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Emerging green innovation platforms

*A comparative study on bioenergy policies in
Emilia-Romagna and Norway*

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Foreword

This report is based on a study of the impacts of institutional and policy frameworks on bioenergy development and rural areas in Emilia-Romagna (Italy) and Norway. The report shows that different institutional and policy frameworks are two main reasons affecting the development of rural areas through the bioenergy supply chain.

Through the application of regional innovation theory the study also draws on the general features of the innovation systems emerging in the case studies.

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AGRICULTURAL DEVELOPMENT POLICIES

“EMERGING GREEN INNOVATION PLATFORMS. A COMPARATIVE
STUDY ON BIOENERGY POLICIES IN EMILIA ROMAGNA AND
NORWAY”

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Abstract

Bioenergy and rural development are increasingly under political focus. Bioenergy development is considered as a tool to deal with the climate change and rural areas crisis. The European Directive 2009/28/CE has set the goals for bioenergy production, and the Regulation 1698/2005 on rural development links the improving of conditions in rural areas to renewable energy production. Rural areas are the source of raw materials and the place to set bioenergy installations, while the new activity could provide rural citizens with new jobs and green energy. This policy context is understood in the view of other three main European policies, namely the regional, climate change and green growth and the innovation policies. Rural development is deeply tied to the former that points at rural regions as the ones to be stronger supported. The innovation policy engages regions in an effort to strengthen innovation policies and learning by interacting throughout the European Area.

The focus of the thesis is on Italy and further on Emilia-Romagna, as one of the most developed Italian regions. Emilia-Romagna is compared with Norway, a non-European Union country that has a different administrative and policy structure, but one that is nevertheless influenced by EU policies through the ETA. Within the two main case studies, I considered individual case studies to find out the practices and the links between the two core policy areas. The results have been framed and assessed through the regional innovation systems theory, in order to explain how the bioenergy system and rural development are fostered in Emilia-Romagna and Norway.

The main findings show two different policy frameworks and how they affect the development of the bioenergy and rural areas. Emilia-Romagna has a confused situation and a difficult confrontation between rural citizens, bioenergy investors and local governments, but the sector is still more developed than in Norway. Moreover the feed in tariff is fostering single random investments. By contrast, Norwegian policy framework is more easily accessible, the investments are more locally-based and there is no national feed-in-tariff. Thus, the actors cooperate more in order to invest in a bioenergy activity, while rural communities seem to experience positive local return in terms of new jobs and energy prices.

1 Introduction

1.1 Background

Renewable energy and rural development have become two main priorities under political focus, almost all over the western world. It happened because the problem of energy supply is today a critical one, while rural areas contain most of the alternative and renewable energy resources of biomaterials, wind and water and yet have been experiencing a depopulation phenomenon and difficult economic crisis for several years. In the 1970s, the oil crisis and related price rises demonstrated the degree to which the western world in particular depended on conventional fossil-based energy, stimulating fears of energy insecurity. These fears have been exacerbated in recent years by the discourse on 'Peak Oil', and the instability in the Middle East, still responsible for the major part of the world oil supply. Moreover, since the 1980s there has been growing attention to the effects of increasing greenhouse gas emissions – much from the burning of fossil fuels – on climate change, especially 'global warming' and related 'desertification'. More recently still, and especially since the start of the economic crisis, there has been an increasing concern to link the development of renewable energy with regional and rural development, including employment creation, investment, research and development (R&D), and innovation (OECD, 2012).

These factors in turn have led to increasing interest in renewable energy (RE) from water, wind, marine phenomena, the sun, and biological resources. Policy makers, researchers and experts are studying how to develop RE production and link it with wider development issues. Since most renewable energy sources are in, or most accessible from, rural regions and localities (including agricultural and forestry land), this is fast becoming a matter of interest for territorial rural development or the development of predominately rural regions. Yet recent research has questioned whether investments in renewable energy always have positive impacts on the rural economy, society and environment, and leading to new and more competitive rural jobs and regions while at the same time reducing CO₂ emissions (OECD, 2012).

Renewable energy clearly offers economic opportunities to rural regions, and yet so far only a small minority of rural regions seems to benefit from the massive investments occurring in the development of renewable energy systems (OECD 2012). Indeed in some regions there has been so much opposition to the ways in which renewable energy has been developed that future development has been constrained. Those few regions where the benefits seem to be considerable are those that have considerable local and community ownership of renewable energy production or elements of the supply chain and energy distribution and use system. In rural regions where the greatest benefits from renewable energy are observed there is a recognizable regional innovation system around the renewable energy supply and distribution chain, and which is particular to each region. Regional innovation studies stem from the idea that regions are not homogenous areas regarding history, culture, human and natural resources, population density, local economies, business sector, geography, infrastructure, or governance structures. The central point is, therefore, the specificity of regions and their ability to find the

territorially appropriate “smart specialization” based on the fields they have most possibilities to succeed.

1.2 Structure

This study stems from considerations on regional innovation systems theory and some core concepts, namely social capital, embeddedness and learning by interacting. Within this theoretical context, I discuss the European Rural and Renewable Energy policies with a look at the European energy policy and the European Regional policy. The core part of the thesis explores the two case studies, Norway and Emilia-Romagna, starting from their own regulatory frameworks (both bioenergy and rural development policies), the field research and the case evaluation. The final part will draw conclusions on what emerged from the field research assessment, what should be improved, changed and included, and eventually, if there are the bases to develop a green innovation platform or if it is already on the way.

2 Methodology and theory

This section discusses the methodology adopted in this study and the research methods used for collecting data. It also discusses the theoretical approach of the study.

2.1 Theoretical approach

This thesis takes the regional innovation approach to the study of the bioenergy and rural development policies. The approach is founded on the work of Lundvall (2005), Doloreux (2002, 2005), Cooke et al. (1997), Cooke (2012) among others. The innovation system is commonly defined as national by the original innovation systems thinkers such as Lundvall. Cooke on the other hand is more concerned with regional innovation systems at the sub-national level. The definition of *national* refers to the sets of institutions related to the state. So, when we talk about national innovation system, this is territorially bounded and institutionally linked to the state sovereign government. Nevertheless, nations are something different from states, as they involve cultures, norms, and common values. *In this sense, we should say that a state can comprise many nations* (Cooke et al., 1997). These many nations can take the form of a region in order of two different processes. One is called *regionalization* (Cooke et al., 1997) and refers to the political-administrative delimitation of a supra-local territory by the state – it could be defined as a top-down process since it is led from above. The other one is *regionalism* (Cooke et al., 1997). It involves political demands from below where cultural regions (or nations) mobilize against state neglect, inefficiency or discrimination asking a new institutional order. In both cases, creating the new institutional order builds up institutional routines, norms and values within which actors may trust each other collectively (Cooke et al., 1997). In this context, innovation has a positive meaning. It is seen as a process of improvement, involving and linking technological, market/economic and institutional changes.

Scholars, as Cooke, Lundvall and Doloreux, think innovation could be better understood and fostered starting from the regional or even more local level, because it relies on what they call *embeddedness* and *social capital*. Innovation is thought of as a process of interaction – involving learning by interacting (Lundvall, 2005), that starts at a more territorially embedded level where the skills, norms, values, resources and experiences have common roots. This and the territorial proximity of the firms and actors, helps the creation of interacting networks where common institution, values and norms allow a better cooperation and coordination. Lundvall (2005) talks about the processes of *learning by doing* and *by using* that occur when a new technology is introduced and unforeseen problems should be solved. *These kinds of learning take place in all parts of the economy to different degree. The more innovations in terms of new products and systems the more learning will be imposed upon developers, producers and users. But you might argue that their impact in relation to the whole economy is limited since the learning is 'local' and 'specific' to one specific user or producer or perhaps it even remains embodied in individuals*

(Lundvall, 2005). For these reasons, he argues that the *learning by interacting* allows the externalization of the local knowledge creating a system of innovation.

The regional innovation system can be thought of as one of the innovation levels *where firms and other organizations are systematically engaged in interactive learning through an institutional milieu characterized by embeddedness* (Cooke et al., 1997). Milieu refers to the territorial dimension of the local development. Territory or milieu is the *ensemble* of natural, social and cultural conditions of a community of people, which constitutes both the roots of a specific collective identity and the ground for local development. These roots should lead to what is called *smart specialization*, that is widely considered as the place-based process to gather the regional/local skills and assets around any region's particular human, natural, cultural and other assets and identifying the 'right' regional and local sources to develop in the context of globalised markets. The learning process is, therefore, the essential condition on the path to the regional innovation platform, linking territorial dimensions and components. *The concept of RIS has no commonly accepted definitions but usually is understood as a set of interacting private and public interests, formal institutions and other organizations that function according to organizational and institutional arrangements and relationships conducive to the generation, use and dissemination of knowledge* (Doloreux and Parto, 2005: 134–135).

Talking about regional innovation systems does not mean that we think it is territorially confined. Regions are defined by territorial and administrative boundaries, but flows of knowledge and learning networks are open processes that cross and push them forward. We also refer to the *green* side of the innovation process, referring to what is widely accepted as sustainable development¹. The term 'green' does not refer only to the environment it rather involves three core dimensions: economy, society and environment. Here the main question is how can these three dimensions work together in order to foster sustainable development. Hence the concept of 'triple bottom line' in which any 'sustainable' project or innovation results in simultaneous gains to the economy, society and environment. These concepts are even more relevant if we consider rural development. Social capital is an evident and core feature of rural areas, one that should be considered when we want to engage the rural society in developing new solutions. *The promotion of a new rural paradigm of placed based agri-food eco-economy and multifunctional, integrated development is a more radical response to social concerns that calls for critical social innovation and attempts to change the agri-food system as a whole. It seeks to replace what is indicated as the "bio-economical", productivist modernization paradigm by a system in which agriculture is place-based and relocated into the "regional and local systems of ecological, economic and community development"* (Marsden, 2012).

Farmers are required to develop new products and services, such as local, high quality food, nature conservation, energy production, rural tourism and green care.

¹ Brundtland commission (1987) "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. *It contains within it two key concepts:*

- *the concept of **needs**, in particular the essential needs of the world's poor, to which overriding priority should be given; and*
- *the idea of **limitations** imposed by the state of technology and social organization on the environment's ability to meet present and future needs."*

Yet, being characterized by traditional practices, norms, knowledge, values and social networks, rural areas need that the innovation process considers the interrelations between actors to support social change too. Innovation could be, therefore, an *instrument and strategy to rescue rural societies through collective engagement* (Bock, 2012, p. 61).

It is also relevant to consider the contribution of Midttun & Koefoed (2005), “Green innovation in the Nordic Energy Industries: systemic contexts and dynamic trajectories”. Their study identifies a commercial core or Porterean Cluster of firms which emerge within and as part of a territorial innovation system involving the private sector, the university-college-research sector, the government, and in some cases non-government bodies in a dynamic relationship over time. These dynamic inter-relationships define the trajectory of any innovation system, and therefore allow us to eventually identify the features of emerging green innovation platforms in the areas concerned.

The theoretical framework serves the aim to consider these interconnections in approaching the renewable energy and rural development policies and practices in the above mentioned case studies. The concepts of embeddedness and social capital help to understand if the two case studies are heading to *smart specialization* around a suitable bioenergy industry considering the territorial needs. This is even more relevant when it comes to rural development, given the strong tie between the rural milieu, rural community and the influences of new activities in such traditional environments.

2.1.1 Research questions

The following research questions are to be answered in this report:

- What is the relation between bioenergy and rural development?
- How do different institutional *milieus* influence the social and political practices of the bioenergy policy implementation?
- Are the case studies creating a smart specialization around specific renewable energy sources?
- Is it possible to identify a green innovation platform in both the case studies?

This study accounts for the development of policies, political and social practices within the above mentioned fields. The findings are interpreted from the regional and green innovation platforms approach. The main explaining variables for the relation between bioenergy and rural development are expecting to be found in the link between policies and socio-political practices, and in core concepts of the regional innovation theories, namely embeddedness, social capital and learning process. The comparison between Norway and Emilia-Romagna is expected to draw the different contexts in which renewable energy policy is developed and explain how these features shape or not different social and political practices.

2.2 Methodology

This study applies qualitative research methodology, since it investigates rather new phenomenon which data are still not complete. Nevertheless, it uses also some quantitative data when it comes to choose the individual case studies to interview.

In qualitative research authenticity rather than reliability is often the issue. The aim is usually to gather an “authentic” understanding of people’s experiences and it is believed that “open-ended” questions are the most effective route towards this end (Silverman, 1997). However, there are different ways to approach the interview method. Positivist scholars as Sellitz, are suspicious of unstructured interviews. They recognize their flexibility and that can allow more intensive study of perceptions and feelings, but it is harder to generalize the results. Moreover, their analysis is more difficult and time-consuming than that of standardized interviews. (Silverman, 1994). Interviews based on pre-structured and standardized questions are a way to increase the reliability of research. In a way, pre-structured questions allow a deeper comprehension of how and why people behave in practice, but aiming the questions to the research goals. Another school of thought is that of interactionists (Silverman, 1994). They see the interviews as symbolic interaction, social events based on mutual participant observation: the coming together of two or more persons for the purpose of focused interaction (Denzin, 1970: 133).

This study is a qualitative research that aims at discovering the interaction and social, economic and political relationships between several actors within the renewable energy system and rural areas. Interaction, observation and knowledge are the tools to investigate the developing environment in which bioenergy is set. The focus is on the relationships between Emilia-Romagna and Norway national/regional policies and the innovation system around renewable energy focusing on rural areas. Nevertheless, the use of quantitative helps to focus on relevant individual case studies and gives a certain degree of reliability to the study.

2.2.1 Methodological approach

Case study research is an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used (Yin 1984:23).

The case study approach is widely used in the social sciences given its interdisciplinary and global outlook. *Case study is an ideal methodology when a holistic, in – depth investigation is needed (Feagin, Orum, Sjoberg, 1991).*

Firstly, it should be clarified what a case study is. There is no common agreement on it but it may be assumed that it is a *phenomenon specific to time and space (Johansson, 2003)*. It refers, therefore, to a specific context, either spatially or temporarily defined. This approach is useful to investigate contemporary real life phenomenon and the relationships between them. If statistics aims to evaluate how often a variable is present (regularity and patterns), this kind of study reveals the conditions and causal mechanisms that make an outcome occur. Nevertheless, there are some critics of this approach, namely that case studies lack robustness and, since they consider a narrow sample, it is not possible to generalize. It is therefore necessary to build the design of case studies. It can be single or multiple case study designs, considering that having several case studies shows numerous sources of evidence through replication and *pattern-matching (Johansson, 2003)*.

According to Yin, this study is an exploratory case study. The aim is discovering the practice within the renewable energy system and its connections with the rural development policy in Norway and Emilia-Romagna. The investigation of relevant regional and local policies is appropriate, as these proved to be important in the recent OECD study of renewable energy as a rural development policy (OECD,

2012). We do believe it is relevant to narrow the focus on the regional level in Italy, since regions have a greater role in the decision making and implementation phase, and they also allow to focus on a more specific social capital. We have therefore focused on Emilia-Romagna, as one of the most developed Italian regions, with a background of strong industrial innovation, intensive agriculture and a fast developing renewable energy system.

The study does not consider a Norwegian county because there is a lack of relevant and comparable administrative responsibilities, but it is, nonetheless, more focused on the East of Norway.

There are two levels of case studies: one considers policy and administrative frameworks comparing Norway and Emilia-Romagna (the contexts); the other is composed of individual case studies of investors in bioenergy in each context. The former sees a comparison between two different governmental levels. Reasons for that are: similar population (Norway p. 4,952,000; Emilia-Romagna p. 4,432,418²); presence of relevant political and administrative institutions in both Norway and Emilia-Romagna which even if different in terms of powers and finances are broadly comparable. The differences partly derive from the European political context in which the regions are key targeted actors for the policy implementation and economic development. Norway is not a member of the European Union, but is however influenced by some of the European policies being a member of the EEA system. However, in general it has a much more decentralized structure of administration and finance than Italy. Thus, the study tries to observe similar phenomena, namely the link between rural development and bioenergy, but within two rather different contexts, in terms of policy frameworks, administrative practices, renewable energy sources, political culture, and societal dynamism. Consequently, I focused on individual case studies – namely investors in bioenergy – as a second level of research, using the snowball sampling approach. This approach aims to recruit future subjects by the suggestions of existing study subjects. It is a useful tool to build new contacts and networks, especially when the population is difficult to access for the researcher. It is therefore important to have some previous reliable contacts to create a credible reputation. I targeted the individual case studies thanks to previous contacts with local administrators (Chiefs of agriculture and environment departments), farmers unions and national agencies (the latter, mainly in the Norwegian case, Enova and Innovation Norway). The study explores similar phenomenon to find out how variations in context influence the behaviors and practices within the bioenergy and rural sets.

2.2.2 Research Methods

In qualitative research one can account for several research methods, namely: observations, interviews, literature review focus groups etc. This study is based on semi-structured qualitative interviews with the stakeholders involved in the renewable energy system, and official documents related to the policy area of renewable energy and rural development in the Europe Union, Italy, Emilia-Romagna and Norway. The semi-structuring of the questions is based on the green innovation systems approach developed by Midttun and Koefoed (2005), and the regional innovation systems approach by Doloreux (2005), Lundvall (2005), Cooke et al. (1997) Cooke (2012). It is, nonetheless, particularly influenced by my focus on

² www.google.it/publicdata

two policy domains that are expected to influence renewable energy, notably policies on renewable energy (typically in the remit of Energy Ministries at national levels) and rural development policies (typically in the remit of national Ministries of Agriculture, but in the EU reflecting EU CAP and EAFRD policies).

The questions are standardized and repetitive, but suited to each interviewee's role in the system. The samples are small and for each category a relevant representative is interviewed. The set is usually the interviewee's office and the interview lasts more or less one hour. The interviewees categories are: investors in bioenergy activities – farmers and other entrepreneurs – national agencies, local/regional decision-makers, farmers unions, research groups, scholars, environmental organizations, local/rural population. Political institutions and Farmers Unions have been asked to suggest relevant investors in bioenergy in the rural areas. The sampling is not only based on their ability to choose, but also on official database otherwise not publicly accessible.

Although Agency contacts may initially provide a biased list (because they may be favored by Agencies for unclear reasons) it is anticipated that snowballing will reduce or neutralize any such biases, although I have no way of testing that in the statistical sense. Renewable energy investors have been asked about the decision to invest in a bioenergy activity and about the problems they faced during the process. Rural Committees and local population were expected to give their opinion about bioenergy investments in the rural areas and highlight the problems they perceive connected to them. Other actors, like scholars, biologists, experts, were supposed to be a reliable source about the effects of the bioenergy plants and ways to improve their functioning.

This set of data is complemented by desk analysis of official documents and rules at European, national and regional level. Regarding official documents, free internet, transparency and the presence of acts of freedom, at all levels of government, permit an easy way to access the sources of data. Nevertheless, there is a concern about the large number of documents one can find and the consequent difficulty in selecting those that are most relevant. The main goal should therefore be to establish clear boundaries for the study, and limit the research to what is actually considered relevant information. The official documents regard bioenergy and rural development policies, as well as, documents on innovation policies at the European, national and regional level, and in some cases also local plans.

Interpretations are therefore a result of the field study and qualitative data collection from formal documents.

2.2.3 Reliability and Validity

What characterizes the empirical methods is its manner of exposing to falsification, in every conceivable way, the system to be tested. Its aim is not to save the lives of untenable systems but, on the contrary, to select the one which is by comparison the fittest, by exposing them all to the fiercest struggle for survival (Popper, 1959: 42).

Marshall and Rossman (1989: 147) argue that *positivist notions of reliability assume an underlying universe where inquiry could, quite logically, be replicated. This assumption of an unchanging social world is in direct contrast to the qualitative/interpretative assumption that the social world is always changing and the concept of replications is itself problematic.* What we can tell is that one should always assume a certain degree of uncertainty, even if the comparison and matching

of the case studies could be a good mean to increase the reliability of a qualitative research.

The issue of validity can be solved through two forms of validation, according to Silverman. One is comparing different kind of data (e.g. quantitative and qualitative) and different methods (e.g. observations and interviews), that is *triangulation*. The second is called *respondent validation* that is *taking one's findings back to the subjects being studied* (Silverman, 1994). Through this, one can be more confident about the validity of the collected data.

The exploratory purpose of this research and the time constraints related to the master degree let us consider the results provisional and opened to further studies. Nevertheless, the data matching of the interviews with institutional representatives and bioenergy investors, and the analysis of official document texts, give a certain degree of reliability and validity to the research.

The comparative method is used to allow judgments to be drawn on the relative importance of policy and other framework conditions in each context for the emergence of the innovation system. While the analysis and structure of qualitative interviews can be considered partly based on grounded theory (inductive), as they do not depend on prior hypothesis development, but seek to build understanding of the inter-relationships between policies and actions from the interview base, the semi-structuring of the interview questions and the analysis of textual materials must however be considered as deductive, being based on a key question (and hence implicit hypothesis) about the difference that policies and institutions makes in the two country case studies, and why any observed differences have emerged. This also involves addressing what are perceived to be the key dimensions of *context*, and in particular those dimensions of context found by other studies (for example, Midttun & Koefoed, 2005) to have been important in explaining country or regional differences between innovation systems.

3 European regulatory framework

“The condition for success is a real ownership by European leaders and institutions. Our new agenda requires a coordinated European response, including with social partners and civil society. If we act together, then we can fight back and come out of the crisis stronger. We have the new tools and the new ambition. Now we need to make it happen.”

José Manuel BARROSO

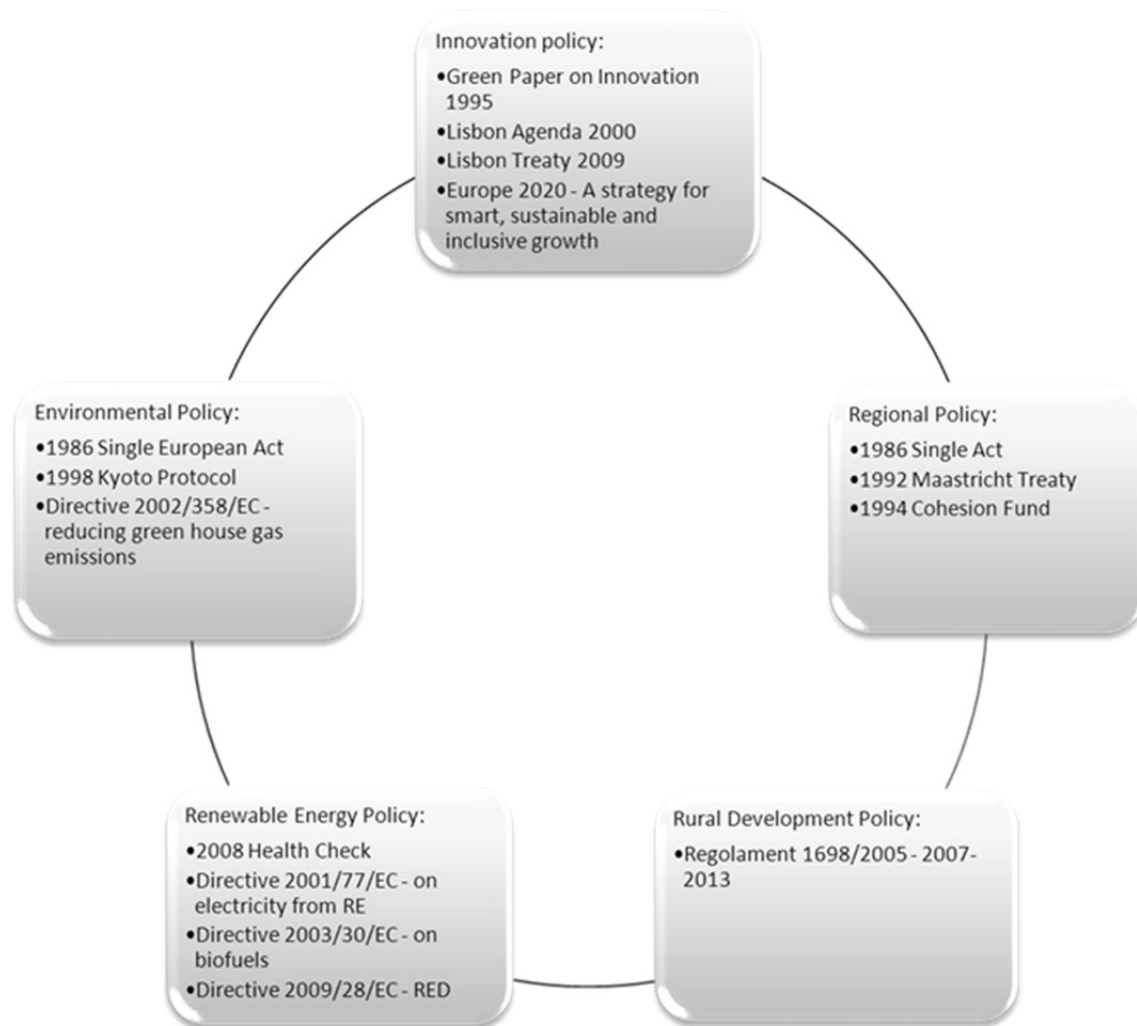


Figure 3.1 European Union policy framework considered in this report

The policy preamble of this study refers to the European Union Innovation Policy. EU started to consider innovation policy probably under the influence of a new school of economic thought called “endogenous growth”, developed during the 1980s, and because of the gap with its main global economic competitors – United States and Japan. The endogenous growth scholars pointed at innovation policies and investments in knowledge-based economy as a tool to boost economic growth.

The diminishing marginal returns of capital cannot foster a long-term growth without any investment in human capital and innovation. Some “endogenous” scholars – Romer (1990), Aghion and Howitt (1992) – developed a brand called *innovation-based economy* explaining that innovation triggers increase in productivity of new products by investing in research&development and knowledge. Meanwhile, the first *Green Paper on Innovation*, published in December 1995, pointed out the *European paradox* as its major weakness. *Over the last fifteen years its technological and commercial performance in high-technology sectors such as electronics and information technologies has deteriorated* (Green Paper on Innovation, 2005), despite the scientific and technological good and comparable results if compared with the major competitors, namely United States and Japan. *One of Europe’s major weaknesses lies in its inferiority in terms of transforming the results of technological research and skills into innovations and competitive advantages* (Green Paper on Innovation, 1995). The Green Paper recognizes that innovation is a process to reach successful production, assimilation and exploitation of novelty in the economic and social sphere, meeting the needs of both individual and society. Its focus is, therefore, multi-dimensional and should simultaneously consider economy, society, environment and employment.

The Lisbon Agenda 2000 arises from these pre-considerations and trying to lay the base to make *Europe become the most competitive, knowledge-based economy in the world and at the same time preserving or even improving social cohesion and maintain environmental sustainability* (Johansson et al., 2007).

It has been recognized that the Lisbon Agenda set too many goals³, thus the mid-term review in 2005, aimed at revising the goals and engaging all the member states in the process. Instead of maintaining the focus on long-term quantitative objectives, the review main targets were medium-term and aimed at delivering stronger, lasting growth and create more and better jobs, with a concern on social and environmental objectives. The adoption of the *Lisbon Treaty* in 2009 gave new impetus to the innovation policies.

In 2010, the Commission drew “Europe 2020 – A strategy for smart, sustainable and inclusive growth”. It sets three areas of priority, namely *smart growth* – developing an economy based on knowledge and innovation – *sustainable growth* – promoting a more efficient, green and competitive economy – *inclusive growth* – fostering high employment economy delivering economic, social and territorial cohesion – (The European Commission, 2010a, pp. 10–11). These targets are interrelated and they do not represent a “one size fits all” approach. The Commission recognized that each Member State is different, so it proposed that the EU targets are translated into national targets and trajectories to fit each national situation. The strategy aims to build a common governance relying heavily on the measurement of the Member States’ innovation policy activities – countries reporting. For each priority the Commission set several *Flagship Initiatives*.

With respect to this study, we take into account two flagship initiatives, namely “Innovation Union” within *Smart Growth* priority, and “Resource-efficient Europe” within *Sustainable Growth* priority. The former aims to *re-focus R&D and innovation policy on the challenges facing our society, such as climate change, energy and resource efficiency, health and demographic change* (The European Commission, 2010, p. 12). The latter supports *the shift towards a resource efficient and low-carbon economy that is efficient in the way it uses all resources. The aim is*

³ According to a report by the International Monetary Fund it has over 100 goals.

to decouple our economic growth from resource and energy use, reduce CO₂ emissions, enhance competitiveness and promote greater energy security (The European Commission, 2010, p. 13). The Innovation Union Policy is based on a broader concept of innovation that should be considered as a system where different actors collaborate and interact. Policies shall be directed not only at innovation and research, but also at fostering collaboration between stakeholders engaged in innovative activities. Since the geography of innovation is diverse, the inclusion of the regional policy is essential to boost innovation and avoid broader gaps between regions. The Innovation Union must involve all regions. *The financial crisis is having a disproportionate impact on some less performing regions and hence risks undermining recent convergence. Europe must avoid innovative divide between the strongest innovative regions and the others* (The European Commission, 2010, p. 20). Member States are encouraged to use Structural Funds, especially the resources of the European Regional Development Fund (ERDF) to invest in regional research and innovation through focusing on “smart specialization”.

The European Regional Policy existed from the very beginning of the European integration process. Indeed, it was widely recognized that developmental gaps were higher focusing on European regions. The main idea was to deal with economic and social imbalances at the Community level addressing the developmental gap between them. From 1957 to 1986 several reports and communications were adopted on regional development, but only in 1986, with the Single European Act, that policy was included within the Treaties framework. The Clause 23, modifying Art.130A – European Economic Community – stated *in order to promote its overall harmonious development, the Community shall develop and pursue its actions leading to the strengthening of its economic and social cohesion. In particular the Community shall aim at reducing disparities between the various regions and the backwardness of the least-favored regions*. Reasons for that, was in particular the accession of three poorer countries, namely Greece (1981), Portugal and Spain (1986).

The Maastricht Treaty officially consolidated the regional policy in 1992, establishing a new specific instrument, the Cohesion Fund, and a new specific institution, the Committee of Regions, as well as the principle of subsidiarity. Special attention is since then on *rural areas, areas affected by industrial transition, and regions which suffer from severe and permanent natural or demographic handicaps such as the northernmost regions with very low population density and island, cross-border and mountain regions*.⁴ The Regulation⁵ establishing the Cohesion Fund stated that 70% of the budget was to go to the poorest regions with less than 90% of average GNP per capita. With the next accessions to the EU (1995 Austria, Finland, Sweden, and 2004 – the famous Eastern Enlargement), especially with the last one, the social and economic disparities considerably rose, bringing out the need to strengthen the Cohesion policy and its Fund.

On 2000 the ‘Lisbon Strategy’ focused on growth, employment and innovation. The latter became the new paradigm of the Cohesion policy signed in Lisbon, shifting the efforts on *the transition to a competitive, knowledge-based economy and society*, by investing in people and society. The environmental pillar was added with the Goteborg European Council, in 2001, to face climate change.

⁴ Consolidated version of the Treaty on the functioning of the European Union, Art. 174 (ex Art. 158 TEC).

⁵ Council Regulation (EC) No 1164/94 establishing a Cohesion Fund.

One of the actions of the first planning period 2000–2006 was “Innovation Actions” funded with the European Fund for Regional Development. Its aim was financing practices of regional innovation policies set with a bottom-up approach. For the next planning period 2007–2013, the Fund is not financing these actions anymore, but the European Community has gathered the efforts highlighting the innovation good practices came out under the previous help. However, the European Fund for Regional Development, the European Social Fund and the Cohesion Fund together, contribute to three main objectives for the planning period 2007–2013: Convergence, Regional Competitiveness and Employment, and European Territorial Cooperation.

With regard to the energy policy, since the beginning, the Member States have not agreed on a common market. In order to provide a legal base, the European Community has legislated on other policies, namely environment, transports, internal market, scientific research, in order to have common rules on the energy sector. The first common energy policy came at the beginning of the 1970s, with the Resolution on the Community new energy policy strategy approved by the Council on September 17th 1974. Its main purpose was to guarantee energy security through a decrease in the Community dependence on energy import from outside. Nevertheless, the first efforts failed to create a common strategy and the differences between state markets and policies deepened. The energy crises of the 1970s and 1980s, and the fall of the Soviet Union opened a new perspective even if the energy policy still is a domain out of the European Treaties. Since the end of the 1990s, some Directives gave impulse to the internal energy market through the liberalization of the electricity and natural gas markets. Despite these steps further, we are still far from an internal common energy market. In the 1990s a concern about sustainable development and climate change took off among the international community. The EU Environmental Policy was established through the Single European Act – SEA – in 1986, and the Kyoto Protocol signed by the Commission in 1998 on behalf of the European Community led to the Directive 2002/358/CE to reduce the greenhouse gas emissions. On 2001 and 2003, the European Community adopted the two directives on electricity and biofuels from renewable energy, integrated in a common Directive in 2009.

The RD and RE are set within this policy framework. The former has its roots in 1968, when the first Agriculture Commissioner warn about a Common Agricultural Policy based only on market. Nevertheless, the first steps were made in 1986, with European Single Act and the need to reduce the gap between regions, especially if rural. The Rural Development Policy emerged as a cross sectoral territorial issue in the late 1980s following the southern enlargement, the Single European Act, and the reform of the structural funds. It was funded jointly by the regional fund, the social fund and the agricultural guidance fund until 2000, when it became a single fund issue (following Agenda 2000) and an agricultural responsibility, so allowing it to be called the ‘second pillar’ of the CAP.

The structure of RD is now a seven year planning framework that must be adapted at the national and regional level. The objectives for RD policy for the period 2007–2012 are: increasing the competitiveness of the agricultural sector; enhancing the environment and the countryside through support for land management; enhancing the quality of life in rural areas and promoting diversifi-

cation of economic activities. The renewable energy sector was included as one of its priorities only in 2008 with the Health Check reform.⁶

The Maastricht Treaty in 1992 ranked the energy policy into the European Community goals but it has not dedicated a chapter to it. In the following years green and white papers stated the need for a common strategy on RE development and energy efficiency, and two Directives drew common steps at the beginning of the 2000s. Directive 2001/77/EC is on electricity produced by renewable sources, and Directive 2003/30/EC is on biofuels in transports. The most recent Renewable Energy Directive 2009/28/EC⁷ (RED) has combined both of them and set the European target of *at least a 20% share of energy from renewable sources in the Community's gross final consumption of energy in 2020*. The target for biofuels is *at least 10% of the final consumption of energy in transport*. *In order to achieve the targets laid down in this Article more easily, each Member State shall promote and encourage energy efficiency and energy saving. Each Member State shall ensure that the share of energy from renewable sources in gross final consumption of energy in 2020 is at least its national overall target for the share of energy from renewable sources in that year. Such mandatory national overall targets are consistent with the European one.*⁸

The national targets which were formerly 'indicative' are now compulsory, because most Member State had failed to reach the indicative targets. Each member must submit a national renewable energy action plan under the RED. *The national renewable energy action plans shall set out Member States' national targets for the share of energy from renewable sources consumed in transport, electricity and heating and cooling in 2020.*⁹ Besides, an Energy Efficiency Action Plan (EEAP)¹⁰ shall establish an intermediate national indicative energy savings target for the third year of application of this Directive, and provide an overview of its strategy for the achievement of the intermediate and overall targets.¹¹

Regarding the subsidiarity principle, each region must submit a regional renewable energy plan and a regional energy plan in order to have a narrower view on the territorial situations and better foster the local needs. The plans are a summary of the regional overall energy consumption and production as well as for each sector; regional RE goals, measures to improve RE and energy efficiency, administrative responsibilities.

⁶ The four new challenges the European Union must deal with, are climate changes, water resources management, biodiversity and bioenergy.

⁷ Art. 2 lett. a) 'energy from renewable sources' means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.

Art. 2 lett. i) 'biofuels' means liquid or gaseous fuel for transport produced from biomass.

⁸ Art. 3 paragraph 1 and 4.

⁹ Directive 2009/28/EC Art. 4 paragraph 1

¹⁰ Based on the Directive 2006/32/CE on Energy Efficiency

¹¹ Directive 2006/32/EC Art. 4 paragraph 2

4 Case studies: Norway and Emilia-Romagna

4.1 Norwegian regulatory framework

Norway is not a member state of the European Union. After its first application for membership and rejection in 1962, it tried again in 1972 and 1994 but two referendums failed to support the government's aim. Consequently, Norway entered into a trade agreement with the European Community, which turned into the European Economic Area agreement in 1994. The EEA Agreement extends the European Market – Internal Market – and its four freedoms (free movement of goods, capital, services and persons) to Norway and other three EFTA countries – Switzerland, Liechtenstein and Iceland. It establishes a system ensuring equal conditions of competition. In addition it includes the so-called "flanking and horizontal policies" intended to strengthen the Internal Market. Other fields of cooperation include consumer protection, culture, education, environment, information services, and small and medium-sized enterprises. The EEA Agreement does not cover the Common Agricultural and Fishery policies but contains provisions on various aspects of trade in agricultural and fish products. For those reasons, Agricultural and Rural development policies and – to the extent that it comes from rural policy – Bioenergy policy have a different structure compared to European Union Countries. Nevertheless, a number of other EU policies, especially Energy policy, Food Safety Policies, Pesticide Directives and the Water Framework Directive, do apply in the EEA which are relevant for agriculture. In fact, Norway is bound to adopt the RED – Renewable Energy Directive – under the EEA agreement, and is currently preparing a national energy action plan that should run within the period 2014–2020.

4.1.1 Norwegian socio-political path

According to the purpose of this study, it is necessary to focus on interconnections among facts that have shaped the Norwegian administrative – political – social system.

Norway gained independence from Denmark on 1814. It was allowed to have its own Constitution although tied in the Swedish Crown until 1905. Local government was reformed and the modern system created soon after independence in 1837, when the Alderman Act (Local government act) was enacted. It came from the post-independence need to drive out foreign officials and control the 'Danophile elite' in Oslo by creating strong local elected governments, and extending the franchise to all males with land, actually a significant proportion of the population because of the small scale owner-occupied farming structure and the importance of small farmers in pre-industrial Norway. The decentralized governance system is rooted into the independence process and integrated in the Substantial Constitution even if it has not been counted among the Formal Constitution founding principles yet. The Local Government Act assigned specific responsibilities to municipalities on school

(primary and lower secondary school), family care (nurseries and kindergartens), social welfare (elderly care and disabled), social services, local plan (land use), agricultural and environmental issues, local roads and harbors (Brox, 2006, p. 73). Municipalities had a key role in developing public welfare system *in a way the municipalities have been the driving force in modernizing Norway. The pioneering municipalities also provided youth with a chance to acquire more education than the minimal standard which had been determined by the parliament. They built hospitals and roads. In recent years they have in cooperation with NGOs been in the forefront in terms of offering women protection against violence* (Speech of Minister of Local Government and Regional Development, 2007). They can rule on some main policy issues, namely social services (among them waste management too), increase ongoing taxes, hydropower revenues and fiscal equalization. The last one is deeply tied to the decentralized administrative system since economic resources can be transferred from wealthiest municipalities to the poorest ones.

The core purpose was, and still is, to foster equal growth and development throughout the country. Specifically, it refers to the notion of territorial “equivalence”, peculiar to Norwegian political system and to the Scandinavian countries in general. *Territorial equivalence* imply “*equivalence of services and livelihood opportunities in the sense of providing access to public services of equivalent quality irrespective of place of residence, social background, or other personal characteristics as well as equivalent opportunities for work, enterprise and livelihoods*” (Bryden et al, 2010, p. 1). It relies on the *community model* (Brox, 2006, p. 73) as a shared political project. We can use the term *community* in the way that Ottar Brox¹² asserts in one of his essays collected in *The political economy of rural development*: “*Community must be different things of which one can have more or less: the people who live in a defined territory may share tangible assets, like grazing, oil fields, fish stocks or recreational areas, or they may share a history, a GNP, heroes or enemies, and thus come to share values, cognitions and fates*” (Brox, 2006, p. 73). Moreover, it has to be underlined as an important feature of the natural resources management. In fact, since the independence, natural resources attached to or under the land were not owned by individual persons and they often could not be bought or sold through market transactions. Even transactions in farms and farm land have been – and remain – heavily regulated. The ideology was that persons had the right to use the natural resources and also exploit them economically, but they however belonged to the community. *This was the basis for a society with a rather decentralized distribution of natural resources[...]*Until the

¹² Ottar Brox (born 30 August 1932 on the island of Senja in northern Norway) is a Norwegian authority in social science and a politician for the Socialist Left Party. He was professor of sociology at the University of Tromsø from 1972 to 1984, and later adjunct professor while working as head of research at the Norwegian Institute for Urban and Regional Research.

Brox graduated from Norwegian College of Agriculture (NLH) in 1957, took history and sociology at the University of Oslo in 1959 and 1960 and dr. scient. degree from NLH in 1970.

Brox was a member of parliament for Troms in the period 1973–1977. On the local level he has been a member of Bergen city council 1971–1972 and Oslo city council 1991–1995.

Brox has written a wide range of popularized science literature and participated actively in the public debate. Brox' most influential book is *Hva skjer i Nord-Norge? (What is happening in Northern Norway?)*, published in 1966. This book became a source of inspiration to Northern Norwegian regionalism and caused an upgrading of the economic impact of small vessels in fisheries. The theme of this book was carried on in *Nord-Norge: Fra allmenning til koloni.* (1984).

He is a member of the Norwegian Academy of Science and Letters. In 2002 he received the Fritt Ord Honorary Award. He holds an honorary doctorate at the Memorial University of Newfoundland since 1994, the University of Aberdeen since 2001 and the University of Tromsø since 2003.

second half of the 19th century the majority of the households combined income from various natural resources as the basis for their welfare (farming land, fish, forests, hunting, mines). This created the basis for an economy characterized by a very large number of small independent producers (mostly farm based) located in rural villages and regions (Wicken, 2010, 9).

This cultural/social path structure joined the economic boom in the second half of the 19th century and *the industrial development took place within the framework of local communities with many small producers* (Wicken, 2010, p.21). These features led to a government structure called localism, where Norwegian municipalities, farmers and fishermen had a relevant role in politics and society. That created interconnection between economic development and political democracy by encouraging active citizenship and mutual trust between people and politicians. Peasantry and fishermen strongly opposed capitalistic forces that took off in most European countries, such as *growth poles, large scale industrialization, rural – urban migration, alienation of hydro-electric power rights, transfer of fishing rights to longer trawling companies* (Wicken, 2010, p. 21).

Industrialization played a key role but in a way that seems different from other experiences. It was highly interconnected with rural areas where it could find available labor forces as well as a necessary market outlet. According to Ottar Brox, explanation of Norway's quick development comes together with strong connection between rural and urban world, rural areas and political system, rural areas and economy. *Rural people with new voting power took care of their own interests, pressing National government by municipalities. Most parties, especially Labor, had members leaders and voters in equal measure from rural and urban areas. [...] rural development not only improved market power of urban labor, but increased the demand for industrial goods as well.[...]And industrial development stimulated the development of rural areas. The new optimism in the villages made many young farmers' sons enter the industrial sector, often construction or seasonal manufacturing industry, in order to save money for rural investments: buildings, tractors, fishing boats* (Wicken, 2010, p.21). On the other hand urban money flew toward rural areas to invest in school, land reforms and training local government. In addition, the important role played by fishermen and peasants in the rural areas, encouraged resistance to the centralization tendency by prioritizing district politics. These social and political features are still influential, given that local opposition has formal power to block external actors to enter into activities of exploiting natural resources (e.g. opposition against establishments of wind farms along the coast).

Norway is currently organized on three levels of which municipality is the main unit – 430 *municipalities*; 19 counties – intermediate body (political and policy making administration, territorial state representation); and State. The regional policy divides Norway in zones for specific measures aimed mainly to compensate some regions for disadvantages and weaknesses. The common purpose is to provide equal living conditions by maintaining and strengthening rural areas throughout the country. The efforts to secure *equivalence* and avoid wide migration flows from rural areas to urban areas have certainly fulfilled most expectations, although under constant pressure since the 1980s. The neoliberal policies have affected the fundamental practice of Norway's equivalence by carrying out market-led and individualist reforms in the local governance, in particular the ideas about centralisation and rationalisation of public services.

4.1.2 Rural development policy

Through the overall objectives of territorial and personal equivalence, largely implemented through the municipalities and to a lesser extent the counties, all Norwegian policies provide a bedrock for rural as well as urban areas, and the Districts Policy and Fiscal Equalization Policy in particular provides the foundations for rural development. In this context, ‘rural development’ policy is perhaps a minor factor in securing the development and maintenance of rural areas.

Table 4.1 Agriculture in Norway

Norway	2006	%
Agriculture land	1.04 mln ha	3%
Arable land	0.86 mln ha	
Forests (of land)	12 mln ha	39%
Productive forests		24%
Annual increment	25 mln m ³	
Total harvested	9 mln m ³	
Agriculture and forest sector – employment rate		2.6%
Agriculture and forest sector – GNP		0.8%

Nevertheless, as pointed out in the Report to the Storting no. 8 (1992–1993), Norwegian agricultural policy aims to foster the multifunctional role of agriculture contributing to the production of public goods, such as food security, securing settlement in rural areas and landscapes. Thus, it is important to maintain farming activities throughout the country and provide a strong import protection for agricultural products.¹³

Today, farms provide numerous services based on their own resources, apart from food supply. They include health care services, education and training, nature experience, culture and tourism and energy. The national program “Inn på tunet” (“Into the farmyard”) is an example of its multifunctional role because it encourages the use of farm for educational, health and social purposes – IPT services or ‘green care’. The farmer is required to provide services, either as the person in charge or with a supportive role. Farmers decide to provide these kinds of services to improve the use of their farm resources (Handlingsplan for Inn på tunet, 2007, p. 6).

The government recognizes the bio-energy sector as another possibility to increase farmers’ income and the competitiveness of rural areas, but it is still in development. Nevertheless, the report “Norwegian Agriculture, Status and Trends 2007” (NILF, 2007), highlights that the main challenge is how to transform subsidies to “green support” without significantly affecting the localization or scope of production. In fact, the sector receives many direct supports in the form of several subsidies to production and investments, as well as policies of import protection. There are two main Funds, the Agricultural Developmental Fund and the Rural Development Funds, which resources are administrated by county departments of agriculture and Innovation Norway. Nevertheless, the administrative responsibility for specific environmental and regional measures, as well as for forestry funds, has been assigned to the municipalities in 2004 (Report to the Storting no. 19, 2001–

¹³ See Almås (2004) for an introduction to the development of Norwegian agricultural policy.

2002).¹⁴ It included specific environmental measures such as landscape protection and investment support for environmental measures. Thus, local governments will submit a brief – long term strategy of budget proposals and an annual report about the use of funds to the county governor. The county department of agriculture will allocate the funds to municipalities.

In 2004, it was decided to adopt a national and a regional environmental program in each county. Nationally, it will mainly design a national farm policy, a framework for the regional programs, policy instruments and subsidies. On the other hand, the regional environmental program will include instruments and schemes to face the most critical challenges.

Rural development policy does not include measures directly related to bioenergy investments in farms and rural areas but it is clearly involved in local community development. According to Government White Paper, St. meld. Nr. 25 (2008 – 2009) “Local Growth and Hope for the Future”, the most relevant goal for an effective rural development strategy is to *maintain the main features of the current settlement pattern and to further develop the plurality of historical and cultural resources deriving from it* (Norwegian Ministry of Local Government and Regional Development, 2008–2009, p.5). Growth is seen as a bottom-up approach adapted to the specific opportunities and challenges faced by each region. The main challenge under government’s focus is the continuous migratory flow to urban centers. Thus, the starting point is to secure for Norway’s citizens the real freedom to live in the place of their choice. Local authorities are the key actors for local community development and they have specific responsibilities on service provision, community planning, business development and facilitating the work of non-governmental organizations. The Government pointed out a need of local authority leadership and cooperation among different administrative levels – both neighboring municipalities and regional actors – to reach a widespread local development. *Local Democracy Commission believes that community development is a policy area largely located outside the state authority sphere. This means there is a great opportunity of action and much depends on municipal ability of action* (Norwegian Ministry of Local Government and Regional Development, 2008–2009, p.27). The Government’s rural and local policies are a guide for local authorities but it is their responsibility to develop further targeted local projects. Related to this, the Ministry aims to strengthen the relation between municipalities and local communities, as well as regional and local cooperation. Counties and the Resource Centre for Rural Development have a key role in the system, because they are responsible for regional development, cooperation and dialogue with municipalities on local community development. In addition, Innovation Norway has some responsibilities as provider of advisory services to municipalities about business-oriented restructuring. In particular, counties’ duties are about regional planning in partnership with other regional and local actors and guidance to local authorities for local planning. Counties have to work in tight cooperation with municipalities and Regional Councils in order to finance local development projects.

The Center for Rural Development plays a key and independent role within this framework. *It will be a hub for knowledge-building and dissemination within district community development in the broadest sense. The Center should contribute to coordinated and targeted development efforts through collaboration, networking*

¹⁴ Report to the Storting no. 19 (2001–2002) “New Responsibilities for Local Democracies – at the Regional and Local Level”.

and venues to share their knowledge and to spread experiences.¹⁵ Most significant is the idea of a multi-sectorial Community Planning that involves many policy areas. Each municipality has to prepare a municipal plan within a year after municipal elections that specifies its own developmental strategy. It means to consider the management of several natural resources such as soil, land, water, landscape and biodiversity.

The Ministry's expectation is that municipalities will overcome boundaries to work together. *Inter-municipal cooperation can be useful both within the land management and industry-oriented work, as well as to develop infrastructure and better service provision in a larger area [...] Ministry looks at cooperation across municipal boundaries as an alternative to district consolidation*¹⁶. Local authorities may play a major role in job creation and economic development. Cooperation between municipalities may be necessary to gather the best skills and experience around effective solutions for rural areas. Moreover municipalities may also boost the agricultural sector and deal with climate change by supporting renewable energy development in rural areas. The Ministry asserts that through bioenergy development it will be possible to have new jobs and economic activities based on local resources. *Increased focus on bioenergy could benefit where it is produced and local consumers. This market is large and municipalities are a key target group. Municipalities are large landowners and can decide on new energy infrastructures on their area. Municipalities and counties are therefore important to increase the use of bioenergy and take attention around environmentally friendly energy use. The energy and climate plan should be all local authorities goal by January 2010. ENOVA provides support to help them in preparing such plans*¹⁷ (Norwegian Ministry of Local Government and Regional Development, 2008–2009, p.28–127).

As a basis to develop this new opportunity, the government decided to invest in Research & Development projects both for environmentally friendly energy and biofuels. In particular, the Ministry of Local Government and Regional Development, considers that municipalities should have the possibility to impose mandatory connection to the planned heating district. Related to this, improving forest management and use of trees and chip to produce new green energy, is another chance to enhance the attractiveness and economy of rural areas. In addition, small hydro power is on governmental focus as an important tool to increase energy efficiency on farms and contribute to maintain permanent settlement. Often, the electricity produced is sold to a local power company by signing a bilateral contract.

4.1.3 Energy policy framework

As in most countries, energy policy is one of the most centralized policies in Norway. The energy sector in Norway is characterized by the abundance of hydropower – giving low electricity prices – and large oil and gas reserves. The estimated share of renewable energy is about 58%, of which hydropower represents 50%, while bioenergy has a much lower contribution of about 6%. Water is certainly the most widespread renewable source in Norway.

Hydropower development occurred with industrialization during the twentieth century (Hveding, 1992). At the very beginning, the right to utilize waterfalls

¹⁵ Ibidem, 28

¹⁶ Ibidem, 29

¹⁷ Ibidem, 127

belonged to whoever owned the adjacent ground without any other codification. The national grid was also quite weak due to the long distance between settlements. In addition, several European and American industrial investors wished to exploit the waterfalls in Norway, and that led the government to establish rules on how they could be exploited for economic purpose. The process was long and ended with the Concession Laws. The first one was adopted on 1906 and then reviewed in the final version in 1917. The latter version 'Watercourses regulations act' still applies today. The main limit is the regulation of flow by storage dependent on Royal License – only exempted the State. The Norwegian Water Resources and Energy Directorate – NVE – is currently overseeing the licenses system, under supervision of the Ministry of Petroleum and Energy. The State has mostly a regulatory role (license), whereas municipalities, industry and private investors are the greatest hydropower suppliers.

The first hydropower plant were medium-size ones. Today the tendency is to develop small scale plants first of all in rural areas. Often, farmers – sometimes jointly – invest in small and micro facilities to get revenue from the energy sold to local or regional power companies, partly owned by municipalities and counties. *The licensee shall be required to pay an annual fee to the State and an annual fee to the counties and rural and urban municipalities, calculated on the basis of the average amount of power that the waterfall, once its harnessing is completed, can produce, based on the expected rate of flow from one year to the next.* Micro and small hydropower is currently seen as the major possibility for farmers to get new income in the rural areas.

4.1.4 Renewable Energy policy

Norwegian bioenergy policy is at its first steps. According to Climate Challenges – agriculture part of the solution (Report no. 39 (2008–2009)), *bioenergy is a collective term for energy derived from biological material (biomass) such as wood, various crops, and biogas from manure, including also biological waste. Production and use of bioenergy helps reduce greenhouse gas emissions, economic development in rural areas, strengthen security of supply of energy and can produce positive effects in terms of keeping the cultural landscape open.* Efforts to develop a bioenergy market and secure a stable energy supply are going on slowly, mainly because of Norway's hydropower production for both electricity and heating. *The consumption of bioenergy in Norway today is around 15 TWh, equivalent to 6% of total energy consumption, and is the most important renewable energy source after hydropower. Fuelwood consumption accounts for about a half, while the rest is bioenergy in industry, local heating plants and district heating networks* (Climate Challenge – Agriculture part of the solution, 2008–2009, p.5).

In 2008–2009 the Government adopted a bioenergy strategy to ensure targeted and coordinated instruments to increase bioenergy production by 14 TWh by 2020, starting from 14.5 TWh in 2006. As a part of the EEA agreement, Norway has adopted the European Directive 2009/28/CE and set its first National Renewable Energy Action Plan in June 2012. They set an overall target for the share of energy from renewable energy sources of 67.5% in gross final energy consumption by 2020, starting from 60.1% in 2005 – and 61% in 2010 – (NREAP 2012, p.13). Nonetheless, in 2008, almost all electricity consumed was produced from hydropower for about 98.5% of the total electricity generation. Heat is mainly provided from electricity accounting for 82.3% of total energy use for heating in 2008. The share of district heating is about 11.5% of total energy used in buildings.

Other energy sources are used, although they have a minor role: oil 2.8%, gas 0.8% and wood and wood pellets 2.1%. The sector has experienced a deeper increase since 2008, when the government largely invested on bio-energy strengthening ENOVA's financial role. It has helped farmers and power companies to invest together in heating supply from wood biomass. The goal for bio-heating is about 100 PJ by 2020.¹⁸

In Norway bioenergy production is more linked to the environmental concern than to new opportunities of income for farmers: *Norway's commitment under the Kyoto Protocol is to ensure that its greenhouse gas emissions in the period 2008–2012 are no more than one per cent higher than they were in 1990. The Government has since set a more ambitious target: to reduce greenhouse gas emissions to 9 per cent below the 1990 level in the period 2008–2012.*¹⁹

In the new White Paper on Norwegian climate policy (Meld. St. 21 (2011–2012)), the government has stressed the major goals by focusing both on cutting greenhouse gas emissions and to be a carbon neutral country by 2050. By 2020, Norway's target is to cut emissions by 30 per cent. In addition, it should reach carbon neutrality by 2030 at the latest. It has therefore been decided to invest in renewable energy and energy efficiency by prioritizing long-term measures. Leading tools are investments in more environmentally friendly technologies and restructuring all sectors, first of all industry, buildings, transport and agriculture.

Apart from being *part of the solution*, the agricultural sector is also pointed out as a major polluting one. In 2010, emissions from the sector were estimated of 4.3 million tones CO₂-equivalents, which is about 8% of Norway's total greenhouse gas emissions (Meld. St. 21 (2011–2012) p. 150). Emissions are primarily methane CH₄ and nitrous oxide N₂O. Methane emissions mostly come from digestive processes in ruminants and from manure stores, while emissions of nitrous oxide derives from the conversion of nitrogen in the soil and fertilizer. Yet, we must consider emissions from heating buildings, fuel and CO₂ equivalents from cultivation of soils. On the other hand, trees and growing plants are also fixing CO₂. Basically, the sector can contribute to climate change and bioenergy production with two different but interrelated aims. Firstly it can reduce its own emissions through farm-based biogas plants²⁰ which residue can be used as organic environmentally friendly fertilizer. Secondly, it could provide the necessary raw materials – wood, manure, waste by-products from food production such as straw, grain and offal – to increase use of bioenergy in bio-heating districts, buildings and biofuel production.

It is important to note that due to agricultural land scarcity – about 3% of the whole amount – there is no currently discussion on transition to energy crops, rather the Government is extremely committed in defending food production as its first priority. An important tool to foster bioenergy development is the *Bioenergy Program* administered by Innovation Norway²¹ that provides support for the

¹⁸ European Commission, Joint Research Center, Institute for Energy; Norwegian Centre for Bioenergy Research, Norwegian Institute for Agricultural and Environmental Research, “An overview of the biomass resource potential of Norway for bioenergy use”, 2011, 10–11.

¹⁹ <http://www.environment.no/Goals-and-indicators/Goals-and-indicators/Climate-change/Reduce-greenhouse-gas-emissions/Norwegian-emissions-of-greenhouse-gases-CO2-CH4-N2O-HFC-PFC-SF6-measured-in-CO2-equivalents-/Greenhouse-gas-emissions/>.

²⁰ The governmental goal on biogas stated in Report no. 39 (2008–2009), White Paper on Climate Challenges – Agriculture part of the solution, should be about 30% of manure dedicated to biogas production.

²¹ <http://www.innovasjon Norge.no/Contact-us/>: Innovation Norway is the Norwegian Government's instrument for innovation and development of Norwegian enterprises and industry. It helps companies in

establishment of, among others, biogas plants, as well as feasibility studies and research projects. It will enhance the use of bioenergy in agriculture, in particular for heating throughout 2012. The Ministry of Agriculture and Food has indicated the main strategies: developing innovation systems and value chains, increasing use of bioenergy through investments in fuel production and heating; visibility, branding and communication opportunities; enhance R&D on cost-effective methods of operation and new or improved technology. In relation to this, Innovation Norway will stimulate agricultural and forest users to produce, use and deliver green energy in the form of fuel or heat.

Biogas should be an important source of green energy – fuel, heat, electricity – deriving from manure, food waste, fishery residues, plant residue, and sewage. The reason to develop biogas production relies on its potential capability to reduce greenhouse gas emissions (methane, nitrous oxide etc.). Investing in biogas leads to a double benefit: it reduces greenhouse gas emissions, while supplying energy and digestate to use as a good fertilizer without dangerous runoff into watercourses. Anyway, it is only an irrelevant part of the manure that is used for biogas production: only four farm-based biogas plants are in operation so far. There are twenty biogas plants treating sewage sludge and five plants using food waste, and more new ones are expected due to the government's climate target. Nevertheless, there is no subsidy for the biogas production, which means that the sector faces unfair competition with prices of hydropower due to the failure to account for externalities. It is the current biggest problem that is blocking small biogas-plant investments. Besides, Norwegian farmers live in scattered settlements making feedstock transport unsustainable, both economically and environmentally.

Research at the University of Life Science – UMB – has estimated the total energy potential for biogas, and it turned out that manure mixed with other waste products will give high energy efficiency. Thus, the Government decided that 30% of livestock manure in combination with 100 000 tons of food waste will be treated in biogas plants by 2020 (St. Meld. Nr. 39 – Klimautfordringene, p. 117). Until now the only examples are of big plants, such as Aana in Rogaland which produce 820 MWh of heat, based on cattle manure and silage. Another one is located in South Trondelag and produces heat energy based on cattle manure. There are also several test plants in eastern Norway, one of them is Halden, Ostfold Recycling opened in June 2008. *Based on Govasmark (2010), it can be estimated that half of the biogas produced is sold as bio-methane, while the rest goes to electricity production and heat* (Berglann and Krokann 2011). That is clearly in contrast with Government interest in small-scale biogas production especially if farm-based.

However, in the new White Paper on Climate Challenges (2011–2012), transport is pointed out as the best solution to use biogas. *Technically, biogas is a very good option for heavier diesel vehicles and provides nearly the same energy used in*

developing their competitive advantage and to enhance innovation by providing competence, advisory services, promotional services and network services. There are several sectors in which it works and one of them is Agriculture. They support farmers, forest owners and greenhouse industry to invest in a biomass plant and green energy – hot seat, farm heating, greenhouses and biogas. It is not given support to the purchase of used equipment. It will be given support to the statement of qualifications and measures for consultant assistance in feasibility studies, pilot projects and reports, and to the expertise and information measures. They have also a package which includes a scheme for environmental technology pilot projects or demonstration plants as cleaning technology, more environmentally friendly products and production processes, more efficient resource management and technological systems that reduce environmental impact. It can give up to 35 percent support for investment and 50 percent to the statement of qualifications and measures.

transportation as in warming. Biogas from waste, sludge and manure is the type of biofuel with the lowest risk of negative environmental effects and provides a significantly better energy efficiency and area efficiency than liquid biofuel. It will be achieved a great benefit with significantly reduced particulate emissions in the transition from diesel to biogas in urban areas (Climate Change, 2011–2012). Based on comparisons of data from Statistics Norway, Norwegian Agriculture Research Institute, Norwegian Institute for Forest and Landscape Institute, it may be possible to enhance the use of biofuels in agriculture very quickly. A shift to biodiesel (first generation) could allow emissions reduction of about 44–45% per liter. Furthermore, development of second generation biofuels from woody biomass will allow 96% reduction in greenhouse gas emissions.

Norway's most available renewable source, after hydropower, is forest raw material. The total area of forest and wooded land is about 41% of land area, of which approximately 26% is productive forest. It is worth to notice that Norway currently harvests much less than the annual increment produced in the forests, so that there is a surplus available for use in energy without affecting other uses. Using wood for bioenergy production becomes also a way to a better management of forests and landscapes. Norwegian forestry provides primarily raw materials for wood products and papers. The raw material of current bioenergy production is mainly a by-product from the industry-oriented logging in the form of wood chips, briquettes, pellets and wood. The revenues of the sector are actually too low, thus there is a current, shift from wood delivered for paper production to heat production. Today in Norway it is used an energy equivalent of about 17.2 TWh based on biomass resources from forest, included imported wood. In a relatively long-term perspective it is possible to deem that the expected level of harvesting in 2020 will be sufficient to increase the bioenergy production by up to 14 TWh by 2020 (Meld.St. 21, 2011–2012, p. 166). This calculation includes not only wood but also bark, stumps, roots and branches and it is based on the principle of sustainable forest management. One more chance could be the second generation biofuels. At Borregaard Industries, in Sarpsborg, they produce bioethanol based on wood. This kind of fuel can be produced including cellulose or lignocelluloses from all kind of plants, such as grass and forest trees.

The greatest instrument helping the forestry sector is the *Forest Trust Fund* opened in 2006 which is intended to provide the forest owner with a basis for financing measures aimed at sustainable management of forest resources and energy production. *It shall primarily be used for silviculture, forest management planning, forest production, forest roads and measures aimed at securing important environmental values in the forest.*²²

Furthermore, one of the Government's concerns regards the building sector. It has been launched a project called *Cities of the Future*²³ that runs from 2008 to 2014. The 13 targeted cities are namely Oslo, Bærum, Drammen, Sarpsborg, Fredrikstad, Porsgrunn, Skien, Kristiansand, Sandnes, Stavanger, Bergen, Trondheim and Tromsø. Energy in buildings is one of the four priority areas. It includes measures aimed to energy efficiency in municipality buildings²⁴; energy sources from wind,

²² Act relating to forestry (Forestry Act), Chapter 4, Section 15.

²³ *Cities of the Future* is a collaboration between the Government and the 13 largest cities in Norway to reduce greenhouse gas emissions and make the cities better places to live.

²⁴ The municipalities are responsible for 1/3 of energy consumption in Norwegian office buildings. This gives them a great opportunity to reduce the country's energy consumption, and save money. <http://www.regjeringen.no/en/sub/framtidensbyer/cities-of-the-future-2.html?id=551422>

sun, sea and inhabitants waste. Several projects have been funded for heat production from Oslo sewer or district heating with renewable energy. The main goal is to build pilot projects that will work as laboratories test in the building construction, climate friendly planning, rehabilitation and adaptation to climate change.

4.1.5 Policy measures

The current policy measures are mainly supported by ENOVA (large facilities) and Innovation Norway (small farm-based system) which can give grants to develop pilot projects as well as public and private plants.

Enova

ENOVA is a public enterprise established in 2001 as a public enterprise owned by the Ministry of Petroleum and Energy to encourage environmentally friendly restructuring of energy consumption and production, by working closely with both public and private sector (industry, construction and housing). ENOVA's activities are supported by the Energy Fund which is financed via a small additional charge to electricity bills (1 øre per kWh has been charged since 2004, which amounted to 788 million kroner in 2010). In addition, the Energy Fund has been allocated the proceeds from the "Green Fund for Renewable Energy and Energy Efficiency Measures". The Green Fund's capital this year is 25 billion kroner, however further funds will be added in the course of next year and through a small additional charge to electricity bills (ENOVA).

ENOVA's main goals are:

1. More efficient energy consumption;
2. Increased use of alternative sources;
3. Increased production from renewable energy sources;
4. Introduction and development of new technologies and solutions;
5. Creating well-functioning markets for effective energy solutions;
6. Increase knowledge in society.

In particular ENOVA's funding is aimed to district and local heating solutions; energy efficiency and green energy in residential areas; program for energy industry (conversion from fossil fuels to bioenergy and other renewable energy sources); support to municipalities and households for green projects. It had a specific program to increase biogas production in 2009–2011. It applied to industrial investment with energy delivery whose energy delivery is minimum 1 GWh per year. Support is provided for production and distribution of biogas.²⁵

Innovation Norway

Innovation Norway is the Norwegian Government's instrument for innovation and development of Norwegian enterprises and industry. Grants are being given to local-based projects of farmers and forest owners (or their own cooperatives) to produce heat, biofuels and biogas. Moreover, Innovation Norway will offer consultancy for feasibility studies, pre-projects and investigations, expertise and information measures. Each project will be assessed separately with an emphasis on environmental conditions and profitability. Key requirement is that applicants must have a

²⁵ www.enova.no

clear basis in agriculture and using raw materials directly from agriculture as the main source. Furthermore, Innovation Norway is managing a support system for environmental technology. It means funds are set aside for pilot and demonstration plants.

Transnova

TRANSNOVA is another tool owned by the Ministry of Transport. It is a three years project to reduce greenhouse gas emissions in the transport sector by replacing fossil fuels, switching to more environmentally friendly forms of transports as well as reducing transports. In order to receive grants, biogas projects must be clearly related to biofuels production.

Environmental taxes

In addition to this, environmental taxes are the major national instrument advised in the Bioenergy Strategy – Ministry of Petroleum and Energy – to enhance the use of bioenergy. It refers to taxes intended to promote ecologically sustainable activities through economic incentives. Such a policy can complement or avert the need for regulatory (command and control) approaches. Often, an ecotax policy proposal may attempt to maintain overall tax revenue by proportionately reducing other taxes – e.g. taxes on human labor and renewable resources. It will be consequently improved both environment condition and employment. There are two environmental taxes on mineral products (mineral oil, gasoline, natural gas and liquefied petroleum gas), CO₂ tax²⁶ and Sulfur tax. Low blend of biofuels and gasoline are therefore subjected to diesel tax and CO₂ tax. There is also a tax on NO_x emissions²⁷ – not on mineral products – (generic term for mono-nitrogen oxides NO and NO₂ – nitric oxide and dioxide, produced from the reaction of nitrogen and oxygen gases in the air during combustion, especially at high temperatures. In areas of high motor vehicle traffic, such as in large cities, the amount of nitrogen oxides emitted into the atmosphere as air pollution can be significant. Pricing emissions of greenhouse gases is seen as the main long-term driver to make new investments in renewable energy more profitable. Consumption tax on electricity and the basic tax on heating oil are further financial tools to support bioenergy sector but exist many exemptions. Further governmental measures are green certificates market²⁸ with Sweden, doubled reward scheme for public transport, investment in rail, reinforce Norway's skills and domestic technology production. Other means are Norwegian Research Council's supports to

²⁶ Norway introduced CO₂ tax in 1991 as one of the first countries.

²⁷ Introduced in 2007.

²⁸ Tradable green certificates are seen as an effective alternative to publicly financed feed-in-tariffs or investment support to new renewable energy power plants. (Bianca, the green certificate scheme is actually very controversial and many argue that it is useless, only giving largest profits to large companies, while others argue that all the funds raised will go to RE in Sweden and not Norway!) The system works on a trade basis: the producers of certified green electricity have the right to sell one certificate in the certificate market per unit of electricity produced whereas is the final consumers who purchase them financing the renewable sector. The only Government task is to set how much final electricity consumption has to be produced by renewable resources. In this way consumers are charged of "green" responsibility. The purchase of green certificates would typically be managed by the electricity suppliers, so all the end consumers actually pay an extra expense on the electricity bill. The certificate price will be determined by the intersection of the aggregate cost curve for all "green" producers and the demand for green certificates. Thus, green certificates are a financial tool to reach a desired production from, and investment in, renewable energy.

research and development of renewable energy through User Driver Innovation, RENERGI program, Centre for environment – friendly Energy Research, CLIMIT, Nature and Industry.

Box 1 – Norwegian Energy Market

In 1991 Norway liberalized its energy market that is almost exclusively based on hydropower both for electricity and heat. Before the reform there were about 70 power-producing companies and 230 network owners in the system. The market structure was characterized by a sort of local and regional vertical integration between power generation and the network. 85% of the energy system was publicly owned by local, regional and state owned company. The biggest owners was Statkraft producing 1/3 of the total generation, namely around 30%. About 90% of power was sold by long-term bilateral contracts between the sellers and the buyers, while the electricity prices were decided by administrative or political decree. Today the price is set on demand and offer basis in the Nord Pool stock market that includes Norway, Sweden, Denmark and Finland. Statkraft has been divided into two differentiated legal entities: a generating company – Statkraft – and the transmission company – Statnett. Also the other vertically integrated power companies were split but not with separate legal entities. The market has not been really privatized, so the ownership is still public for the greatest share. The regulatory framework is managed by the Norwegian Water Resources and Energy Directorate that administer the system of the trading licences, necessary to operate in the electricity market. The liberalization should have reduced and equalized prices, as well as lowered investment but raising the rates. It has instead established *larger regional companies, partly through acquisition and merges among local-government entities. Statekraft also grew with the political aim to make it an important player in the international energy market. Nevertheless, prices fell and became more equal, investment declined in both production and transmission capacity.* [Bye T., Hope E., "Deregulation of the electricity markets – the Norwegian experience"]. According to index studies by Bye et al. Norwegian power market is still concentrated.

4.2 Italian regulatory framework

4.2.1 Rural Development policy

In Italy the renewable energy sector is deeply tied to rural development. A National plan and a regional plan are adopted in each member state and in each region respectively. They show the state of the art in the energy sector and rural development, while establishing mandatory targets. Agriculture and rural areas can be keystones for energy efficiency and green energy production targets. They can contribute both as renewable raw material suppliers and to a reduction of CO₂ greenhouse gas emissions. Through renewable energy investments it is also under the right conditions possible to improve farmers' income and also that of rural communities, as well as opening up new opportunities for rural innovation and economic diversification. The National Rural Development Plan 2007–2012 shows a situation that is only partially satisfactory. In the period 1981–2002 the surplus value per unit of labor grew at an annual average rate by 4.3% , more than the economy as a whole (+1.6%), but in 2002 the surplus value per employed represented only the 63% of the national average surplus value. *The reasons for this situation have been identified in the small average size of farms; aging agricultural entrepreneurship, its inadequate education and preparation levels for market dynamics and for developing appropriate marketing and business strategies. Further problems are the*

*strong individualism of the farmers and their inability to organize and integrate both horizontally and vertically.*²⁹

Regarding forest lands, the second National Forest and Carbon Inventory data 2005 calculates a forest area of 10.7 million hectares. It represents 35% of the Italian territory, mostly set in Northern Regions. It represents about 5% of the total European forestry. A good strategy of forest management may have positive effects on a variety of sectors, including the labor market, environment, landscape and climate. Forest management is also increasingly oriented towards sustainable forestry interventions and the adoption of sustainable management practices. However, most of the forests in Italy are owned by the State in the form of National Parks. It is therefore hard to develop a policy of forests exploitation for renewable energy purposes. Further problems derive from the poor quality of Italian wood and the lack of efficient links in the forest industry chain (processors, sawmills, second process – production of furniture, paper and paperboard, pulp and energy), therefore Italy is highly dependent on imports from abroad.

Box 2 – Italian Rural Areas

Four types of rural areas have been identified, adapting the OECD criteria for rural areas territorialisation to the Italian context:

- a. Urban centers -> 1,034 municipalities with a high average population density (about 1,049 inhab. / km²) and low agriculture territorial extension, mainly covering areas closed to urban centers. They represent 43% of Italian population. Agriculture plays a marginal role, with 200 000 thousand employed, while there is a strong presence of commercial and manufacturing activities.
- b. Rural areas with specialized intensive agriculture -> 1,632 municipalities densely populated (253 inhab./ km²). Usually they are plain areas with rural, significantly rural or even rural urbanized character, mainly in the center-north of the country. They represent 22% of the national population and the central part of the agro-industrial sector (38% of agricultural national added value) with a particularly intensive agricultural production. The agricultural workers are about 340 000. Approximately 25.8% of farmers have income-generating activities different from primary production. These areas are characterized by a highly specialized agriculture with multi-sector activities such as tourism, and crafts.
- c. Intermediate rural areas -> 2,676 municipalities representing 24% of the whole population and 32% of the Italian territory. They are mostly mountain areas, predominantly or significantly rural, with some degree of economic activities diversification and widespread development. Agriculture is very important both in terms of covered land and number of employees. Agriculture employs about 385 000 people. Agriculture is complementary to other activities, such as tourism, and it also contributes to economic growth at the district level, thanks to its multi-functionality – maintaining historical, cultural, environmental assets.
- d. rural areas with development problems -> 2,759 municipalities that are sparsely populated (54 inh. / km²), which occupy 42% of land area. Those areas are mainly rural mountain in the South and in the Centre North. Agriculture employs about 225 000 people. Farmers with alternative business activities are 27% of the total. Agriculture is important but it does not guarantee rural development because of low incomes, less productive land, aging population and underdeveloped infrastructures.

²⁹ National Rural Development Plan 2007–2013, 4.

4.2.2 Bioenergy policy

According to the Legislative Decree 28/2011 – implementing the European Directive 2009/28/EC – defines bioenergy as energy from renewable non-fossil sources, namely wind, solar, aero-thermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, gas landfills, sewage gas and biogas purification processes. Particularly, Clause 2 paragraph 1 point e) defines biomass as “the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, including fisheries and aquaculture, the cuttings and pruning from public and private Green, as well as the biodegradable fraction of industrial and municipal waste.” The Legislative Decree 28/2011 adopts the same definition of biomass (Clause 2.e). As a member state of the European Union, Italian renewable energy policy has two general aims. Firstly, it should foster rural and agriculture development. Secondly, it must reach an overall share of energy from renewable sources in energy gross final consumption of 17%, an energy efficiency rate of 9% and an overall share of energy from renewable sources in transport of 10% by 2020. Analysis of energy consumption in 2005 (PAEE, 2011, p. 15), showed a slight increase in overall energy demand and energy intensity, as well as a reduction in consumption of petroleum products, even if is the source with the highest demand of energy. The country is dependent on energy import for approximately 86% of total consumption. According to the European targets, the 2010 National Bioenergy Plan indicates the transport sector as the one that must make the greatest efforts to increase its renewable quota, followed by the heating sector and the electricity sector.

The Legislative Decree 387/2003 on renewable energy production, states that renewable energy plants are of public utility, undeferable and urgent (clause 12.1). Hence, after the European Directive 2009/28/CE, the Legislative Decree 28/2011 simplified the authorization procedures stating that the plants of more than 1MW needs to apply for the *single authorization*, while for facilities of less than 1MW (3MW/thermal) it is only necessary that a *commencement notice* is delivered to the Building Office. If the facility is for micro-generation – less than 50KWe – it will just require a *communication* to the local administration. Usually owners of the facilities of 1MW or less submit the single authorization documents and the Conference of Services trying to avoid future problems and requests connected to environmental and viability concerns. Under the clause 12.6 of the Legislative Decree 387/2003, regions and provinces cannot subordinate the authorization to offsetting measures. However, the single authorization can include offsetting environmental measures to mitigate the negative effects of the new bioenergy activity, to improve the energy efficiency of public buildings or to sensitize the public opinion on the environmental themes. The 2010 National Guidelines on the authorization regime for renewable energy plants specifies some criteria to build facilities while protecting environment and landscape. In particular, projects that set the plants in agriculture areas shall be positively evaluated if integrating the plant within the rural landscape and food-farming traditions (National Guidelines, IV Part, 16(e), 2010 – according to the Legislative Decree 387/2003, clause 12.7). Moreover, regions and autonomous provinces can identify unqualified areas where they can forbid the presence of certain kinds of bioenergy plants, as specified in the National Guidelines – attachment 3.

In 1991, the government stated the possibility for regions to set their Energy Plan considering also energy efficiency and renewable energy (Emilia-Romagna has

adopted the first Regional Energy Plan in 2007). The Legislative Decree 28/2011 draws the link between bioenergy investments and rural development where it states that the national support tariffs can be cumulated up to 40% of the total investment cost, only in the case of plants of 1MW or less, owned by farmers and fed with biogas or biofuels. A farmer is defined as such by the Civil Code, Clause 2135³⁰, and the biogas production will account for the farmer's income only if more than 51% of the material used for the bioenergy production is from his land or livestock. The remaining 49% shall be biomass from agricultural or forest activities of a third party. The Financial Law 222/2007 clause 382 introduces the support scheme for plants running on framework, industry or short chain (within 70km) agreements and producing electricity by agriculture, livestock, forest products and by-products biomass or biogas. Plants of more than 1MW are supported through green certificates, while plants of less than 1MW enjoy a fixed feed-in-tariff, which amount has been reduced with the Law 99/2009 (from € 0,30 per kW/h to € 0,28 kW/h) and both for a period of 15 years. The Legislative Decree 28/2011 goes further, directly focusing the support scheme on fostering biomass and biogas plants owned by farmers and used for the farms activities. It also states conditions for the bio-methane production and the connection with the natural gas grid. Even if the decree mentions the support scheme for the bio-methane, it has not been approved yet.

4.3 Emilia-Romagna

4.3.1 Rural development policy

In Emilia-Romagna, almost 80% of the population lives in rural areas of specialized agriculture and intermediate rural areas, which together represent slightly more than 80% of all rural areas and population; 4.7% of the population resides in rural areas with development problems covering 25.3% of the surface. The main feature of rural districts is the high proportion of elderly residents: in rural areas with development problems 28% are more than 64 years old, while in urban centers, the percentage drops to 25%. The “young” are concentrated mainly in areas of specialized agriculture and intermediate rural areas.

Tabell 4.2 Rural Areas in Emilia-Romagna

Area	Residents	Area	People > 64 years
Urban areas	15.7%	2%	25%
Areas of specialized agriculture	43.2%	24.3%	
Intermediate rural areas	36.4%	48.4%	
Rural areas with development problems	4.7%	25.3%	28%
Total	100%	100%	

The major critical aspect concerns the human capital in agriculture, namely the scarce attractiveness of the sector on the young people: within the period 2002–2003

³⁰ Codice Civile [approvato con R.D. 16.03.1942, n. 262]

the percentage of young farmers (less than 35 years old) has been constant on 5.2% , compared to the 8.4% of farmers of more than 55 years old (2003). The education rate of the agriculture employees and farm holders is one of the highest in Italy, but considering that the country has the most undereducated workers in the sector compared to other European Countries (Regional plan for Rural Development, Review 2010, p. 46). Regional companies are dominated by the trade and services sectors, followed by industry. Agriculture accounts for 5.5% of total employment and produces 3.4% of surplus value compared to the national percentage of 2.8%. However, the regional distribution of employment by sector shows a tendency for agricultural employment to decline: between 1999 and 2005, the share of agriculture in total employment decreased from 6.7% to 4.4%, compared with a national drop of 5% to 4.2%. The land use data show that artificial surfaces comprise 8.5% of the regional territory, almost all concentrated in the plain. The agricultural area accounts for 60% of the territory (80% in the plains), while wooded areas and semi-natural environments account for 28% nearly all in the mountains (National Rural Development Plan, Review 2010, p. 7–10). This means that the forestry biomass is not close to where most of the people live, and so there is a significant transport cost in moving it to biogas or biofuel plants and for heating.

The ownership structure in the sector is characterized by the prevalence of direct farmer management (97%), followed by use of only family labor (81.5%) and companies with employees (8.8%). The average size corresponds to that of the micro enterprise³¹ with 94.2% of workers employed in small business, 5.7% in medium-sized farms and only 0.11% in the very large farms. Nevertheless, within the period 2000 – 2005, the sector has experienced a loss of competitiveness, with an output contraction of 6% over 2000, especially due to fluctuations in the international prices. Moreover, prices for food increased after 2008 (there has been a long debate within the international community about the influence of energy crops production on food prices), and there were fears of a world food shortage.

The Plan also affirms that there are some “innovation” deficits in the primary production and technologies, while the networks between the production sector and the universities are still too weak, with almost 6% of farm managers without a high degree of educational qualification. Innovation in the sector is then listed among the most important problems to face. Nevertheless, the Plan refers to the primary sector only and not to rural development in general. RE is one of the new challenges to deal with the climate change. The Plan therefore underlines the need to support new biogas plants connected to farms in order to help the farmers’ income diversification and secure energy supply to rural areas.

4.3.2 Bioenergy policy

The Regional guidelines of 2011 established areas zoned for the installation of renewable energy facilities – wind, biomass, biogas and hydroelectric. In particular, for biogas and bio-methane production there are some restrictions in Parmigiano Reggiano district – Provinces of Reggio Emilia and Parma – due to clostridia in the digestate obtained by corn silage and other energy crops. These limitations do not exist outside that area. Other important criteria are that of distance from the facility and whether it derives from energy crops. A plan is also required for the monitoring

³¹ Defined at European level as a company whose workforce is less than 10 people and whose sales or total annual balance does not exceed EUR 2 million.

of gas and bad smells both for new and existing plants. Moreover, it is proposed to build the facilities in pre-existent rural settlements in order not to damage landscapes. The Regional Resolution 1495/2011 on environmental mitigation criteria for biogas planning and management determines the evaluation of traffic viability, noise, and greenhouse gas emissions. Regarding production of biomethane and biofuels, rules and subsidies have not been decided yet. Thus, it is still not permitted to use them in transport or feed them into the national gas grid (biomethane).

Each region is required to have its own Energy Plan and green energy targets. Nevertheless, the Italian government has not fulfilled its task until March 2012,³² when the Ministerial Decree 15/03/2012 established the regional burden sharing to meet the European goals by 2020. The regional burden sharing has been set considering the goals of the National Action Plan on energy and the regional energy consumption in the electricity, transport and heating sectors. It seems that natural resources availability and sustainability, as well as rural development priorities, have not been considered. Specifically, Emilia-Romagna's burden sharing is of 8.9% by 2020 (Ministry Decree 15/03/2012). However, the 2007 Regional Energy Plan shows that there has been a progressive decrease in the production of primary energy (fossil) from 1980s–1990s to 2007. Renewable energy gives a small contribution, covering about 6.3% of primary production (2007), mainly hydropower, followed by biomass, wind and geothermal at low heat content. 50% of the renewable source is used to produce electricity. In 2009, 11.4% of electricity in the region was produced with renewable sources, accounting for 9.4% of the electricity demanded by the network. The agricultural sector produced 3.3% of gross final consumption of energy. In detail, there are 7,000 power plants (of which over 6,600 is PV) for a total installed capacity of almost 7,500 MW, of which 10.5% comes from renewable sources. The most common renewable resource is wood. It could be used in a sustainable way because the current use for energy purpose is lower than the annual increment of wood mass. Moreover, wood residues from other activities are underused due to a lack of economic and organizational conditions during harvesting, storage and processing. Another potentially green energy productive sector is that of food-processing industries waste, which could supply a large amount of material for bioenergy and biofuel production.

4.3.3 Administrative responsibilities

The Legislative Decree 28/2011 establishes that it is ENEA³³ – Italian National Agency for New Technologies, Energy and Sustainable Economic Development – and GSE³⁴'s task – Manager of Energy Services – to give information about energy

³² The burden sharing was decided on 2009 by Law 13/09 "Conversion into law, with amendments, of Decree-Law 30 December 2008, n. 208 laying down special measures in the field of water resources and environmental protection ", in which Art. 8 bis states that the Community's objectives regarding the use of renewable energy must be shared, by burden sharing, among Italian regions.

³³ ENEA borned in 2009 as a public body to carry out research and technological innovation, while running services for national enterprises and public administration in the energy sector, namely regarding nuclear power, and sustainable economic development.

³⁴ GSE is the state-owned company – the only shareholder is the Ministry of Economy and Finance – which promotes and supports renewable energy sources (RES) in Italy. In particular, GSE fosters sustainable development by providing support for renewable electricity (RES-E) generation and by taking actions to build awareness of environmentally-efficient energy uses. GSE manages support schemes for renewable energy sources (RES) at central level, with different solutions, which take into account the

instruments, arrangements, financial and legal framework for the dissemination and promotion of energy efficiency (in particular tax deductions for renewable energy and energy efficiency). The regional administration, in accordance with the local authorities, should instead manage the project planning, installation and operation of the facilities. They can also adopt measures to address and coordinate the duties of those local authorities who do not fulfill their functions as well as to encourage research, training, information and innovation. They also promote and organize the development of energy efficiency certificates (white certificates) and of renewable sources (green certificates) and the achievement of Kyoto Protocol targets on greenhouse gas emissions. Provinces have similar responsibilities, but in those areas which are not reserved to the State and Regions.

4.3.4 Support scheme

The national support scheme for bio-energy is mainly a feed-in-tariff paid by Energy consumers. One is granted to every renewable energy facility up to 1MWh (200 KWh for wind power) for fifteen years, apart from solar panels and all heating facilities. A fixed return is guaranteed and differentiated by source. GSE – energy services manager – pays a tariff for the energy fed into the national grid except for the energy used for own consumption. The subsidy cannot be combined with other forms of public assistance or local, regional, national or European Union incentives for plants activated after June, 30th, 2009.³⁵ However, there are some exceptions for electric power plants up to 1MW owned by farms or that use by-products from agriculture, agro-food industry, farming and forestry for a percentage that does not exceed 40% of investment costs. Nevertheless, there is no subsidy for feeding bio heat in the national grid yet, even though it is stated by the Legislative Decree 28/2011 and the 2012 feed-in-tariff scheme abolishes the support for plants that waste heat. The aim of the governments seems to induce the instalment of smaller scale plants close to areas in need for heating.

The second support scheme is a programme which grants incentives for electricity generated by photovoltaic plants connected to the grid. Plants with a minimum capacity of 1 kW/h and connected to the grid may benefit from a feed-in tariff, which is based on the electricity produced. The tariff differs depending on the capacity and type of plant and is granted over a period of 20 years. Moreover, to add value to the electricity produced by photovoltaic installations, it is possible to choose between two other subsidies: purchase/resale and net metering. The former is active since 1st January 2008. Under these arrangements (AEEG's Decision 280/07), producers sell the electricity generated and to be injected into the grid to GSE, instead of selling it through bilateral contracts or on the spot market. The latter is active since 1st January 2009. This service is activated at the request of interested parties. Under the service, the electricity generated by a consumer/producer in an eligible on-site plant and injected into the grid can be used to offset the electricity withdrawn from the grid. GSE pays a contribution to the customer based on injections and withdrawals of electricity in a given calendar year and on their respective market values.

different technologies of the plants and the level of maturity of the related markets. The granting of support by GSE requires a careful technical assessment of the plants in order to check their compliance with sector-specific legislation.

³⁵ See Art. 26 paragraph 1 Legislative Decree 28/2011, formerly Art. 2 paragraph 152 Law 244/2007.

Another way to foster bio-energy production is through green certificates. Green Certificates (GCs) are tradable instruments that GSE grants to qualified renewable-energy power plants (IAFR qualification) which have been commissioned before 31 December 2012 through the Legislative Decree 28/2011. The number of certificates issued is proportional to the electricity generated by the plant/system and varies depending on the type of renewable source used and of project (new, reactivated, upgraded, renovated system/plant). The GC support scheme is based on the legislation which requires producers and importers of non-renewable electricity to inject a minimum quota of renewable electricity into the power system every year. They represent proof of compliance with the renewable quota obligation: each GC is conventionally worth 1 MWh of renewable electricity. GCs are valid for three years. To fulfil their obligation, producers and importers may inject renewable electricity into the grid or purchase an equivalent number of GCs from green electricity producers. (GSE, 2012).

Box 3 – Italian energy market

The Italian electricity market was created by the Legislative Decree of 16th March 1999 No. 79 (so-called Bersani Decree), that transposed the European Directive 96/92/EC on the internal electricity market. Until then, it was characterized by a single large national operator vertically integrated in all stages of production, Enel S.p.A. Enel had to set up separate companies for conducting electricity production, distribution and sale both to eligible and captive customers, to exercise the rights of ownership on the electrical network transmission and to dispose of the Italian nuclear power stations. Enel was obliged to reduce its production capacity in order to not exceed the threshold by 50% of total electricity produced and imported into Italy. Moreover, the decree stipulated that the national electricity transmission network should have been managed as a monopoly, hence it ordered the establishment of a company whose network infrastructure ownership belongs to Enel. On 31st May 1999, it was then formed Terna S.p.A within the Group Enel. The decree also entrusted the network operational management to a public entity named Manager of National Transmission Network (ISO), today Electrical Services Manager (GSE). The Authority for Electricity and Gas (AEEG) is instead responsible to determine the conditions ensuring to all network users the system access equality, the impartiality and neutrality of transmission services and dispatching. The Italian Power Exchange (IPEX) – active since March 31st, 2004 – is managed by the Manager of the Electricity Market (GME). Despite a market share decreasing over the years, Enel Group has contributed to 31% of gross domestic production on 2007. The first six producers (Enel, Edison, group Eni, Edipower, Endesa Italy, Tirreno Power) have jointly produced about three quarter of gross electricity on 2007. The main national operator is Enel Group, with a market share around 43% on 2007. Moreover, the geographical location of plants illustrates Enel's higher share. It is currently the only operator with a widespread presence in various areas of the country: 45% of net-power installed in the North, 21% of the Middle South, 13% in the South and 9% in Middle-North, 8% in Sicily, 4% in Sardinia. The other operators have a more unbalanced diffusion with a high percentage of their plants located in the North. The gas market is almost similar. The Legislative Decree 164/00 transposing the European Directive 98/30/CE has maintained the original vertical integrated chain by providing the first and main power operator to control the national grid. The main one is Snam Rete Gas SpA, owned for a 40% by Eni controlling about 96% of infrastructure. The gas is mostly imported by three main entry points that runs completely on Snam Rete Gas. In Emilia-Romagna is rather important a multiutility – HERA – created on 2002 merging together several regional companies. Today, it is regionally supplying energy and water, while managing the waste system on 70% of the regional territory. Hera founders have been 139 municipalities in the provinces of Bologna, Ravenna, Rimini and Forli-Cesena. Today there are 183 municipalities sharing Hera ownership, located in the provinces of Bologna, Ferrara, Modena, Ravenna, Forli, Cesena and Imola.

5 Field research

5.1 Norway

Most of Norway's land is rural, although agriculture accounts for around 2.2% of the total gross domestic product. The sector is experiencing a crisis typical of all other countries, as the number of farm holdings has fallen by slightly more than 75% over the period 1959–2010 (BFJ, 2011, p. 10–11). Despite this situation, the Norwegian rural policy does not point directly to bio-energy as a way to increase farmers' income, although it is fostering farm's multi-functionality through production of IPT services and other services. Nevertheless, since the new climate change goals were set in 2008, investments on bio-energy have been increasing in number helping farmers and forest owners to invest in bioenergy. The only existing national support is in the form of investments grants given by Innovation Norway – for farmers and small projects – and Enova – for big projects and industry. Øyvind Halvorsen (Innovation Norway) and Helle Grønli (ENOVA) underline that investment in biogas is not profitable due to the several factors. The main reasons for biogas not to be developed are the low price on hydroelectricity, scattered rural settlements, no intensive farming, and the weather. However, Mr. Halvorsen and Reidar Tveiten (Norwegian Agricultural Authority) highlights that due to the Norwegian climate policy targets, it would be reasonable to support the biogas production based on manure. Mr. Tveiten reminds that agriculture should do greater efforts to reduce its polluting emissions and part of the program is precisely to use manure in the biogas plants avoiding the direct spread on the fields. By 2020, Norway must reach 30% biogas produced by manure, but the current data are not encouraging, since in 2011 less than 1% has been produced. At the beginning of May 2012, the Ministry of agriculture and food suggested to encourage biogas production by giving NOK 15 per 1 ton of manure delivered. It would be the first real subsidy to biogas, which is otherwise unlikely to be developed because of the high investment costs and low-efficiency.

Anyhow, there are some big biogas plants of which 30 are financed by Enova. Most of them will use organic waste, fish waste, manure and sewage to produce biofuel for buses and public transports in general. Some of them are built near industries and will supply heat or biofuel to them. One of the most important biogas plants is set near Stavanger – *Rogaland* – and produces 30 GWh of biogas per year. Ivar IKS has the plant ownership – a power company owned by the 11 municipalities of Finnøy, Gjesdal, Hå, Klepp, Kvitsøy, Randaberg, Rennesøy, Sandnes, Sola, Stavanger and Time with a total population of approximately 300 000. It is the only case where the bio-methane will be fed into the natural gas grid, since the latter was already existent. To deploy biofuels in public transports is a way to link rural resources and economies to urban areas and other sectors. However, the Norwegian bio-energy industry is focusing on bio-heat produced by *clean wood* – wood by-products (chips waste, etc). Companies and corporations engaged in the wood and/or bio-heat supply, as well as heating districts management, are rising in number throughout the country, in particular in the south east where there is a huge amount of forest. Bio-energy Oplandske is an example of a corporation initially

based only on farmers' capital, but today extended to a local forests cooperative and to a power utility company – BioEnergy EIDSIVA spa. Einar Stuve, the General Manager, during the interview highlights that the corporation is deeply rooted into local skills. Indeed, it capitalized on the business culture from farmers, expertise in raw materials from the forest cooperative, and high expertise on managing energy plants from the power company. This experience has also created new job opportunities in the rural areas involved. "There is a business on bio-heat due to the high cost of oil. However, if electricity price is very low it will be unlikely a high demand of bio-heat supply. Our contracts are therefore quite long-term, running for 15–20 years." The problem of price is critical: when the price of electricity decreases the price of bio-heat should do so. For that reason Mr. Stuve hopes that green certificate also will be extended to bio-heat.

Several similar experiences are arising throughout the country, such as Torpa Biovarme AS, a small scale bio-heat company. Those companies may include different stakeholders, such as farmers and carpenters/ wood workers, or also a power company. It is a chance to differentiate their activities and to make profit on that. Furthermore, there is a pivotal project set in Brandbu – North of Oslo – that represents the most important bioenergy farm experience in Norway. The project name is *The Energy Farm* and was founded by Erik Eid Hohle in 1991 with a main initial support of the Ministry of Petroleum and Energy through the BOKOM programme. It also received funding from the Agricultural Development Fund. Today *The Energy Farm* is self-funded by selling services to Enova and Innovation Norway, by holding training courses, consultancies and development work. Mr. Hohle's main goal is testing the farm's possibilities to be energy self-sufficient. *Demonstrations include production and chipping of wood chips, production of biofuel from rape seed, a biofuel boiler for domestic heating and production of biodiesel for use in cars and other farm machinery.*³⁶ *The Energy Farm* is showing how to invest practically in renewable sources. Nevertheless, he is also promoting the use of renewable energy and energy efficient systems between farmers, industries and the political system. Indeed, he is lobbying the government and the state institutions to improve measures for renewable energy production. *The Energy Farm* has also an institutional role working as a *meeting place where potential customers and suppliers meet to discuss possible solutions and the costs involved. These discussions lay down a foundation for negotiations and possible agreements.*³⁷ Potential customers are therefore aware about the heating prices and possibilities of supply. "Energy farm is behaving as a neutral actor, as a middle institution, presenting solutions given the demands and need of customers" Mr. Hohle explains. "The Norwegian bioenergy market is characterized as an underdeveloped market with few traders and this increases the need for more information both among suppliers and consumers. Even if the market is small and increased demand will boost competition." He underlines that the heating market is the most profitable in Norway, followed by the biofuels in the transport sector. Nevertheless, the framework conditions for bioenergy are still weak because of inadequate measures, namely those to build the infrastructure for "[...] *district heating, local heating and water-based heating. We have lacked a national heating policy*" (Mr. Hohle). He

³⁶ Ole Jørgen Nilsen and Anders Lunnan – Norwegian Institute of Forest and Landscape, "Drivers and barriers for implementing bioenergy – a case study of The Energy Farm", Høgskoleveien – Ås.

³⁷ Ibidem

hopes therefore in an increasing financial support for investments in district heating infrastructure and other bioenergy sources.

Mr. Hohle's reasons for starting with such activities were firstly connected to the environmental concern and sensitivity due his study and work background in forestry and research projects at the Norwegian Defense Research Institute. He had contacts with other countries, such as Denmark, Austria, Finland, and Germany, where renewable energy was already under political focus. Their experiences encourage him to initiate a regional bioenergy network even more expanded today: "to bring home knowledge about practical and theoretical solutions from other countries was also one of the reasons to establish the Energy Farm as a place to display mature technologies and energy systems".

Those interviewees explain that usually there are no big conflicts between local communities, local governments and the facility owners, insofar as the bio-heat production is widely accepted by the large majority of the population. There are local returns from these activities, such as new jobs and income possibilities, as well as lower heat prices. But probably, this is also due to a participated decision making process – *public hearings* – led by local representatives and open to every inhabitant. "Every time you want to build a heating district you have to ask for a concession to the municipality. Usually there is a competition and the winner will build and manage the facility and supply chain," highlights Mr. Stuve (Oplandske Bioenergi AS). Moreover, the municipalities' and counties' ownership of power companies adds more confidence in a system where localities have a great policy power. Such a case is that of the district heating in Aas *Kommune*, County of Akershus. The project has included several actors throughout the value chain, such as UMB, Viken Skog (collection and delivery of timber) and Statkraft Heat (heat production and delivery), besides the municipality that will have the possibility to reduce its greenhouse gas emissions respecting the climate targets [Johan Alnes, Ås Mayor]. UMB Rector, Hans Fredrik Hoen, emphasizes: "the new heating plant will cover the university's future energy needs, including all new buildings that come in connection with the relocation of the veterinary community, to Ås. About 90–95% of the new energy will come from wood chips, and 5–10% from bio-oil, this means a clear commitment to a green environment for both UMB and Ås municipality. Moreover, Statkraft Heat facilitates the management of the new district heating system by teaching and researching in a number of interdisciplinary areas such as: biomass, combustion technology, operations, technology, process analysis and simulation, control technology, logistics, renewable energy and the environment and climate. The project is therefore creating new possibility of work in the rural district".

In such a general context, cases of rural communities' disagreement are not common. However, as Mr. Stuve says, the problem generated after the energy market reform in 1991, is that of "big" integrated regional companies felt too 'distant' from the local interests. This situation, if not well managed, may have impact on renewable energy generation and selling due to a wide social rejection of big projects without clear interconnections with the rural needs (OECD report, 2012). Cases of rural communities' disagreement are, for instance, that about wind turbines as in the case of Troms County. Wind turbine installations are perceived as detrimental to landscape and consequently to tourism. The negative externalities are perceived as much more important than the potential local benefits. In addition, the national project of wind turbines is a top-down decision making process that has not involved rural communities in a significant way. It seems that while district heating

investments are helping farmers, rural areas climate targets and rural development, wind turbines benefit only the big firms who will build them.

5.2 Emilia-Romagna

The interviews with local authorities and farmers' unions underline that renewable energy sector is a crucial opportunity for agriculture to deal with its economic crisis because it opens new income chances. Moreover, the sector is expected to play an important function to reach European climate change targets. Nevertheless, it means a reduction of agricultural land due to the installation of renewable energy facilities – biogas plants, incinerators, solar panels. What is pointed out by local authorities and farmers' unions is that solar panels and biogas plants have increased in number due to the support schemes started on 2009. However, all actors involved apart from farmers, have strongly criticized the national schemes. Luca Simoni – CIA Ferrara/Argenta – criticizes bio-energy sector management. In particular he underlines a lack in the incentive framework where it does not differentiate tariffs either for kind of used materials – manure, agricultural waste, energy crops – nor for long or short production chains. This lack is affecting typical food production in the area due to a shift into energy crops production. In accordance with his claim, Lorenzo Frattini, President of Legambiente Emilia-Romagna, argues that there is still no effective tool to avoid this shift. Mr. Simoni further underlines the effects of such a policy: “it is reducing many job opportunities. Intensive tomato farming is more labour intensive than energy crops, the latter being more capital intensive. Local authorities should lobby the national government to change the tariff system, and give greater support for the short production chain”.

Giorgio Bellini, Chief of Ferrara Environment Department, has the same view and says: “to increase agricultural waste and manure use, the incentive regime should be based on what kind of material is put inside the biogas plant. Furthermore, it would be necessary to define an average area size to dedicate to the biogas plant”.

According to Mr. Simoni, critics are also focused on the authorization process that states how much raw material farmers have to put in the biogas plant from their own production namely, if they have enough fields or animals. Conversely, rents for new fields have increased sharply. Nonetheless, as clarified by Emanuele Burgin, Chief Department of Environment – Province of Bologna: “local governments – provinces and municipalities – do not have any power to make territorial planning. Legislative Decree 387/2003 Art.12 paragraph 1 states renewable facilities are named as *facilities of public interest, deferrable and urgent*, thus we cannot include them in a territorial energy planning”.

Moreover, almost all the interviewed farmers admit the main reason to invest in biogas is to earn more money. None is led by environmental concerns and, moreover, Italian law on renewable energy does not encourage projects managed in a sustainable way, as for instance the closed loop. A closed loop is a system where farmers use their own agriculture waste, manure and, in case, energy crops to produce energy. Only two of the interviewees, Pizzoli group and Minghini Farm, were interested to close the loop from the very beginning. Pizzoli is a famous Italian enterprise set in the Province of Bologna that processes potatoes into by-products. Potatoes are cultivated in fields all around the district by farms which have signed a contract with them. The enterprise has decided to invest in a biogas plant to process residues after training in Northern Europe. There, they came into contact with

similar enterprises which have already had a biogas plant. They wanted to close the production chain without affecting environment. Nonetheless, there is no district heating planned. The new activity has opened some new job positions – as for research in the laboratory – even if not many.

The second farm – Minghini's farm – is set in the Province of Ferrara. Instead of just increasing their income, they have also planned to close the loop by using only their own raw material (manure, energy crops, agricultural waste) and by spreading the digestate on their lands. Regarding involvement of local community during the decision-making process, Mr. Minghini (enterprise chairman) shows a strong perplexity about a broader participation during the planning phase: "it is too risky. Local community involvement is a task for public authorities. Anyway, we did not have any problem because the livestock have been here for years. The only event we planned is a little party in our farm to involve people and let them know about the biogas plant". One of the biggest problems he and others underline is an inappropriate national grid to sustain the new electricity produced. Anyhow, only one new job has been created since the plant was built.

Generally, farmers do an individual investment in biogas and few of them work together in a cooperative or company. There is no current incentive to create such cooperation between farmers in order to share costs and raw material supply. As a result, the material often comes from outside the farm overloading local roads of tracks. Few case studies are of farmers' cooperatives, as for instance, Cooperativa Agrobioenergia farm set in Medicina, Bologna. During the interview, Enrico Dall'Olio, the cooperative leader, explains that the decision to create a cooperative of 25 farmers and 1800 hectares of fields, has come out both to preserve primary production from a complete shift to energy crops and to share the cost of an expensive project. "It has not been difficult to put together several farmers because we had already worked together. We trust each other" says Mr. Dall'Olio. He assures that the material is totally from their farms (energy crops and manure) and from another cooperative that has tomato skins. They have many problems with the local community who complains about bad smell, pollution, noise and ruined landscape. At the very beginning of the project, local people have also reported their claims to the Regional Administrative Court. On the other hand, local authorities have only given authorization without being involved in any other activity. Mr. Dall'Olio does not agree with their behaviour and considers that it could be useful if all the actors were involved in the system by municipalities, since it may foster confidence. He therefore believes that the best use of biogas plant should be reached by using sewage and organic waste in addition to manure.

Energy crops are unethical and illogical. Thus, each area could be selfsufficient with a decentralized energy system. As for all the other cases, they are not feeding heat in a district heating, but only a little part is used for the plant. The plant technology is usually German but building skills and transport companies are local, as their common purpose is to foster local job and economy sectors. However, this experience has not led to new job positions. Nonetheless, most of investments are not shared. Such a case is that of Farm Cà Bianchina. The five partner managers were not farmers when they decided to invest in a biogas plant but they created a farm to get some advantages on the support scheme (51% of material must come from the farm). "It means the new activity is not helping a farm get new income and this is in contrast with the European directives" explains one of the committee members. The plant is set in Ferrara Province – Vigarano Mainarda, in the countryside where they bought some fields from a local farmer. Its potential is

1 MW/h and it is fed with energy crops as corn silage. As for all the other cases there is no district heating built and no new job positions opened. They had some troubles with the local inhabitants who claimed for viability damages and air pollution because the corn silage was and is still transported from another place.

There are many other cases like this throughout the region and Italy. For instance, “San Marco Bioenergie” is set in Ferrara countryside – Bando di Argenta. The plant burns imported wood from Eastern countries to produce 20 MWh electricity. The head administration changed three times because of troubles: use of the household waste without any authorization. In addition, the green energy produced is causing pollution because of thousands of trucks that transport the material to the plant from other countries. As explained by Mingozzi Marino, Chief of local committee, the enterprise made an agreement with the local farmers to collect their wooden agriculture waste, but it has never been respected so far. There is no local return of this activity a part for environmental and viability problems.

Another bad experience is located in Bondeno, Province of Ferrara, where Energy group built four closed biogas plants as there were four different owners. The local community fought against the project without any results. There are problems of pollution, bed smell, destroyed rural landscape and roads viability. The last example to mention is Cazzani’s farm. He had many problems of bed smell and water pollution from the very beginning. His plant is of 2.8 MWh in which he can put energy crops and animals waste from slaughterhouses. To cultivate energy crops he rented new fields from other farmers. The bad management of raw materials was polluting water and emanating a bad smell all around the district, as underlined by the local community. Moreover, according to Legambiente Medicina, Cazzani’s raw materials are from other areas in the region. Provincial authorities decided to suspend his activity until the moment he would have changed the plant diet with only energy crops.

The strongest complains of the local communities usually are about bed smell, environmental and landscape concerns, no correspondence between farm available raw material and plant size, damaged viability, no participation and sharing decisions. In their opinion, the renewable investments are only for economic advantages. Indeed there is no real planning for the future, when the incentive scheme will be ended. “It is not a sustainable way to invest in green energy and, in addition, there is no combination between energy needs and farm available raw material. Biogas plants planned this way are only speculations and they are not producing a true green energy,” one of the Vigarano Pulito committee members explains.

On March 2011 Ferrara and Bologna committees have signed out a common moratorium on renewable energy facilities in Emilia-Romagna delivered to local, provincial and regional authorities. They highlight that biogas applications are not well documented on environmental impact – greenhouse gas emissions, liquid digestate norms of spreading. Most of the applicants are not real farmers and there is not a proportion between the biogas plants size and the local raw material available for them. Thus, they asked for a suspension of biogas plants authorizations, a regional regulation that limits the investments to those that close the loop of existing farms and are environmentally friendly. Above all, it is requested that the size of the fields dedicated to the plant is at most 10% of the total farm area. They ask for an eventual legalization of bio-methane to feed into the national system and to open biomethane stations. Legambiente Emilia-Romagna embraces all their proposals adding a request for a support to heating production.

Professor Leonardo Setti, one of the most important researchers on these issues from University of Bologna, Industrial Chemistry department, explains that in Italy there are no incentives for heating production from renewable sources but only for electricity: “We already have a national grid for natural gas. Bio-methane could be our keystone to shift to green heating. But, prior it may be more important to plan a decentralized energy system through spread micro-generation. For doing this, it is necessary that each municipality writes its energy development plan in which to define an integrated energy strategy to reach energy efficiency and renewable energy production. As one of the most important research groups, we are lobbying regional administration to allow the local energy planning.”

The local energy plan is, therefore, the prior instrument to begin what Professor Setti, and his research group, call a *local solar community*. Such *community* is an attempt to develop a system managed by a cooperation of citizens and enterprises, while the municipality should establish the local energy targets to comply with European rules. In this idea, the local energy plan should come from the regional burden sharing. In fact, according to the law, municipalities should not draw up a local energy plan, although they still do it in order to locally manage policy requests regarding renewable energy. At the beginning, technical and economical keystones for *local solar community* will be both a special mechanism of voluntary local Carbon Tariff and an innovative way to manage district solar panel platforms. Each inhabitant may give a small annual contribution, based on his own consumption to sustain the local solar community. In return, they will have a great economical advantage in case of future investment in green energy or energy efficiency. Thus, the enterprises involved will be guaranteed a minimum and constant demand of “green” products, which will provide them with the necessary resources to invest and create new jobs. It will eventually create a virtuous local cycle, with shared skills and responsibilities. Local enterprises and experts, together with the University of Bologna – Industrial chemistry department, will help local governments to make the energy plan. The first municipality currently working on such a project is Casalecchio di Reno, Province of Bologna, which in 2008 asked University of Bologna support to design its local energy plan. “We want to reduce our dependence on fossil fuels by investing on renewable energy but without exploiting our natural environment.”

Some other scholars underline that biomasses are polluting hence, there is a case for an analysis of their impact on human and environment health. Mr. Gasparini explains that biogas plants and plants burning wood are polluting. The greenhouse gas emissions of these facilities are: ultrafine particles, aromatic polycyclic, formaldehyde, benzene, dioxins and furans toxic metals and H₂S (hydrogen sulfide). He recognizes that emissions from renewable energy facilities are less than from the other ones, but he warns that renewable energy is not as clean and green as it is pretended to be. According with him, Professor Tamino especially focuses on renewable sources combustion, which is the most polluting one: “Whatever I burn turns into a multiple number of chemical compounds most of the times toxic (for instance, wood combustion at home). Small particulate and nitrogen are formed. We should adopt the “Principle of firewood”: forest surplus is distributed in order not to affect the initial capital. A positive solution may be to use forest scraps, for example, but it needs small plants with a potential less than 1MWh. This would be sustainable renewable energy. Indeed, if we destroy the healthiest trees we will not create sustainable economic environment”. He imagines a shift from the centralized energy system, which relies on big facilities, to a decentralized one, which using small and

adapted facilities. Professor De Ambrogio adds that it may be necessary to divide the digestate in two parts: one solid and one liquid. “The liquid fraction contains nutrients, especially nitrogen and ammonia, ready to use. It should be injected under the soil or spread when there are plants. It is the form of nitrogen preferred by plants and can replace therefore the synthesis nitric oxide (which is normally produced with fossil fuels, among others). If the digestate is let there on the fields, the ammonia – a greenhouse gas – will evaporate in the atmosphere. Moreover, if it is spilled on the ground when the plants are not there, ammonia will turn into nitrate and if it rains, water sources will be damaged by nitrates.” Usually the digestate remains on the ground because of the high cost of the appropriate machines to inject it underground. The solid part is mainly organic. About 70% of the land in Emilia-Romagna are deficient in organic component (it means storing carbon in soil) that is very useful for cultivation – it works as a slow fertilizer. The solid part has a conditioner effect, while the liquid one has a fertilizer effect. Both of them must be injected as soon as possible, otherwise they will lose many of their positive effects, besides polluting air. Everything relies on the good sense of those who have the facility.

The biggest question is “where is the public administration?” The passive role of local authorities is one of the major problems underlined by almost all interviewees. Farmers and other actors, such as Farmers’ Unions, think that local authorities have to involve their own communities in public hearings. As Mr. Simoni underlines: “local representatives should do previous public hearings to explain how renewable facilities work and why it is useful to invest in them. Too often it happens that inhabitants are aware about the project only after authorization has been given.” Not all local representatives have the same view. Mr. Calderoni³⁸ affirms farmers should involve their local community in the project planning. Conversely, Mr. Bellini³⁹ thinks that municipalities could have a key responsibility on this issue: they should be intermediate actor between community and farmers who decide to invest in renewable energy facilities. “Currently, almost all municipalities are trying to involve their local communities to reduce misunderstanding and enhance the democratic system.” This is the case of Bologna where its provincial administration organized a two days Forum about biogas plants on March 16th and 23rd 2012. The Forum involved several stakeholders: local authorities, universities, research centres, rural committees, environmental associations, farmers’ unions, industries. During the first forum day, each stakeholder stated its view about renewable facilities and its own needs. The second day, they tried to establish new sustainable criteria for renewable resources exploitation. Mr. Burgin himself admits there are serious problems to deal with complaints: “It is the most critical topic of this legislature. Rural communities do not understand in which direction we are going.” Instead of recognizing this situation, local representatives seem unable to deal with it.

The lack of confidence in institutional skills and power is a real obstacle for districts development. Yet, it would be necessary a local return from these investments. For instance, lower energy tariffs could be decided in the districts with renewable energy facilities. Mr. Calderoni stresses: “in Italy, it is rather popular the NIMBY syndrome⁴⁰. Above all, there is a real confusion on the way facilities

³⁸ Chief Agricultural Department Province of Ferrara.

³⁹ Chief Environment Department Province of Ferrara.

⁴⁰ Not In My Back Yard.

function. Usually, media refers to biogas plants by using the verb *burn* instead of talking about fermentation processes”.

Claiming for the NIMBY syndrome bundles together all forms of protest or critique, including ‘legitimate’ critiques. I do believe the important point is that we are dealing with a bundle of rather critical public goods – from CO₂ emissions to nitrates, phosphates, landscapes, biodiversity etc – and so decisions must not be left to market forces, and the public institutions are not merely desirable but they are essential. Local authorities have real problems to grasp why people are strongly opposing renewable energy. This is due to a lack of communication between them and little institutional sensibility towards territorial needs. Anyhow, there are some exceptions such as Casola Valsenio – municipality in the Province of Ravenna. There, the biomass facility (280 KWh heating) was planned jointly with the municipality administration and local population. The project came out from four farmers’ need to increase their income and the consequent proposal of Coldiretti to involve the municipality in the project. Initially, an ESCO⁴¹ – SenioEnergia – was created in 2008, to oversee activities. The original idea was to use the three main renewable sources available in the area: wind, wood and sun. Solar panels were installed on all the public buildings and in a parking area (no exploitation of agriculture fields) for 270 KW/h of power produced. The wood plant is supplying heat to a local primary school, whereas the planned project on wind turbines is still under examination by the Province. Nevertheless, the authorization will be hardly given since they should be installed in a forest area.

Another example is that of CISA – Center for Sustainable Environmental Innovation⁴² – Porretta Terme. Initially, it was created as a private-public Consortium (51% Province of Bologna, 24.5% Carisbo⁴³ and the rest from the Italy Sustainable Development Foundation). Now it is a public Foundation of thirteen municipalities which could work with the private sector as well. During the early experience, they did a thorough research to show the existing interrelation among local energy and working needs. This has led to set small renewable facilities calibrated on local needs. Forests are one of the most important energy sources in the area and a job opportunity for Apennines farmers. CISA’s experience emphasises that there are many financial opportunities to be gained, particularly provided by Europe. CISA, together with two other European partners, is participating in a European sub-project of EnerciTEE (its purpose is to increase best practices spread towards areas with a minor experience), called Friprec – Financing Instruments by Potentials and Requirements of Energy Saving Contracting. Their goal is to study economical-financial pattern of contracts which could encourage public authorities to invest in renewable energy and energy efficiency. Other funds have been obtained through regional programme as PRRRIITT – Regional Program for Industrial Research, Innovation and Technological Transfer. It provided the necessary capital to buy a Stirling engine for one of the small biomass plant and to study CO₂ emissions as well. On one hand, they measured the forest size to know the amount of available raw materials, the forest absorption capacity of CO₂, and some new forest management methods to increase this capacity. On the other hand, they assessed how much CO₂ is emitted by each municipality. Under its leadership it was planned a project to save 2760 toe by building a district heating which currently

⁴¹ Energy service company.

⁴² Centro Innovazione Sostenibilità Ambientale.

⁴³ Italian bank.

heats both public and private buildings. CISA also financed two big exhibitions on renewable energy with experts, farmers, institutional representatives, and others stakeholders. In addition, since 2008, an information point has been activated within the framework agreement between the Province of Bologna and the four mountain communities of the time. The municipalities involved lent some of their public rooms for this activity. Mr. Odaldi of CISA says: “Citizens do not need a seller, but rather an expert who can explain them which is the best investment to do.” Within the same agreement it is possible to count other projects such as “Moving with the sun” and a solar panel plant of 20 KW/h on a factory in Porretta Terme. It feeds 5 flats and 2 vehicles for social services, a bimodal van and fifteen electric bicycles. Moreover, there is another biomass plant which burns wood near Porretta Terme museum. Mr. Odaldi explains that the Province of Bologna and the four mountain communities have recognized CISA as the reference point for renewable energy in the district: “CISA is a sort of external consultant for public authorities or small private firms (since it has shifted in to a Foundation), providing expertise to win regional and European funds as well as to study territorial energy needs and supply capacity.”

According to the European and regional directives, other initiatives could be promoted by Provinces and Local Action Groups – LAG – through public programmes. For instance, Province of Ferrara, activated a programme related to Measure 311, Action 3 – renewable energy facilities set in intermediate rural areas. Beneficiaries were Italian or European farmers⁴⁴ living in Italy. Action aims were:

- farmers’ income supplement;
- enhancing rural areas attraction in terms of investments;
- support to build facilities (maximum power 1 MW/h) for renewable energy production and supply.

Since spring 2012, CISA and Prof. Setti’s research group are currently working together in a joint effort to coordinate the green investments at municipal/local level. The collaboration stems from the EU mainstream movement called *Covenant of Mayors*, involving local and regional authorities, voluntarily committing in energy efficiency and use of renewable energy sources on their territories. By signing the Covenant, Mayors commit to reach and exceed the EU 20% CO₂ reduction objective by 2020. The agreement shall run for 3 years and the signatories must submit a SEAP – Sustainable Energy Action Plan – informing about the CO₂ gas emissions of their municipality, besides submitting a Local Energy Plan. EU targeted the Province of Bologna as the project coordinator in the area, so that the administration fostered coordination between the two actors since the first European assignment is performed by CISA, while the second is the main request claimed by Leonardo Setti’s group. The collaboration runs on the Sustainable Energy Action Plan, so that Setti helps the municipalities within CISA on setting their local energy plans, while proposing to the ones he has already helped to enter in CISA to have the possibility of getting funding resources. “It is a chance to create new ways of cooperation and engage municipalities in a common effort for greening the energy sector”, says Marco Odaldi of CISA.

Another example is that of LAG – Appennino Bolognese, opened in 2003 and gathering 26 municipalities together in the area. They have started three programmes

⁴⁴ Art. 2135 Civil Law.

on renewable energy facilities, financing 12 farms with the first two. Furthermore, there are two work-in-progress projects. Firstly, they are trying to cooperate with other agencies in the area to create a consultant centre on energy efficiency for public and private actors. Secondly, there may be the possibility to encourage an agreement between COSEA – public/private enterprise which manages waste in the district – and local farmers. COSEA proposes to collect wood chips and forest raw materials from farmers to put in a plant which will produce heat. This last project is still vague but if it proves profitable, the contract will be certainly signed up. Nonetheless, the problem is still the same: they cannot influence the system because of the regional law.

6 Assessment

Smart specialisation is widely considered as the place-based process to gather the regional/local skills and assets on the path to the regional innovation platform around any region's particular human, natural, cultural and other assets and identifying the 'right' regional and local niche to develop in the context of globalised markets. *“Both global economic growth and social cohesion require increasing the competitiveness of regions, especially where potential is highest. The comparative advantages that drive innovation and investment are as much a regional characteristic as a national one. For regions to succeed, they must harness their own mix of assets, skills and ideas to compete in a global market and develop unused potential.”*⁴⁵ Smart specialisation involves developing a vision, identifying competitive advantage, setting strategic priorities and making use of smart policies on the base of a common aim: maximize the knowledge-based development potential of any region.

The following part assesses the green regional innovation status of both Emilia-Romagna and Norway, in the light of regional innovation systems theory.

6.1 Emilia-Romagna

As broadly recognized by almost all the interviewees, bio-energy represents a new important source of income for farmers but also for agriculture which has been facing a hard crisis for several years. Emilia-Romagna is characterized by intensive agriculture and small–medium size farms, and its agricultural background constitutes the necessary basis for a bio-energy business based on farmers. Their knowledge and skills should permit a sustainable use of renewable sources, whereas the agro-industrial sector could provide the necessary competence for a proper facility management. The regional RE industry is focusing around biogas plants and solar panels as the pivotal technologies, but there is no regional programme on a specific RE technology that could foster smart specialization. A biogas plants technology is imported from abroad (mainly from Germany) and there are still no signs of local improvements made by owners' contacts. The use of by-products to produce green energy is scarce and it is also unlikely to be the main goal of plant owners, who usually try to gain a greater profit by using energy crops. Energy crops have a high opportunity cost, while other by-products – e.g. residues from food production or food waste – are rich in energy but usually costly to dispose otherwise. Energy crops production is also indirectly linked to the regional agricultural context (intensive agriculture), the regulatory RE framework and the support scheme that favours farmers. Those elements have led to a frantic *gold rush* in the rural areas, affecting food production, social confidence and the environment. Moreover, due to the feed in tariff for electricity, a power production surplus is affecting the national grid capacity, while wasting bio-heat produced by the biogas plant's anaerobic digestion. The bio-methane could be an excellent substitute of

⁴⁵ OECD (Conclusions of the Chair, High level Meeting, Martigny, Switzerland, July 2003).

natural gas, since it could be fed into its national pipelines without any further adjustment. In addition, given that biogas plants are usually set in the rural areas and run with agriculture products or by-products, bio-methane could link rural and urban areas economies. In fact, rural areas could become bio-methane suppliers for cars and/or public transports. Nevertheless, there is a high risk that rural areas will be exploited for this aim. The role of institutions and policies is again of key importance to frame the right conditions for RE production.

Box 4 – Innovation technology in Emilia-Romagna

Emilia-Romagna has a good level of technology innovation, as its research centers and universities produce nearly 17% of Italian patents, the second highest national data. The support of Emilia-Romagna government is about 41% of public resources provided for this field. Its production system is one of the most advanced of Italy accounting for 13.8% of employees on national basis. A lively and consolidated business environment and a dynamic socio-economic context foster such development. Furthermore, the region has several international contacts and one of the best Italian universities which has multiple studies, research and job programmes with European and non-European countries. There is also an important Consortium – ASTER – that involves the regional administration, universities, national research groups, such as CNR and ENEA, the regional Chambers of Commerce and the regional business associations. It has been created to promote and coordinate actions to develop the regional production system, to transfer technological skills and to foster networks dedicated to research of industrial interest, sponsored in collaboration with universities, research institutions and companies operating in Emilia-Romagna. ASTER has also activated some bio-energy projects within the European framework, such as RENEWED – EuRopEan NEtWork of BioEnergy Districts and EnerciTEE – a European networks, helping cities and citizens to become Energy Efficient.

It seems that local and national governments have no strong interest to develop bio-energy production in a successful way. From the very beginning, there has been a big lack of information and easily accessible regulatory framework, both nationally and regionally. Moreover, the Italian energy sector is not characterized by a link between small/medium private suppliers and local or regional governments that could allow energy market decentralization, differentiated prices and a source of income for the localities. The Italian energy market is an oligopolistic asymmetrical interaction where Enel (electricity) and Eni (natural gas) are dominating. Such imbalanced market is certainly bad for the creation of small local companies. Moreover, there are many regional incinerators which are producing heat by solid and household waste. The facilities are owned by a multi-utility, Hera, created in 2002 merging together several regional neighbouring utilities. Hera is currently one of the biggest Italian multi-utilities and it is carrying on a centralized model to incorporate more and more companies. Nevertheless, the proliferation of new renewable energy plants may encourage a more liberalized energy market in the future. It may happen thanks to operators' interest in a free energy market and to the needs of local returns.

The weak legitimization of the bioenergy is currently affecting the opportunity to develop local RE systems. There is a lack of confidence in the local authorities' skills, in addition to a generalized lack of local authorities willingness to involve rural areas into the RE decision making process. According to the interviews, there is a common agreement about the passive role played by local governments, probably due to several reasons. Firstly, regions are much more powerful than

localities, in particular on energy issues. The regional administration is the main actor who can decide where and how to locate renewable energy. In addition, RE facilities are of public utility, deferrable and urgent, thus local authorities cannot do any energy planning.⁴⁶ Italian localities also miss the financial resources and policy making power on energy issues, and this is probably leading to a lack of interest in the renewable sector development at local level. Thus, local authorities can only respect the law participating to the authorization process and require an environmental compensation to improve energy efficiency in the public buildings, if the plants affect the surroundings.

Considering the ownership regime of the bioenergy plants, it is even more unusual that a local/regional government or rural communities own the RE facilities, which are rather typically owned by single farmers. The national rules and the support scheme do not encourage farmers to cooperate, either among themselves or with municipalities or agro-industries. On the contrary, it stimulates single investments that are supposed to provide a greater profit. The national scheme makes the operators passive and dependent, while they are not able to compete on the market. Nevertheless, as shown before, there are some cases of cooperation and planning between different actors, such as Casola Valsenio, CISA and AgroBioenergia Medicina. But the absence of the local communities in the decision making entails both a weak legitimacy of the renewable energy and of the local governments, so that committees against RE plants are rising in the rural areas. The social basis “cluster” is therefore lively, but hostile, due to a lack of local economies development (no new jobs and lower energy prices, for instance).

Although energy is a top-down policy, it must be pointed out that the strong struggles against nuclear power in 1987 and 2011 have created a major consensus on a new energy framework which should be localized and decentralized. As mentioned before, the two regional best practices are those of CISA and the project of *Local Solar Community* that are now working together to boost the greening of local energy sectors by directly engaging municipalities. Their work can be considered a local and green innovation platform that could improve and expand regionally by opening its boundaries to other local initiatives but also joining experiences of other countries.

The biggest regional gaps are the exclusion of local communities from the decision making and planning processes and the absence of local returns, both of which damage legitimacy. Nevertheless, the problems of interaction and the management of renewable energy chain are fostering learning by interacting process. Within the region are emerging some relevant case studies usually stem from rural struggles against biogas plants. These struggles are forcing the other actors to deal with the need to create a different pattern of energy chain. The evidence is that some rural areas are developing their own way to invest in renewable energy and to connect their experiences to the European networks. It is too early to assure that a regional innovation platform will emerge, but some common efforts are on the way.

6.2 Norway

Norway is focusing its smart specialization around bio-heat from wood chips through district heating technology. Norway has a huge share of forest lands and its

⁴⁶ See the national law 387/2003.

farmers are almost all forest owners. It means they have the requisites to handle the supply of wood. District heating technology is mostly coming from abroad, in particular from Germany, Finland, Sweden and Austria. Interviewees assured that it is not profitable to invest in research & development, as it is cheaper to import the technology from other countries. However, during the last decades, Norway has developed the world's best hydropower technology, while investing in solar panels technology. Moreover, the Energifarm is working as a testing and diffusion center, mainly for biomass technologies, and as a lobby as well. It seems that Norwegian operators could have the skills and the right environment to develop new ways of doing things with existing technologies adapted to the local community needs and features.

Norway's bioenergy market is not well developed. Bioenergy is in unbalanced competition with the hydroelectric power which meets over 90% of electricity demand and is highly competitive in terms of price. The energy market reform in 1991 has not avoided a regional concentration of the power companies and has somewhat leveled the prices at local level. Local or regional corporations, investing in bioheat, are rising throughout the country. Usually, such companies include farmers, actors processing wood and delivering chips, and a power company. It is unlikely that farmers alone decide to invest in a biogas plant or in plant burning chips for a district heating, because of the high investment costs and unbalanced competition in the market. Moreover, there is no national support scheme for the bioenergy fed in the grid, and only a small incentive of approximately 1 eurocent/kWh for wood chips production. However, Innovation Norway and Enova are the national agencies that provide grants for bioenergy investments. In 2008, the government increased the fund for Enova in order to strengthen its role. Indeed, since then, Enova's projects have risen considerably and it has furthermore helped municipalities to frame their own climate change strategies. On the other hand, Innovation Norway is helping farmers' bioenergy projects, sometimes in collaboration with Enova. The regulatory framework is quite clear and accessible. Local administrations control the concession system (the main criteria is to secure the environment and landscape), while the local government usually call public hearings. The government has established national targets both for greenhouse gas emissions and for renewable energy production. Each county and municipality should set its own climate and energy action package, including targets and measures. Furthermore, counties and municipalities are often involved in the energy sector through part-ownership of local energy companies, linking the renewable energy deployment to local economies. Localities gain revenues that they can use in relation with their energy policies.

Even if there is no formal connection between rural development and the bioenergy industry, the latter is linked to the environment and climate policy. It seems therefore, that many actors are working together in the rural areas in order to guarantee climate targets fulfillment and common local returns. The local energy planning helps rural districts to improve their energy performance, while creating new job opportunities and stimulating a green consciousness. This is not exactly the case of the big biogas projects and wind turbines though. They are usually single investments to exploit rural scattered settlements and wide empty areas. Thus, there is no interest to secure rural development and population acceptance. Nevertheless, local returns, shared investments and the absence of a highly profitable feed in tariff, have avoided a dangerous *gold rush* to renewable energy in the rural areas. Nevertheless, the green certificates system with Sweden created in 2012 could

generate a *gold-rush* behavior that will affect the traditional Norwegian sharing attitude. This attitude derives partly from the hydropower tradition that has had two effects. On one hand, it taught private and public sectors to share a localized energy chain. On the other hand, it has slowed down the need to improve other RE technology.

Apparently, Norway has the basis to foster a green innovation platform around RE, especially on bioheat and biofuels. Nevertheless, it should not be greedy for big RE investments in rural areas, because it could destroy the typical strong confidence between the population and the political system, in particular it may affect local governments. It should also make greater efforts to develop a good bioenergy market able to fairly compete with the hydropower prices. It is also important to find a way to foster farmers' biogas production in order reach the goals of reducing agriculture greenhouse gas emissions. Although at its first steps, Norwegian bioenergy industry is broadening its roots thanks to *old* processes of learning by doing, using and interacting; especially in the South and South East, where forests are abundant and the warmer climate could enhance a regional innovation platform around RE. It only seems to lack of a strong national research framework that may develop or improve the technologies of its smart specialization around wood and district heating.

7 Results and conclusions

The two case studies show different ways in which the RE sector can be developed.

On one hand, there is a conflicting context where atomized stakeholders are trying to deal with the several emerging problems related to RE. Local governments and investors in RE are apparently unable to share efforts, needs and problems. The former is only at its first steps to involve rural communities in a participatory approach. In addition, the regulatory framework does not clarify the specific competencies or, at least, it is not observed. The results are no local returns and no rural areas development, in most of cases. Rural communities claim for attention and complain about the negative externalities they are currently facing, due to random biogas plants investments. The last point local committees are shouting out loud, is to stop rural lands and economies exploitation and grabbing. They demand for RE development, but taking care of landscapes, environment, human health, through a territorial planning including also the people who live in. Where the RE investments are carrying out positive externalities (especially in the mountain rural areas – CISA and Casola Valsenio), in terms of new jobs and citizens involvement, the social tensions are controlled and the new activities accepted as an opportunity. These positive exceptions represent local innovation platforms, which could be extended to other areas. In particular, they show both the importance of the ‘legitimacy issue and how it can be fostered. It is not evident at present that the nationally dominated renewable energy policies are succeeding in this, and in consequence they may be ‘shooting themselves in the foot’.

On the other hand, in Norway, the hydropower – an RE itself – has stopped a further top-down willingness to develop other source of RE. Nevertheless, several stakeholders are working together to extend the use of bioenergy and foster local economies. In addition, Norway’s adoption of the EU RED Directive means that it is seeking to foster other renewables, even if the mechanisms are not yet clear. A background of shared responsibilities and local investments, fostered by relatively powerful and well-funded municipalities, is therefore helping the emerging of an innovation system around bio-heat and biofuels production from wood, sewage, organic waste and manure. Municipalities are actually recognized to be the driving force for bioenergy development throughout the country, replacing the national level where it does not support it. This is possible thanks to the great share of political and financial resources they have, but undoubtedly also because of the high degree of trust they enjoy from citizens. These cases represent examples of how RE deployment should provide rural communities with benefits both economically than environmentally. Nevertheless, some of the recent events (wind turbine investments and green certificates market with Sweden) and the liberalization of the energy market, could lead to a disconnection between local dynamics, negative impacts compensation and RE production.

Both Italy and Norway should foster a more effective decentralization of the energy market and renewable energy policy, in particular Italy, where there is a strong disposition to vertical integration at the national level. It stops the creation of a decentralized bioenergy system that, instead, would be the best way to further the RE development, through, for instance, local lower energy prices. In addition to this,

Emilia-Romagna's government should localize the energy planning through the *local energy plan*. Moreover, the feed-in tariff should be given to cooperatives of farmers or rural citizens, or companies including multiple stakeholders, sharing investments, costs and responsibilities. It may avoid the rising of single investments on RE (in Emilia-Romagna especially on biogas), without any long-term planning. It means that when the feed-in scheme ends, the farmers should be able to keep their activity alive. This framework may also secure local returns to rural areas, thanks to the creation of new jobs, common activities and shared responsibility strengthening local economies. If the national government is wise to legalize the biofuels, it will be also possible to link rural areas and urban areas. Rural districts may supply the raw materials for biofuels to use in public or private transports. This could also be the case for Norway, which already has biogas plants producing biofuels for public transports. Norway should be careful not to encourage big projects without interconnections with the local needs, otherwise it will face a strong opposition by its rural communities. Moreover, both of them must encourage technology innovation, maybe through tests on foreigner technologies, if not by inventing new ones. Focus should be on somewhat cost-effective, predictable and long-term stimulation of planning that encompasses the most of the actors and fields.

The study teaches that rural development can be provided only if a common local governance is developed. Rural communities should be linked to RE chain, mainly guaranteeing economic and environmental returns, and a participatory framework previous to the authorization/concession is given. *A bottom-up approach that includes economic incentives for local seems to yield less difficulty in obtaining local approval* (Buen, 2006 p. 3896). Within the common governance, all the stakeholders should also focus on new ways of doing things as well as technology innovation, particularly adapting it to the local needs. Such framework it is crucial to say that a green innovation platform is on the way.

8 Unresolved questions

Due to time and spatial constraints some questions still lack an answer, while some new ones emerged during the research. In particular, the link between rural development and bioenergy development should be further explored in order to trace the economic, social, political and institutional conditions under which bioenergy can contribute the most to sustainable rural development. However, other issues are rather important, such as the decentralization of the energy market that is considered to be an important step for bioenergy development; the matter of the plants ownership. There is a strong debate on the importance and consequences of local ownership instead of supra-local. Some scholars warn about the “local-trap”, the assumption that the local scale is inherently good and therefore advantageous (Bain, 2011 p.140). More important, the local trap masks the fact that local places are not homogeneous communities organized around shared community interests (Bain, 2011 p.140). Within this context it would be rather important to further investigate how the learning by interacting works and if there is any mechanism of collective learning that involves several actors along the chain, namely bioenergy investors, farmers, localities, rural communities, universities. Another interesting issue is if the learning process could be engaged in supra-local networks and reinforced by the interacting with other experiences, knowledge and practices.

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