresh impetus to the bioenergy development, limiting the human footprint regarding GHG emissions, and improving regional security (Regional council of North Karelia 2007). Together with this triple target, the programme stresses international and bilateral cooperation (North Karelia Bioenergy Programme 2008).

The share of renewable energy sources within the TPES of the region is about 63% (Pitkänen 2010). It is about two times more than the RES share in the national TPES and about seven times more than the RES share in the EU. The objective set by the Finnish government at the national level is that by 2050 at least 60% of final energy consumption should come from alternative sources. This fact highlights even more the significance of renewable energy sources within the region, which has already exceeded the national target for 2050 (Poutiainen 2010; Lohilahti 2010).

Another local programme recently released is the Regional Climate and Energy Programme 2020. This document seeks, amongst other things, to implement the National Climate and Energy Strategy at a regional level. Furthermore, it updates the current North Karelia Bioenergy Programme 2015, including other alternative sources such as wind or solar power (Poutiainen 2010)

The strategies developed in the North Karelia region, either as multisectoral or sectoral programmes (wood based energy), take into consideration the impacts and opportunities of climate change. Each one of the documents was developed in line with the different ongoing policies at regional and national level. This fact prevents overlapping between the documents and ensures consistency of measures on different levels.

The region starts from a good baseline since it has a very advanced forest sector. The policy documents clearly set out the needs of the region and set specific targets for each of the alternative

sources. The expertise within the area is large and transparency and clarity are shown throughout the document.

Comparison of wood based energy related policies at the regional level

Regions differ regarding their areas and populations. However, when considering the forest sector, the availability of forests or high importance of the forest sector for the region remains similar. Forestry is one driving force within their economies. That is why the forest sector is stressed in the regional development strategies.

Table 5 shows a brief comparison of the regions. The share of renewables in the total energy balance of North Karelia is twice that of the Republic of Karelia. It appears that the policies and measures developed since 1998 in North Karelia have been successful. Furthermore, the diversification of energy sources within the region has been slightly favoured, as well.

Comparing the regions' policies, wood based energy is seen as an enhancer of the quality of life. The creation of jobs, the security of the energy supply, and the significance of the impact on the environment are strongly highlighted in the policy documents. Both regions point out that there are enough resources available to develop domestic bioenergy markets. For instance, in the Republic of Karelia, the local production of electricity covers only 50–60% of the demand. The deficit is currently covered by imports. Moreover, available local biomass resources are not used to the full extent, especially peat. The peat deposits in the region are about 2.1 billion tons (40% moisture content; see Table 6), of which the annual extraction potential is about 2 million tons. However, the actual volume of peat harvested in the region in recent years accounts for less than 2% of the extraction potential (Shegelman, Skyyakskii & Shchukin 2010).

The observations within the forest sector in the Republic of Karelia place the region in an advantageous position (Fact Sheet of the Republic … 2008). Furthermore, wood based energy has grown in significance during the past few years. In general, the policies and measures developed for the Republic of Karelia seem less vague than those strategies developed at the national level. It is important to emphasize the fact that the Republic of Karelia is less dependent on the federal state than other regions.

The policies of North Karelia in Finland clearly state the targets and implementation of actions needed. The document distinguishes measures adopted for different sources and fields such as forest chips, fuel wood and pellets, herbaceous biomass, and biogas; it also includes particular houses, heating entrepreneurs, transport biofuels, and peat (see Table 6). On the contrary, the initiatives related to the promotion of bioenergy in the Republic of Karelia are less diversified and mainly address biofuels and peat.

The fact that regional programmes have clear objectives and measures shows that bioenergy development is also seen by the regional authorities as an important opportunity. However, the challenges for both regions are not the same. While North Karelia has been developing its own wood based energy market for more than 10 years, the wood based energy market of the Republic of Karelia is at an early stage. Finland was a pioneer in wood based energy development even before the European Union.

It seems that the availability of raw material for energy production on both sides of the border is huge. Nevertheless, neither the infrastructure nor the available technologies in the Republic of

Table 6. Measures and objectives by subsector within the North Karelia Bioenergy Programme 2015 and forecast of main subsectors in the Republic of Karelia (Regional council of North Karelia 2008; Shegelman, Skyyakskii & Shchukin 2010)

	Main goals for 2015 in North Karelia	Actions taken in North Karelia	Forecast of wood energy development in the Republic of Karelia
Logging residues (fragments of trunks, damaged thin trees, undergrowth, stumps, and roots)			Pine 26.7 % (15.3)* Spruce 38.0% (26.1)* Broadleaves 29.2% (19.0)*
Forest chips	Production 950–1350 Gwh/a. Usage 800–1480 GWh/a.	Improving availability of biofuels.	
Fuelwood and pellets	Fuelwood usage 890 GWh/a. Pellet usage 120 GWh/a.	Improving availability of biofuels. Increasing pellet production. National regulatory instruments.	Availability of fuelwood: over 3 million tons of oil equivalent. 7% of firewood. 9% of harvesting wastes.
Herbaceous biomass	Arable area 11,000 ha. Produce 120 GWh/a of energy. 2–4 farm-scale biodiesel facilities.	Improvement of production. GIS reports. Developing usage applications. Opening biogas plants. National regulatory instruments.	
Biogas	Produce 50GWh/a of energy and 6–12 farm sized biogas facilities. Initiative for vehicle usage of biogas.	GIS raw material reports. Starting investment. Opening biogas facilities.	
Households (private homes)	Decrease oil consumption by over 60% and electricity consumption by over 15% from 2004 levels. Reduce residential heating and private vehicle emissions.	Providing energy advisory services. National regulatory instruments. Updating building stock and heating systems to improve energy efficiency. More effectiveness considering environmental issues.	Demand for electricity will increase to 9.5 MWt by 2015.
Heating enterprises	Increase the number of heating enterprises; and sell 70 GWh/a of energy.	Implementation of micronetworks. Charting of adapted applications.	Energy consumption will increase to 116. 3 million MWt.
Transport biofuels	Build a biofuel production facility with 250 MW capacity in the region.	Initiating biodiesel production.	
Peat	Produce 430–2,800 GWh/a of energy.	Searching for peat reserves. Implementation of new technologies and methods. Charting of environmental risks.	Potentially up to 2.3 million tonnes (about 1.3% of the potential is currently used).

*The figures in brackets refer to the actual percentage of logging residues.

Karelia are favourable. This fact may slow down the development of the regional market and may also relegate to second position the concerns about the mitigation of climate change.

The policy documents analysed present similar overall objectives – to boost bioenergy in the regions. However, the weight given to environmental matters is different. The policies developed in the province of North Karelia seek profitability of the sector economically, socially, and environmentally. The documents set specific objectives which are feasible at the regional level. At the same time as pointing to the regional development, it seems that their sight goes beyond that (to a global perspective).

The strategies consider that development and implementation of bioenergy policies at the regional level has an impact on the global level and vice versa – global policies have an impact on the regional development. The policies seem to combine with each other. However, when analysing the policies developed for the Republic of Karelia, it is found that they need support from other policies for further development. It appears that wood based energy enhancement may contribute to the wellbeing of the region; however, some measures should consider first the improvement of infrastructure (reduction of transport costs and improvement of efficiency) and inclusion of modern technologies (cost effectiveness) and should allocate funding that supports the competitiveness of wood based energy (economic aspects prevail over environmental concerns).

Following the example of North Karelia, the Republic of Karelia has many chances for success and for a rapid growth of wood based energy through regional action. However, neither the forest nor the global market will wait forever.

5 Conclusions and Recommendations

5.1 Wood based energy in the national policies developed in Russia and Finland

The policies at international and European level have to be general enough since they cover a wide range of countries. At the same time they have to be easily adaptable to the specific conditions and needs of each country. This issue entails great complexity and responsibility. Through the Kyoto Protocol, countries are aware of the implications of climate change, implications that mankind is already noticing through natural phenomena.

However, the major responsibility for combatting climate change through boosting wood based energy production and consumption is held by the governments of the countries. International treaties should give the framework for global action but it is countries that have to act. Aiming to contribute to the national specific action plans, the Protocol has introduced market mechanisms that bring a range of opportunities for the wood based energy sector (reducing emissions, reducing costs, attracting foreign investment, and promoting knowledge transfer).

Bioenergy policy in Russia is very different from that in Finland. The two governments hold different positions. While Finland's energy sector is decentralized and diverse, the major power in Russia concerning energy belongs to the government. In a country such as Finland it is difficult to reconcile the interests of all stakeholders, which is the reason why some of the power is transferred to the regions. This reconciliation of different interests is even greater in a country with the dimensions and special features of Russia.

In conclusion, policies are essential tools for the development of bioenergy and wood based energy. An example of success can be found in Finland. The country has a long track record in the development of wood based energy policies and measures to support them. Their advanced position is the result of consistent steps made in capacity building, development, and application. Finland´s leading position in energy and climate policies is a response to three main factors: dependency on other countries to fulfil Finland's energy quota, which has led the country to diversify its energy sources, wide resources (wood, technologies, and expertise), and the fact that Finland is an active member within the EU.

In all Russian core documents (energy, climate, and forestry related policy), wood based energy seems to be the State's concern. Nevertheless, in the Forest Code we noticed that only six articles out of 109 are related slightly to bioenergy, while just one of them mentions it explicitly. We can conclude that the subject has not attracted enough attention in the country. This can be noticed from the vagueness of the Forest Code, which can lead to different interpretations.

The Forest Code is likely to be modified or replaced in the future for two main reasons. The criticism has been made that it was developed without the involvement of forest experts and that it satisfies the needs of a small privileged group of stakeholders rather than the entire stakeholder board. If the Code is modified it will give an opportunity to promote wood based energy development and to bring it to the national agenda.

Taking a closer look to the policies mentioned in Chapter 4.1 and their influence on bioenergy, it seems that they are more like declarations of intentions than a set of measures to boost wood based energy. It appears that the bioenergy market and therefore wood based energy market development still remain a minor need for the State. Specific figures do not appear in any document, and supporting measures have not been developed. This trend seems likely to continue. Compared with the neighbouring country, the push toward wood based energy development is negligible.

It appears that in both countries there is a link between the policies and the supporting measures developed for wood based energy and the development of wood based energy itself. The policies created in Finland are more accurate and effective than those developed in Russia. Therefore, part of the success of wood based energy development is the result of the quality, maturity, and supporting measures of the policies implemented.

Although Russia has a long way to travel there are always two sides to the coin. For instance in several documents RES are addressed and the limitations of these documents are considered. This is important for the development of a better follow-up policy. Most likely these new policies or modifications to the current documents will be built on the basis of transparency and clarity, concepts which are widespread in the current climate and energy policy.

5.2 Wood based energy in regional policies

The picture at regional level seems clearer. Finland´s focus on the regional level adds the fourth significant factor, besides the three mentioned in the previous chapter. This, together with the supportive measures developed for the wood based energy promotion, puts the province of North Karelia in a good position within the EU. Moreover, investors in Finland can benefit from its strategic location near the Russian border as wood based energy in Russia is a market with great possibilities. For that to succeed, policies developed in Russia must provide a safe and transparent environment for investors.

Russia's potential for wood based energy development and in particular the potential of the Republic of Karelia now look better than they did a few years ago. The Republic of Karelia is a region in Russia which has preconditions for success in wood based energy development. Russian Karelia has access to forest resources, infrastructure (which also needs further improvement), a forest sector under development, a strategic position near to the European border, and some independency from the State. Furthermore, the regional authorities have developed two programmes for the promotion of bioenergy. The measures within both programmes appear more specific and seem more feasible that those at national level. However, more supportive measures and a better business environment are needed to attract foreign and domestic investment.

5.3 Summary of wood based energy in Russia

The word "intention" may be a common characteristic of all Russian policy documents analysed regarding wood based energy. To make this intention real, it is important to first build an environment of trustfulness based on transparency. Disadvantages of the Russian policy framework need to be improved step by step and this can be achieved through effective (accurate and feasible) policy instruments and subsequently through public control. However, this still seems a huge challenge for the government and for society.

It was already stated within the Energy Strategy of Russia up to 2030 (2010) that possibilities for bioenergy development in some regions appear particularly interesting, for instance in Siberia and Far Eastern districts (mentioned in Chapter 4.1.1.1 of the present paper). The main reason is the remoteness of these areas. However, to realize their wood based energy potential some measures have to be developed beforehand. First of all, investments are needed. This could be partially achieved by developing measures to attract investors (including foreign ones), cooperative projects with Europe, and of course adequate supportive measures from the national budget.

The mechanisms introduced by the Kyoto Protocol (see Chapter 3.1) might be one tool for financing, contributing to the modernization of the existent infrastructure and knowledge transfer. However, it seems that the emissions trading mechanism is not yet a priority and that despite the advantages of the joint implementation projects for Russia it appears that the level of bureaucracy is hampering the development of this tool.

The improvement of infrastructure and technology is a major challenge within the wood based energy sector. It is expected that remote regions can develop bioenergy as an alternative energy source. However, it is important to take into account that good networks and modern technologies should be placed in these regions before the benefits of profit can be expected. This may result in costs that are possibly not acceptable for regional budgets.

One thing is certain: change. Russia has experienced many changes in the last 20 years. It is shifting from a planned economy to a free market economy, which involves huge restructuring at all levels and in all sectors. However, it is not the only country that is facing drastic changes in its economy; many countries have gone through similar experiences. Change is a matter of time, and with the adherence to the Kyoto Protocol (development of the protocol mechanisms) and cooperation with neighbouring areas and with the EU, wood based energy in Russia has many chances to follow the same successful trends as in other countries.

5.4 Recommendations

Regarding energy and climate policy, Europe is leading the policy processes. The EU is constituted by many different member countries, each with specific features. Establishing a comparison between Russia and Finland as a member of the EU one can notice that the EU gives the baseline in relation to RES policies. Each member country has its own legislation and policies to promote RES development. Conversely, Russia is a huge and diverse country, which means that the coordination role of the federal government must be maintained when developing policies for the country. Each region in Russia has its own needs, and possibilities for the development of RES, and particularly of bioenergy, differ greatly between regions. This has to be taken into account when developing policies.

Diversification of energy sources does not necessarily mean diversification of policy documents to support them. For successful development of RES in Russia one document which compiles each of the RES and its contribution to the energy balance of the country should be created. It should be a framework which will provide a solid basis for each region to develop a wood based energy policy according to its own needs. Finland has already developed a document that presents these characteristics (based on the EU requirements): Finland's national action plan for promoting energy from renewable sources pursuant to Directive 2009/28/EC.

Relevant energy and forest policy documents in Russia show that there is not a precise figure on the contribution of bioenergy towards the target of reaching a 4.5% share of electricity in the country's energy balance. This should be corrected in upcoming revisions of the documents. Once the objectives have been established at the federal level, it will be time to transfer them to different regions and republics within Russia. A study on resources availability and capability that takes into account impacts at regional and global levels should be developed. Once the analysis of the regions, including each region's limitations in the promotion of RES, has been developed, the supporting measures for non-renewable sources, which are already profitable, should be removed. Instead support should be shifted to wood based energy or other renewable sources and supportive measures that meet the local requirements and enhance and simplify the usage of wood based energy among local communities within regions.

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